ISBN : 978-93-88441-93-3

NATIONAL CONFERENCE ON

Exploring New Dimensions in Teaching-Learning for Quality Education

8th- 9th June, 2019

Under Aegis of
All India Council for Technical Education, New Delhi

In Association with
Engineering Education Foundation

Organized By
K. K. Wagh Institute of Engineering Education and Research, Nashik (Maharashtra)

Hirabai Haridas Vidyanagari, Amrutdham, Panchvati, Nashik - 422003
Website: https://engg.kkwagh.edu.in

National Conference

on

Exploring New Dimensions in Teaching-Learning for Quality Education

Proceedings
of
National Conference
on

Exploring New Dimensions in Teaching-Learning for Quality Education

8^{th} and 9^{th} June, 2019

Under Aegis of All India Council for Technical Education, New Delhi

Organized By

K. K. Wagh Education Society's

K. K. Wagh Institute of Engineering Education & Research, Nashik (Maharashtra)

In Association with
Engineering Education Foundation

Disclaimer:

ISBN : 978-93-88441-93-3

Printing & Published by:

Success Publications
Radha Krishna Apartment, 535, Shaniwar Peth,
Opp.Prabhat Theatre, Pune - 411030.
Contact - 9422025610, 8390848833, 020-24433374, 24434662
Email- marketing@sharpmultinational.com
Website- www.sharpmultinational.com

Wishes from Chairman

Shri. Balasaheb D. Wagh
Chairman,
K. K. Wagh Education Society, Nashik

I am pleased to welcome you all in the K. K. Wagh Education Society which is celebrating its Golden Jubilee year in 2019-2020

K.K. Wagh Education Society works in the field of education with philanthropic approach since last 50 years.

K.K. Wagh Institute of Engineering Education and Research, Nashik (KKWIEE&R) is a flagship unit out of 34 other educational units, of K.K. Wagh Education Society

I am happy to note that KKWIEE&R, Nashik has organized a National Conference on "Exploring New Dimensions in Teaching Learning for Quality Education"

As a chairman of Association of all private engineering colleges of Maharashtra state, I always feel the dire need of quality teachers and improvement in quality of teaching-learning methods. The needs of new era Google generation in higher education are totally different and modern teachers need to update and equip themselves accordingly. I am sure that this conference will serve the purpose of fulfilling these needs.

I hope the teachers all over India will enjoy this conference through sharing of their experiences.

I wish all the best to the conference.

Message

Dr. K. N. Nandurkar
Principal,
K. K. Wagh Institute Engineering Education & Research, Nasik

I feel honoured and privileged to be the convenor of National Conference on “Exploring New Dimensions in Teaching Learning for Quality Education”. I welcome you all for the conference.

K.K. Wagh Institute of Engineering Education and Research (KKWIEE &R), Nashik was established in the year 1984 and so far produced over 15000 engineering graduates who are successfully working in India and abroad. This institute is known for providing quality technical education and it is accredited with grade Á’ by NAAC. It has a blend of young and experience faculty members who are active in teaching, research, consultancy and training activities. They strive to improve the teaching learning process in such a way that the students get best learning experience during their course of study. With four Ph.D. Research centres, the institute has developed research culture and encourages its staff and students for presenting their research at National & International level.

Recently, the responsibility of continuing activities of Engineering Education Foundation (EEF), Pune was entrusted on KKWIEE &R. Since then, it was planned to carry out some activities for enhancing the quality of technical education in the state of Maharashtra. As a part of this mission, a proposal to organize a National level conference solely dedicated to engineering education was sent to AICTE for funding. Fortunately, it was accepted by AICTE considering the importance of the topic.

It is expected that deliberations on various topics such as new dimensions of teaching learning, faculty development, quality in education, R&D and innovation, skill & entrepreneurship and academic governance will be done during the conference. We have also planned plenary sessions by experts in the field of technical education.

Today, the technical institutes in our country are facing lot of challenges. The sharing of experience by engineering teachers across the country will be beneficial for enhancing the quality. I am sure that the junior faculty members will be motivated and guided by the seniors attending the conference. The interactions at different levels will also lead to innovative solutions for some of the problems faced by teachers. If we are able to attract talented students for engineering courses and if we are able to retain them, we can create a highly skilled technical work force which will help our country to march forward in the technical field.

With so many developments in the field of Information and Communication Technology (ICT), the teaching learning methodology is evolving rapidly. The role of teachers in this situation is also challenging. I am hopeful that the presentations in this conference will be able to define the role of teachers in proper way and also provide some guidelines to face the challenges faced by 21^{st} century teachers. The compilation of research papers received from various parts of the country will certainly serve as reference for all stakeholders of the technical education. I am glad to share this proceeding and thank all the contributors for their well researched articles.

Exploring the New Dimensions…..

Prof. Sunil Kute
Organizing Secretary
Dean (Academics)
K. K. Wagh Institute Engineering Education & Research, Nasik
Member, Board of Studies (Civil Engineering) S. P. Pune University

The higher professional education is on the cross roads of new trends in teaching-learning. The number of institutes imparting higher and professional education has grown up by leaps and bounds in recent past. Catering the need of availability of accountable teachers and maintaining the quality of education is a real challenge, today. Modern techniques in teaching-learning such as the digital education, ICT in teaching-learning, innovation, startups, e-governance, autonomy, private universities, MOOCS, flip classroom, virtual reality etc. are some of the new dimensions which have demanded to respect the current education system. The new generation teachers are required to be exposed to these dimensions. Senior faculty is also required to be updated with these dimensions.

On this background I am pleased to organize this conference, keeping this aim of enhancing the quality of teachers and education by exploring the new dimensions of teaching-learning, in mind.

The six themes of conference namely, Different dimensions of Teaching-Learning, Faculty Development, Quality in Education, R & D and Innovations, Skill and entrepreneurship, and Academic Governance are the key issues in Teaching –Learning, now days. I am glad to share that many teachers in the country are doing nice experiments on these themes and this has clearly reflected in the papers of this conference.

I am sure that through the common platform of this conference, all the academicians from different parts of the country will get nice opportunity to meet, interact and share their experiences. Such sharing is the need of time for quality of future education. I thank AICTE for funding this conference. Also, I thank all National Adivisory Committee Members and Delegates for their support in organizing this conference.

ORGANIZING COMMITTEE

Committee	Name
Patron	**1)** Hon. Dr. Anil Sahasrabudhe, Chairman, AICTE, New Delhi **2)** Hon. Shri. Balasaheb Wagh, Chairman, K.K.Wagh Education Society, Nashik
Convener	Prof. Dr. K. N. Nandurkar
Organizing Secretary	Prof. Dr. Sunil Kute
Conference Secretariat	Ms. K. S. Aher
Technical Program	Dr. S. M. Kamalapur
	Prof. V. N. Suryawanshi
	Prof. Taware Ashwini
	Prof. Megha Patil
	Mrs. Rakhee Palde
	Mr. Nawale Yogesh
	Mr. Rajguru Dattatraya
Reception Registration	Dr. S. P. Ugale
	Prof. Sagar Zalte
	Prof. K. Nirmalakumari
	Prof. Snehal Raut
	Mrs. Rupali Kale
	Mr. Balu Dhongade
Proceedings	Dr. P. J. Pawar
	Prof. Vaibhav Gaikwad
	Prof. Anil Mandlik
	Prof. Nilesh Wakchaure
	Prof. Santosh Sangle
	Mr. R. V. Jadhav
	Mr. Alok More
	Mr. Santosh Dhage
Local Transport	Prof. Suhas Pandit
	Prof. Ganesh Savant
	Prof. Neha V. Sonwane
	Prof. Sagar Suryawanshi
	Prof. Swati Ghadojel
	Prof. Apurva Vaidya
	Mr. P. D. Niphade

	Mr. N. P. Birari
Catering	Prof. P. R. Rahane
	Prof. Ranade Pankaj
	Prof. Vishal Galande
	Prof. Bhushan Patil
	Prof. Pritam Ahire
	Mr. V. W. Jadhav
	Mr. Pawar Rakesh
	Mr. Pawar Narayan
Certificate	Prof. Ms. Sagare Snehal
	Prof. Deshmukh Zameer
	Prof. Rahul Mane
	Prof. Jaya Mane
	Prof. Sadique shaikh
	Prof. Amol Game
	Prof. Rohini Haridas
	Mr. Anil Niphade
	Ms. Borade Shubhada
	Mr. Chaudhari Deelip
Hall arrangement and session management	Prof. S. V. Purkar
	Prof. Deshmukh Zameer
	Prof. MahaleTejmal
	Prof. Kshirsagar Abhijit
	Dr. S. J Gadge
	Prof. S. S. Ambewadikar
	Prof. Tejal Patil
	Prof. Prachi Dorle
	Prof. Nikhil Barawkar
	Mr. Swapnil Ahire
	Mr. Abhiman Hadape
	Mr. Ritesh Ugale
	Ms. Aherharshda
	Mr. Nathe Anil
	Mr. Pagar Amit
	Mr. More Bhika

Accommodation	Dr. P. S. Bodake
	Prof. Badijate Sagar
	Prof. Kiran Somavanshi
	Prof. Mahale Poonam
	Prof. Pratik Kadam
	Mrs. Seema Patil
	Prof. A. A. Hipalgaonkar
	Prof. Harshada Rayate
Co-ordination	Dr. A. W. H. Ansari
	Prof. Sagar Shinde
	Prof. Vasant Chavan
	Prof. Shahir Prachi
	Prof. Unahale Rupali
	Prof. Kshirsagar Monali
	Mr. Thakare Mangesh
	Mss. Dharam Ashwini
	Mr. Wadghule Gaurav
	Mr. Wagh Harish
Finance	Dr. S. P. Dhake
	Prof. Avinash Bhusnar
	Prof. Swanand Dongare
	Mr. Yogesh Nawale

National Conference on Exploring New Dimension in Teaching-Learning for Quality Education

8th – 9th June, 2019.

CONTENTS **Page No.**

KEYNOTES

Track 1
Different Dimensions of Teaching-Learning

Track 2
Faculty Development

Track 3
Quality in Education

Track 6
Academic Governance

KEYNOTE ADDRESS

Changing Paradigm of Teaching-Learning in the Age of Knowledge and Innovation

P. B. Sharma
Vice Chancellor, Amity University, Gurgaon
vcauh@ggn.amity.edu,pbsharma@ggn.amity.edu

Abstract:
With the rapid growth and advancement of information and communication technology, ICT based applications and their inclusion in education and research, the education system is changing in ways which had never been thought of before. As a result, the ecosystem for education and research at all levels from primary to tertiary is undergoing a rapid transformation.
But whether our education system in India is apt and prepared enough to cope up with these rapid changes is a question that needs to be answered on an urgent basis. The complexity is further added due to disguised nature of the new and emerging technologies. Importance of on-demand, anytime and anywhere learning facilitated by the ever increasing penetration of ICT and online self learning system is on a rise. In fact, it is being believed that "an avalanche is coming in higher education that shall cause massive disruption of the university landscape." The industry is also under severe pressure from rapid penetration of automation and artificial intelligence driven systems in Industry 4.0 and that is the way Industries of tomorrow shall advance further. The future of jobs shall be dependent upon how the Universities of tomorrow are able to transform their higher education system to tune to the requirements of knowledge and skills of the industries of tomorrow. A rapid paradigm shift is advocated to create a greater space for learning by doing, making autonomy of learning a reality in educational system and empowering students and faculty with ample opportunities for collaborative learning and to nurture imaginative and intuitive faculty to capture new ideas and thus make innovation a habit. This calls for a sea change in the way education is imparted, governed and regulated.
Authors examine the emerging challenges of the higher education from the point of view of industries and services of tomorrow and present a framework of reforms that are needed to make higher education a powerful vehicle of growth and advancement of human society in the era of knowledge and Innovation revolution.

Keywords: University education, blended learning, industry 4.0, autonomy, governance and regulation of higher education.

"My message, especially to young people is to have courage to think differently, courage to invent, to travel the unexpected path, courage to discover the impossible and to conquer the problems and succeed. These are great qualities that they must work towards. This is my message to the young people."
A.P.J. Abdul Kalam

1.0 Introduction

We are in an era of digitisation and things have changed a lot from the earlier times. For instance, various services and facilities are available to us on click. Similarly, the changes brought about by the technology are visible in the education sector too. Till last century, the education system in India was the traditional classroom-based learning, where students didn't get opportunity to participate actively in the teaching – learning process. This led to the development of the concept of digital learning which evolved in around 2002-03. However, certain factors like gaps and lack of implementation within the system are leading to the failure of quality utilization of this digital access. Thus, we as educationists need to work towards removing such barriers and ensuring that we do justice to the coming generations. Providing our students with the best quality of education should always be our priority, especially in an age wherein knowledge and innovations are becoming central to the teaching – learning process. But what is education in its true sense? The word education has been defined differently by many eminent personalities. For instance, Mahatma Gandhi defined education as " all round drawing out of the best in the child and man – body, mind and spirit" while Tagore defined education as, "which makes one's life in harmony with all existence and thus enables the mind to find the ultimate truth which gives us the wealth of inner light and significance of life". For Swami Vivekananda, "the education is the manifestation of perfection already in men". He thought it a pity that the existing system of education did not enable a person to stand on his own feet, nor did it teach him self-confidence and self-respect. To Vivekananda, education was not only collection of information, but something more meaningful; he felt education should be man-making, life giving and character-building. For the thinkers of east, the education was more of an enlightenment and manifestation of inner light. The thinkers of the West in early times also voiced a number of opinions about education. For instance, Aristotle viewed education as "paying emphasis in all round balanced development and the creation of a sound mind in a sound body". Thus to him the aim of education was the welfare of the individuals so as to bring happiness in their lives. **Education philosophy gradually started to change from oriental to**

occidental and later after industrial revolution, education became a means of empowering and developing the society as a whole. So, it was thought that, education being provided to an individual is not only limited to him/her but it directly affects the society and the community in which the individual is living. It should be noted here that, it's not just the institutions which play a role in ensuring quality in education but also the community and society. For example, let's have a look at how **NASSCOM** is doing its bit.

10000 Startups – Torchbearers of a Young & Confident New India

10,000 Startups is an initiative to scale up the start-up ecosystem in India by 10x through incubation, funding and support for 10,000 technology start-ups in India over the next en years.

- 10 warehouses incorporated since its inception in 2013
- Incubated ~ 300 start-ups across warehouses with more than $40.7 mn funding raised
- 800+high impact events conducted in 22 cities – attended by 35,000 attendees
- Initiatives impacted 2468 start-ups – out of which 327 received funding, and rest received mentorship
- Partners : Google, Amazon Web Services, DigitalOcean, IBM, Microsoft Ventures, Kotak, Facebook.

(Image 1)10,000 Startups – Torchbearers of a Young & Confident New India as per NASSCOM Report- Inclusively India 2017-18

NASSCOM, through its initiatives and efforts is providing the youth with opportunities to innovate and disrupt the global market. For instance, it can be seen above in image 1 the no. of ways in which they are making it possible.
Looking at the example of NASSCOM, it would not be wrong to mention that apart from theory and practical components in the education system, providing exposure which is professional and accessible is the requirement of the time. It's essential to empower the youth to work and lead the society towards a global era. Empowerment of an individual will lead to the empowerment of the masses which will in turn help the country move forward towards development and prosperity. With the invasion of technology, it has become much easier to know and spread knowledge. That's why it is essential to leverage this opportunity and empower the citizens of our country, for which education is the first and the best means. Making knowledge easily accessible should be the major priority. **Thus, we as educationists of today should ensure that the education being provided should fulfil the objectives which are being carried down the generations through ages. We cannot ignore the fact that the scenario of jobs and market has changed a lot from the earlier times. The future of jobs in the coming days shall be dependent upon how the universities of tomorrow are able to transform their higher education system to tune to the requirements of knowledge and skills of the industries of tomorrow**. A rapid paradigm shift is advocated to create a greater space for learning by doing, making autonomy of learning a reality in educational system and empowering students and faculty with ample opportunities for collaboration learning and nurture imaginative and intuitive faculty to capture new ideas and thus make innovation a habit. Various modern techniques in teaching-learning such as digital education, ICT in teaching-learning, innovations, startups, e-governance, autonomy, MOOCs, flip classrooms and virtual realities should be implemented across the universities and institutions in India.
The journey of improvisation and expansion in higher education is not as simple and easy as it may seem. Many personalities of immense importance have a role to play in it. In context of technical education, let's have a look at the growth of technical education institutions in our country since the time of independence with the help of the following table:

Table 1 : Growth of Technical Education in India

Year	Number of Engineering Institutes	Students Intake	Intake per Institution (average)
1950-51	50	3700	74
1960-61	110	16000	145
1970-71	145	18200	125
1980-81	158	28500	180
1990-91	337	66600	198
2000-01	776	185758	240
2003-04	1208	359721	298
2004-05	1265	404800	320
2005-06	1346	452260	336
2006-07	1511	550986	364
2007-08	1668	653290	392
2006-07	1511	659717	437

2007-08	1668	701214	420
2008-09	2388	753910	316
2009-10	2972	1093380	368
2010-11	3222	1219347	378
2011-12	3286	1386083	422
2012-13	3369	1567722	465
2013-14	3384	1634596	483

Total number of engineering institutes was 50 in 1950-51 with a student capacity of 3700 only. Intake per institution was 74. The number of engineering institutes increased to 337 in 1990-91 and 776 in 2000-01 with student intake increasing to 66600 in 1990-91 and 185758 in 2000-01. Intake per institution also increased to 198 in 1990-91 and 240 in 2000-01. Since 2000-01, there have been a quantum jump in both the number of engineering institutes and their intakes, with the former increasing to 1668 in 2007-08 and further to 3384 in 2013-14, while the latter registering a corresponding rise to 653290 and 1634596 in the respective years. Intake per institution also shot up to 392 in 2007-08 and 483 in 2013-14.

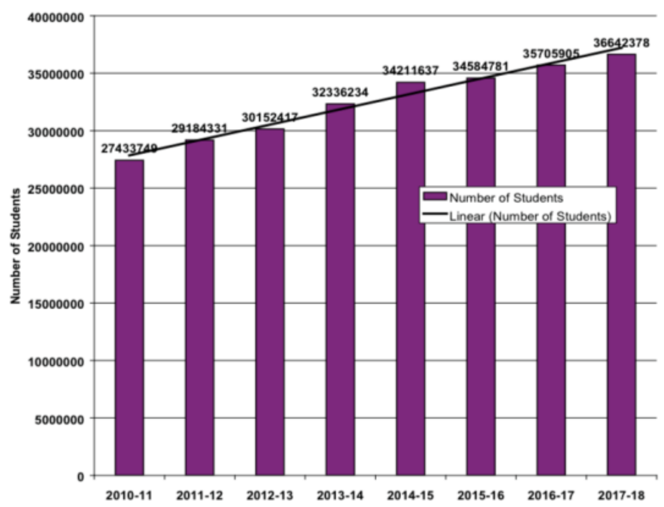
The Gross enrolment ratio too plays an integral role in deciding the future of the education system and signifies the present status of the quality of education being imparted. In this regard, l*et's have a look at the latest gross enrolment ratio and year wise growth in the ratio in our country in the following table:*

Table 2 : Gross Enrolment Ratio in Higher Education during 2012 – 2018 as per UGC Annual Report 2018

Year	GER
2012-13	21.50
2013-14	23.00
2014-15	24.30
2015-16	24.50
2016-17	25.20
2017-18	25.80

Gross Enrolment Ratio (GER) has increased from 21.5 in 2012- 13 to 25.8 in 2017-18. (Source AISHE Report 2017-18).

Graph 2.3(i) Year-wise Growth of Students Enrolment (Higher Education) 2010-11 to 2017-18



Graph 1 : Year wise growth of student's enrolment in higher education 2010-2018 as per UGC Annual Report 2018

Figures of student's enrolment pertain to regular courses and Distance Education Programmes in Universities / Colleges / Stand Alone Institutions in the system of Higher Education. (**AISHE Report 2017-18)**

While looking at the higher education as a whole, it's important to glance at the no. of institutes catering to various disciplines and subjects and for this let's have a look at the no. of colleges based on the disciplines or subjects they are catering to in the following table:

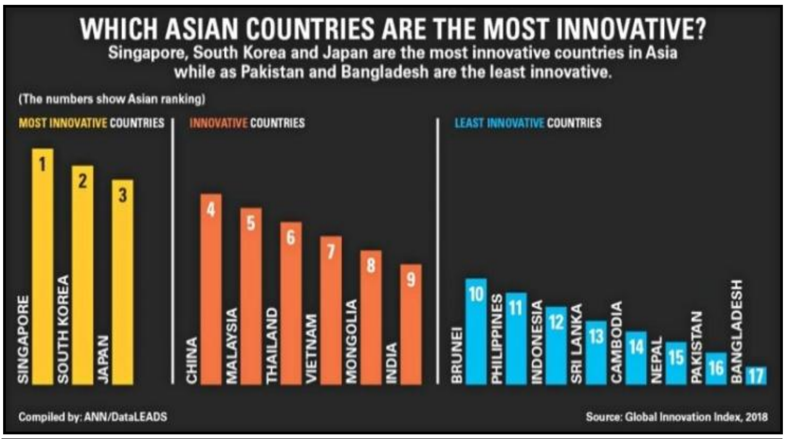
Table 3 : Specialization wise number of colleges as per UGC Annual Report 2018

Table 2.2(ii)(b): Specialization Wise Number of Colleges (Based on Actual Response AISHE 2017-18)

Specialization	No. of Colleges	Specialization	No. of Colleges
General	25366	Medical Ayurveda	216
Agriculture	281	Medical Dental	212
Architecture	169	Medical Homeopathy	116
Arts	855	Medical Others	155
Commerce	267	Nursing	1139
Computer Application	250	Oriental Learning	74
Education/Teacher Education	2893	Para Medical	115
Engg./Technology	2228	Pharmacy	635
Fine Arts	121	Physiotherapy	139
Fisheries	17	Sanskrit	271
Home Science	30	Science	246
Hotel and Tourism Management	81	Social Work	45
Journalism & Mass Communication	10	Sports/Yoga/Physical Education	99
Law	570	Veterinary Science	46
Management	667	Others	480
Medical Allopathy	268	**Total**	**38061**

The table shows the no. of colleges as per the different disciplines and subjects that they are catering to and the difference in no.'s varies greatly. There are 2,228 technological Institutes.
Thus, from all the above tables and graphs, it can be clearly seen that the no. of institutions is on a continuous rise since the time of independence which puts forth the importance of emphasizing on quality education. The more qualitative the education, the healthier and positive will be the lifestyles of citizens of the country.

For instance, recently, *Global Innovation Index Report has ranked India as the 57th most innovative nation in the world. It can be seen that:*



Graph 2 : This image has been taken from an article on Global Innovation Index.

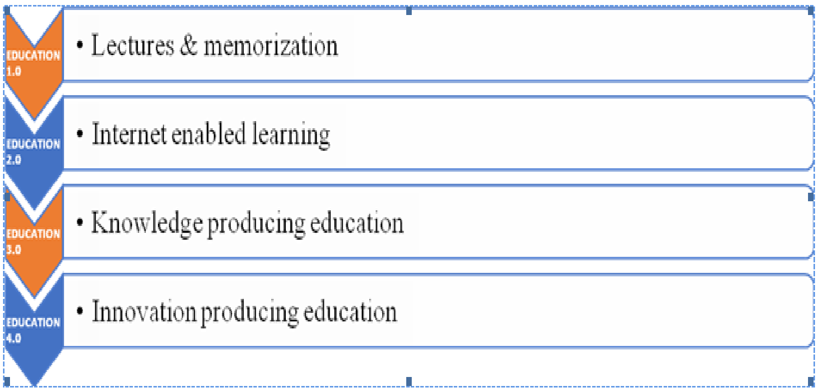
India is at the 9th position in Asia in terms of innovations. Thus, it becomes imperative to make technology and innovation a part of the education system, as education is the basis of the development of any society. Our aim should be to reach the 1st position by working on making our education system qualitative. "The quality of higher education in India should reach new heights with innovations and global exposure coming and disrupting the education system". **For instance, Former RBI Governor, Raghuram Rajan while interacting with high school students in a webinar organized by Krea University recently mentioned that: "There is a need for an inter-disciplinary approach where economics integrates with history, politics, psychology, sociology and emerging fields like data-science to better understand and solve real world problems."**The purpose of education is the same even today, but the only difference is the change in paradigm of education due to transformation in all its aspects, which are now technology enabled. This has led to a radical reform in education. Technology is indeed changing the way educators think about teaching and the way students think about learning.

<u>Human Development Report 2018 has recently ranked India on 130^{th}position.</u> This is surely an indicator of the country's remarkable achievement in lifting millions of people out of poverty. But, the journey doesn't stop here. Education is the means to continue towards progress and development of the people and the country and this is why it should be nothing less than qualitative in all aspects.

2.0 Brief Historical Background

We are all aware as to how education was first all about oral communication, which then was followed by written communication. Gradually, slate boards started to be used and then gradually broadcasting and video facilities started to emerge. And finally, computer enabled learning made its way into the education system followed by computer networking. Then came online learning methods and access to education through social media. What distinguishes the digital age from all previous ages is the rapid pace of technology development and our immersion in technology-based activities in our daily lives. Thus it is fair to describe the impact of the Internet on education as a paradigm shift, at least in terms of educational technology.

This massive transformation, which puts forth a journey from the traditional classroom teaching learning practices to ICT enabled education processes, is worth mentioning. For instance, education system throughout the world started from the stage of "Education 1.0" and has now reached the stage of "Education 4.0". <u>The flowchart below depicts how the education system has transformed in India over the years.</u> Education 1.0 was based on lectures and memorization and the teaching-learning was teacher centered. Education 2.0 was the result of internet and technology making their way into the system which resulted in internet enabled learning. Education 3.0 focused on creating knowledge with the help of technology in education. Education 4.0, which is booming at the moment focuses on bringing in new innovations which will transform how teaching – learning takes place in Indian Education system.



Graph 3 : The above flowchart has been designed based on an article on education 4.0.

3.0 Present Scenario In Indian & Global Context

The economic success of any nation largely depends on the quality of education provided by its educational institutions. This is even more important in India's context, as more than 50 percent of its 1.36 billion citizens are under the age of 25 and 65 percent are under 35 years of age. Thus, the question which arises is that whether this section of the youth of our country is getting the opportunities to show their calibre worldwide? Are there enough world class universities present to cater to such a diverse pool of students? And, how we as educationists, plan to take this quality education to those remote corners of the country where children are waiting for us to come and become them igniters? However, the situation seems to be improvising in terms of use of technology and innovations in the regular teaching- learning practices. For instance, *<u>Auronya College of Liberal Arts, Pondicherry</u>*, has become India's first educational institute that is built on the foundation of education 4.0 and has been dubbed "The futuristic forest of knowledge". On the other hand, Union human resource development minister, *<u>Mr. Prakash Javadekar</u>* had last year said that the government is striving to introduce a liberalised regime in the education sector with emphasis on linking autonomy with quality. However, this does not mean that the universities will be out of the ambit of the University Grants Commission, the higher education regulator, but will now have the freedom to start new courses, decide on the fee structure, set-up off campus centres, Etc. This will indeed be a new milestone in the education system as both the Faculty and the students will get the opportunity to explore spaces for innovation**. *The <u>FICCI-EY "Future of Jobs" report 2016</u>* highlights that by 2022, India's development and growth will be determined by the country's response to the inevitable impact created by the interplay of three primary forces - globalization, demographic changes and the adoption of Industry 4.0 technologies. And all of these forces are affecting our education system in a way like never before. There are opportunities, facilities and resources available to this generation. But, lack of implementation and gaps in education system are some of the factors which are hampering this progress. The healthier the education system, the happier will the lives of the citizens in a society be. Recently, the latest *<u>Happiness report</u>* has ranked India 140th in 2019**. Various factors that determine the happiness levels of a country include life expectancy, social support, income, freedom, trust, health and generosity, amongst others. It's important to note here that all these factors are directly related to the quality of education being provided to our coming generations and thus, indirectly, it is nothing other than the education system which plays a major role in increasing or decreasing the happiness levels of the people of the country. This is another major factor to keep in consideration while talking about quality in higher education.***UGC Annual Report 2017-2018*****too puts forth the essence of making research an integral part of the education system. In terms of evaluation and assessment, the NAAC has developed and published a series of best practices of various institutions as per seven criteria of assessment and accreditation.** However, each institution can reflect back upon its strengths and weaknesses through the SWOT analysis like that of the IIT's. E*ach IIT publishes their review reports* and put forth their SWOT analysis in order to keep working on the required changes. All the above mentioned points, put forth the essence of having a complete and qualitative education, in order to prepare a skilled workforce which will not only cater to our nation but to the whole world by becoming a part of the global disruptive trends and innovations.

Thus, India, today has the power of ruling the world, but only if it grabs hold of the opportunities being presented to it . The level of quality and excellence, along with technology and innovations in higher education will be a key factor in determining the role that India will play, globally, in the immediate future. The universities throughout the world have already started to disrupt the areas of technology and innovations in higher education. **For instance, in order to make collaboration and flexibility a part of the education system, *Stanford University, California*has implemented 'Stanford Interdisciplinary', "where collaboration is a way of life." Faculty members seek out diverse patterns on the path to innovation, with interdisciplinary institutes spanning departments**. Students are encouraged to take on research projects that cross traditional boundaries. *California Polytechnic University, California* has been imparting practical knowledge and hands on experience to a great extent through 'Innovation Sandbox', a shared workspace that allows students to "play" with the latest prototyping/ideation tools, explore new subjects, develop technologies, and share knowledge. *California State University, California,* which is regarded as the most diverse public institution in the Continental United States is redefining how interdisciplinary education is a need of the day. It's MBA for global innovators are a unique kind of MBA program wherein it creates an incubator environment that mimics the international business world. In terms of innovation, *University of Maryland University College, Maryland,* is leveraging the opportunity to come out with a novel method. It's working on an 'Open Learning Initiative Pilot' which applies adaptive technologies to meet students' unique needs. In context of research and collaborating with industries, it would be right to mention the example of *Greenville Technical College, Carolina,* whose Centre for Manufacturing and Innovation (CMI) builds on an educational partnership with Clemson University and is strongly supported by area manufacturers. This innovative curriculum features project-based learning experiences on real-world projects. Programs are flexible and customizable, allowing students to find their unique place in advanced manufacturing.

Thus, the focus should now shift from a narrower perspective to a broader one. It's time to start working on new projects, bringing out new results and leveraging the resources present worldwide to disrupt the higher education system in India. But, in all this process, it's important that we don't ignore the rural areas as they too will play a major role in what identity will India gain on a global level in terms of educational quality.

4.0 Requirements of the Day

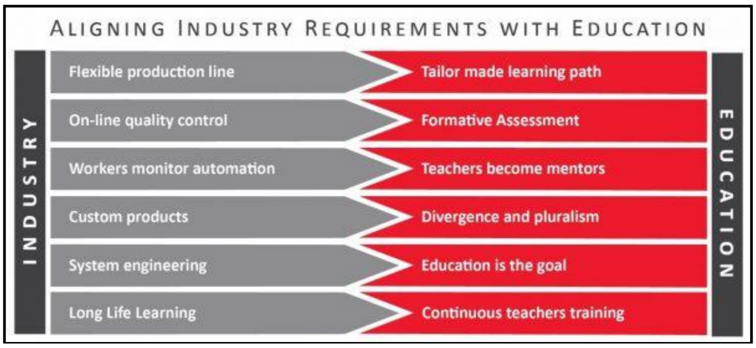
As already discussed about above, there's a lot to be done and in a way which caters to a wide variety of audience. However, the problem is that we as a nation are not being able to bring or put together all the above-mentioned points which are leading to wastage of both man power and resources. We are not being able to lead the large pool of prospective employees in the required manner and assimilate them into the workforce. In order to correct this, certain measures can be adopted.

4.1Adopting Education 4.0 is the need of the day.

It simply demands that the educational institutes too embrace new revolution like industrial revolution 4.0 has found its place in the society. How, when and too what extent it's adopted totally depends on the institution.

4.2Prioritizing and giving the required attention to the placements of students with adequate in-house support and guidance is a necessity.

The institutes should innovate and collaborate with industries to successfully carry out internships and increase job prospects for the students. *This can be better understood with the following chart:* This chart shows how essential it is to align the industry requirements with education. For instance, we can see how as educationists, we can mould the teaching – learning process as per the needs of the industry. Let's see the example of 'Long life learning' which equates to 'Continuous teachers training' in education.



Graph 4 : This image has been taken from an article on Education 4.0.

4.3 The concept of mentor-mentee should be given a lot of emphasis.
The concept is all about how a mentor is allotted to a number of students so that they can get the right guidance and help within the prescribed guidelines. This concept is gaining popularity worldwide due to its personalized nature and human touch.

4.4 Focusing more on value based higher education will help in overall development of the student's personality.
As the saying goes," Man can fly in the sky like a bird spreading its wings and move easily at the depth of the ocean like a fish but he is not able to live on Earth like a man. "These lines beautifully put forth the purpose of education which is to nourish and develop a socially acceptable and balanced personality for the Nation and the whole world.

4.5 Flexibility in all aspects is what today's generation is looking for.
This can be made possible if they have the flexibility of transiting from one course to another within set guidelines so that they can stay true to their purpose in life. As it's said, "Choose a job you love and you won't have to work a day in your life.'

4.6 Programs with specialization at global level are the need of the time.
A global university having specialized courses dealing with global issues is the requirement of the day.

4.7 Encouraging collaborative learning should be emphasized.
Apart from developing various skills in students; this kind of learning helps prepares them for professional lives too. With education 4.0 coming in, collaborative learning is a must and thus should be implemented in the daily teaching – learning process in various forms and with required innovations.

4.8 Providing Accessibility, Affordability and Quality through online educational platforms like 'SWAYAM',
In the form of MOOCs. These today have become a very good resource for students to pursue additional and necessary courses which don't only add up to their resumes, but also help develop their skills.

4.9 Teacher training as per the needs of today needs to be given priority.
As new trends are coming in and advanced technology being used in daily teaching -learning routines, it becomes a priority to educate and conduct various workshops and seminars for helping the faculty to cope up with such changes.

4.10Certain modifications and changes have been introduced in the "Academic Performance Indicator" for both the teachers and the students.
For instance: Simplification of the evaluation process, Overall scores in co-curricular activities and research have been reduced, New fields for evaluation have been introduced such as NSS, NCC and field trips, Etc.

4.11Implementing the recommendations of Knowledge Commission Report 2006 and 2007 can help in a lot of ways.
Let's have a brief look at these recommendations: Expansion, Establishing National Universities, Internal Reformation, Promoting enhanced quality, Ensuring inclusion of all, Diversifying sources of finance - For instance, IIT- Bombay has already turned into an innovation powerhouse with the flowing in of funds.
All the above referred points can be considered to achieve the goal of qualitative education in the era of knowledge and innovations.

5.0 Conclusion
To conclude, this paradigm shift is the result of efforts and hard work put in by various people and we as educationists can make use of this opportunity to implement these into our education system. Being aware of the rapid changes taking place throughout the higher education system, we must step forward to guide and contribute towards providing quality education in

our country. The coming generations, who have the capability of innovating and changing the traditional ways, must be given the opportunities to do so. There should be enough flexibility in terms of curriculum and examination system while giving the students more options to choose from. They should be taught the meaning of "responsible use of technology", so that they can use it intelligently to learn more effectively and come out with some good research work and innovations. Overall, the education system is on the verge of a massive transformation, some of which is already visible and each one of us can put in our bit to become a part of it. *A powerful saying by none other than Benjamin Franklin will be a fit to sum up the purpose of presenting this paper before you,*

"Focus on strategic plan implementation.
If you fail to plan, you are planning to fail."

References

Education 4.0 flowchart based on image retrieved from: https://www.tes.com/lessons/dEjJBTYTW9Oa5g/technologies-and-tools-for-innovative-learning-environment
Historical Background retrieved from:
https://opentextbc.ca/teachinginadigitalage/chapter/section-8-1-a-short-history-of-educational-technology/
education retrieved from:
https://www.intelitek.com/what-is-education-4-0/
Innovations in higher education retrieved from:
https://medium.com/the-mission/higher-education-innovation-25-examples-of-excellence-faa66af4105e
Quality in higher education retrieved from:
https://www.qcin.org/nbqp/qualityindia/vol-2-no2/specialreport.htm
Article - Times of India retrieved from:
https://timesofindia.indiatimes.com/home/education/news/education-should-teach-us-how-to-think-raghuram-rajan/articleshow/68635180.cms
Nature Index Report retrieved from:
https://www.natureindex.com/country-outputs/India
UGC Annual Report 2017-18 retrieved from:
https://www.ugc.ac.in/pdfnews/5595965_UGC-ANNUAL-REPORT-English-2017-18.pdf
Happiness Report retrieved from:
https://www.businesstoday.in/current/world/indias-happiness-ranking-drops-to-140-way-behind-pakistan-china-bangladesh/story/330018.html
Human Development Index Report retrieved from:
http://www.in.undp.org/content/india/en/home/sustainable-development/successstories/india-ranks-130-on-2018-human-development-index.html
IIT Kharagpur Review Report retrieved from:
https://www.iitsystem.ac.in/sites/default/files/externalpeerreview/1/47abebad9528ff3289755.pdf
Global Innovation Index Graph retrieved from:
https://www.thedailystar.net/bangladesh/news/bangladesh-least-innovative-country-asia-global-innovation-index-2018-1634962
Academic Performance Indicatorretrieved from:
https://www.indiatoday.in/education-today/news/story/ugc-new-indicators-323276-2016-05-13
Present status in India retrieved from:
https://digitallearning.eletsonline.com/2018/12/innovative-learning-at-higher-education-level-in-india/
Table and graph of increase in technical institutions
http://shodhganga.inflibnet.ac.in/bitstream/10603/185731/8/08_chapter%202.pdf
Image 1
https://www.nasscom.in/sites/default/files/inclusively-india.pdf
Table 2, Graph 1& Table 3
https://www.ugc.ac.in/pdfnews/5595965_UGC-ANNUAL-REPORT-English-2017-18.pdf

KEYNOTE ADDRESS

Exploring New Dimensions in Teaching – Learning for Quality Engineering Education

M. R. Kurup
Secretary, Kelkar Education Trust, & Founder Principal, V G Vaze College, Mumbai-400081
mr_kurup@yahoo.com

"21ST CENTURY KIDS ARE BEING TAUGHT BY 20TH CENTURY ADULTS USING 19TH CENTURY CURRICULUM AND TECHNIQUES ON AN 18TH CENTURY CALENDAR".
– TOM HIERCK, EDUCATION CONSULTANT

STATE OF ENGINEERING EDUCATION IN INDIA

Coinciding with the IT Revolution of 1970s, engineering education emerged in a big way in India. Government allowed engineering institutions to come up across the country – urban, rural and even in tribal areas, on unaided basis. The government policy envisioned to improve competencies of the youth to enhance global employability. It helped Indian youth to migrate to countries all over the world and establish excellent reputation as competent workforce and decision makers till the turn of the century.

But the unbridled growth of engineering institutions in urban, rural and tribal areas, released almost a million engineers to the labor market every year, leading to huge excess supply in the labour market. Unfortunately, majority of the institutions came up more as "money model" as there was a rush for admission in the initial stages. Many a private management set up institutions based on the ancient saying: "Make hay while the sun shines". Except posh buildings, large majority of private management did not follow strictly the norms laid down by AICTE or affiliating Universities in setting up institutions. The management succeeded in making the authorities to turn a 'Nelson's eye' on a year to year basis. There are engineering institutions in existence for decades in the country without NBA Accreditation, as they are deficient in almost all respect. As a result large number of institutions has turned out to be NPAs (non-performing assets).

Students are turning away from engineering colleges as is evidenced from large scale closure of Institutions. During the last five years, more than 800 colleges have closed their shutters, as they have become non-viable, for want of students, despite diluting admission norms. Students are aware of the massive unemployment among engineering graduates and also about packages they get from campus placement. Majority of placement from tier-II and III towns do not go beyond 2 Lacs rupees per annum. This is far below the remuneration received by graduates of Arts-Science-Commerce colleges in the cities.

An employability survey conducted among 150,000 engineering students by Aspiring Mind, New Delhi[1] found barely 7 percent suitable for core engineering jobs. As compared to tier-1 metros and tier-2 cities, the employability of students coming from tier-3 towns is miserable, largely due to poor practical-soft-people management and English language communication skills. Outdated Programs and Irrelevant Curriculum – do not address need of the 'industry'.

Irrelevant curriculum and outdated learning resources, acute shortage of quality faculty, outdated teaching, learning and evaluation methods, poor 'capacity building' and empowerment process and motivation of faculty and staff, lack of research and development activities and industry networking with MoUs, poor student support services, including quality placement, poor innovation-incubation and start-up support, have reduced large chunk of higher technical education to a mediocre exercise. Poor Learning Outcomes and Graduate Attributes have produced huge size of unemployable graduate.

Studies conducted by NASSCOM, McKinsey, Ernest Young (EY), among others, about professional education and employment, bring out a poor relationship. It is generally found that not even 20 percent of engineering graduates are directly employable. More than 60 percent of the eight lakh engineers graduating from technical institutions across the country every year remain unemployed, according to an analysis by AICTE.[2]

Let us look at the major reasons for pathetic outcome of technical higher education briefly. It is difficult to enhance employability of engineering graduates unless it is an expected outcome of the curriculum, and the teachers understand the context of the concept. 'Employability refers to a person's capability for gaining and maintaining employment. For individuals, employability depends on the knowledge, skills and abilities they possess, in addition to the way they present those assets to employers'[3]. Employable skills, according to Mantz Yorke & Peter Knight are "a set of achievements, understandings and personal attributes that make individuals more likely to gain employment and to be successful in their chosen occupations"[4]. It is unfortunate that our education system and the leadership have not addressed appropriately the link between education and employability.

PROGRAM OUTCOMES AND GRADUATE ATTRIBUTES

We have now moved in to a Knowledge era. The key person in the knowledge economy is the Knowledge worker, the product of quality education system. The traditional higher educational institutions – universities and colleges – have to change lock stock and barrel to emerge "as major *economic engines*, while also serving as civic and cultural centers"[5]. It is important for every HEIs to have very clear Vision, Mission, Goals and Objectives – short-term, medium term and long-term and the programs and courses offered require to have clearly stated expected outcomes. 'Quality in higher education is the processes that ensure institution and students fully and truly achieve their Goals and Objectives (purpose) and thereby satisfy the needs of the society and help in national development'[6]. In other words, the expected outcomes should bear out the vision/mission. Stated in simple terms, all-round development of students means acquiring fundamental knowledge (Learning to Know), acquiring employable skills (Learning to Do), acquiring social and life skills (Learning to Socialize), and developing a positive "Can Do" attitude (Learning to Be). Process should start with defining expected **graduate attributes** or the **learning outcomes** – namely, fundamental knowledge, workplace skills, values and attitude. These components are to be brought out through 'active campus life'. AICTE has very clearly and categorically stated the PO, PSO and CO for the benefit of teachers and students. However there is deficiency in implementation of these guidelines at the institutional level.

We need to make curriculum fit-the-purpose of achieving institutional vision/mission. According to Kothari Commission Report, 'Curriculum is the means of the educational process, which will help us to achieve the goals we have set before us. Curriculum does not mean only the academic subjects traditionally taught in colleges and universities, but **includes** the sum total of experiences that a student receives from the campus life. In this sense, the whole life in educational institutions helps in the evolution of a balanced personality'. A student is expected to acquire fundamental knowledge and employable skills through campus life. While designing curriculum for any discipline, care should be taken to provide opportunities for acquiring fundamental knowledge, discipline related skills and attitude which the prospective employers' expect. For example, a BE or B.Tech graduate in each discipline should learn and demonstrate relevant technical / professional skills and 'know-how'.

It is equally important that every degree program and each of the courses should have clear Preambles stating clearly the Programs Outcome, Program Specific Outcome and Course Outcome. This will provide clear guidelines to teachers for planning the lessons to make education more meaningful to the students. Further, there is an explosion of knowledge in view of the massive research and development work happening all over the world. A recent study has reported that **'knowledge doubles in every 13 months'[7].** The IBM study says that it is much less in ICT related disciplines. This makes huge chunk of existing knowledge quickly outdated and irrelevant. The explosion and obsolesces of knowledge make designing and updating curriculum a regular, may be an annual process. The Evaluation, both continuous and semester-end should bring out the Learning Outcomes of each student, very clearly on a Five to Nine point-scale.

SKILLS EXPECTATION

Besides technical outcomes, employability depends on the quality of work place or soft skills acquired during the campus life. My interaction with more than a dozen engineering colleges in recent times in connection with NAAC Accreditation, brought out a huge gap in this area, not only among students, but even among faculty members, in institutions located in tier-II and III towns and rural areas. Industry does not show any interest in establishing interface with such institutions. Industry requires different sets of skills at different positions. A short list of important soft skills expected is given below[8]:

1. Critical and Lateral Thinking skills,
2. Problem Solving skills
3. Decision making skills
4. Creativity and Innovation skills
5. Cognitive Flexibility skills
6. Communication and Listening skills
7. Collaboration / Networking and Teamwork skills
8. Emotional intelligence skills
9. Adaptability skills
10. Social & Cross Cultural and Interpersonal skills
11. Leadership skills
12. Owning up

It is necessary to integrate the above mentioned skill components in the activities of the campus. This could be curriculum, co-curriculum, and extra-curricular, extra-mural activities. In case of any difficulty in affiliating colleges, they can be brought in through autonomous skill specific short term certificate / diploma courses in the college, including accessing online relevant courses from the list of AICTE/UGC. Provision could be made to register with government skill development programs under Skill-India, SWAYAM, and MOOCs, etc.

In India, Institutions are in the dark about the needs of the industry and industry is equally in the dark about the potential of educational institutions[9]. It is also time for us to move towards a more Outcome Based Education than at present. Outcome Based Education refers to a **method of organizing learning based on the achievement of competency**. Students demonstrate their competency in given areas either by working through content, experiences and assignments and assessing their mastery by using a portfolio of achievements that illustrate mastery[10]**.**

CHANGE FROM LECTURE METHOD TO ACTIVE LEARNING[11]

According to John Dewey, "If we teach today as we taught yesterday, we rob our children of tomorrow". Yet, we continue to teach the same way as were taught by our teachers.

Feedback from students in engineering colleges shows that the mainstay of large majority of teachers to "cover the Syllabus" is traditional lecture method. No one tries to "uncover" the syllabus. This is largely due to the institutional focus on Examinations rather than Learning Outcomes. Engineering being more an applied program, the focus should be student-centric 'Active Learning' or 'Do-It-Yourself' mode. Here the responsibility of learning is that of the student. Teacher is a mere Facilitator, Coach, Guide or Mentor. The methods of learning include:

Assignments	Projects
Seminars	Question-answer (Viva Voce)
Open House	Braining Storming
Sharing Ideas/ Experiences	Role Play
Debates, Elocution, Quiz	Presentations
Tutorial	Preceptorial
Probing	Workshop / Experimentation
Demonstration	Simulation
Industrial Visit	Summer Placement and Internship

Problem based- Case based - Skill based – Work based and ICT Resources Based Learning should replace Lecture based learning. According to Tony Blair, the former Prime Minister of England, 'Technology has revolutionized the way we work and is now set to transform education. *Students cannot be effective in tomorrow's world if they are trained in yesterday's skills*. Nor should teachers be ignorant of *the tools that other professionals take for granted*'. It is a tragedy that for most of our teachers in engineering colleges, power-point-presentation is ICT. The teachers will have to unitize the syllabus and identify the appropriate mode of teaching-learning to cover the entire curriculum, while preparing the lesson planning and academic calendar.

Further, to make the students globally competitive, we need to make **the teachers globally competitive** and the institutions state-of-the-art. There is a huge gaps in the competency levels of teachers; many of them are even unable attend seminars/conferences outside respective State, leave alone outside the country. Just to cite an example of two engineering colleges which I visited recently. According to AICTE norms, there should have been 24 Professors, 28 Associate Professors and 170 Assistant Professors. The reality was that there were just 3 professors, 4 Associate Professors, i.e. 7 in place against 52 needed, giving a shortfall of 87.5 percent. The vacant positions at higher levels are compensated with appointment of additional entry level assistant professors with mere ME qualifications. This maintains the student-teacher ratio. Among the assistant professors, majority had less than 3 years of experience all in the same institution. In one college, almost 2/3rd of the teachers were past students of the same college – amounting to in-breeding. Just a handful of the teachers had any exposure to industry or seminar or conferences outside Maharashtra. Less said the better about research, publications, innovations or IPR. It is further learnt that all these teachers give notes in the class. UNESCO or AICTE expectation of Learning Outcomes or Graduate Attributes is a far cry in such institutions.

For promoting active learning, college/university should have provision for (i) Library – rich with reference books, standard academic journals, e-books, e-journals, reprographic facilities, remote access etc; (ii) ICT facilities – Access to e-Learning Management System, including sufficient internet connectivity, Multimedia, YouTube, Google Classroom, Coursera, SWAYAM with access to MOOCs, etc; (iii) Experiential Learning opportunities such as well equipped Workshops, Science Labs, Language Lab, Innovation-Incubation and EDP Lab etc and industry-interface for internship, on-the-job training, summer placement etc. and (iv) Integrated Extra/Co-Curricular and Extra-mural activities which provide opportunities to learn soft-life and people management skills.

RESEARCH-INNOVATION-INCUBATION & EDP IN CURRICULUM (RIIE)

An important component of employment is SELF-EMPLOYMENT. Curriculum should focus on promotion of Applied Research, Creativity and Innovation, provision for converting creative ideas in to products or services through Incubation, and preparing students to take up enterprise and 'market risk' through Entrepreneurship Development Programs.

The impact of Entrepreneurship is indicated by the contribution of labour-intensive SMEs to India's GDP (45%), which is 3 times the contribution of corporate sector. (Master Card's Micro Merchant Market Sizing and Profiling Report 2016'). According to 2017 OECD report, 'nearly twenty-seven million SMEs in the United States generate about 50 percent of GDP'. The Union and State governments are offering a number of incentives for Startups to promote new ventures. It should be mandatory for colleges and universities to set up Innovation-Incubation and EDP Centres with accountability.

SATISFACTION SURVEY AMONG STUDENTS & TEACHERS

NAAC has come out with a Student Satisfaction Survey in its 2017 Manual. It is confined to feedback on teacher performance. One cannot point at the teacher alone for good or poor performance. Teacher Performance is determined by a number of factors, such as institutional quality policy and culture, quality of student intake, teacher-student ratio, mode of teaching-learning, institutional governance and management, adequacy and appropriateness of classrooms, lab and ICT facilities, financial resources, etc. Since the NAAC Survey does not cover a number of pertinent issues, the outcome of the survey is likely to be deficient and irrelevant[12].

Along with Student Survey, a Teacher Satisfaction Survey would have given the BEST index for quality education of an institution. Being the pivot, the entire range of curriculum and its transactions are carried out by the teachers. Issues like design and implementation of curriculum, teaching-learning-evaluation, use of ICT and learning resources, research and development, student support services, etc are carried out by the teachers. The quality of teacher performance depends on the availability of quality infrastructure, governance and leadership, service conditions, opportunities for faculty development and skill upgradation, performance based incentives, etc. A satisfied teacher is the best asset for any educational institution. He can make a difference. The tragedy is that majority of teaching in colleges and universities are carried out by ad hoc or guest faculty due to restrictions imposed on recruitment of regular teachers by the government. Majority of self-financing colleges do not have faculty as per UGC or AICTE norms. The impact of 'dissatisfied' teacher on quality education cannot be hidden.

CONCLUSION

It is time for the governments, universities, college managements, leadership, teachers and the students to recognize the significance of higher education in respect of its ability to usher in socio-economic transformation. It is recognized the world over that education is the best long term solution to bring down unemployment and poverty.

Government should consider education as a priority area and enhance budgetary allocation to education to 6 percent of GDP. Grant-in-aid should be need and performance based.

University should relook at curriculum design to meet the 'purpose' – expected learning outcome. Curriculum needs to me revised regularly to include fundamental knowledge and directly employable skills and attitude. For this, the traditional mode of education must be replaced with relevant and OUTCOME based education.

Colleges should provide state-of-the-art facilities, employ competent teachers, and change from the traditional mode of teaching-learning to innovative/participative teaching, learning and evaluation. The campus should provide opportunities for networking with industry, and learning for life and making a living. The governance and leadership in colleges should be educationally proactive and motivative.

Teachers should periodically enrich themselves and become competent 'professionals' who can make a lasting impact. **Students** should treat learning as their responsibility and acquire 'global competencies' while in the college/university. As growth of formal employment is not keeping pace with growth of GDP, it is important to encourage research, innovation, incubation and EDP to promote self-employment.

Competency building of students could be accelerated if the institution becomes autonomous and establish close linkages with industry.

Education is the key catalyst of socio-economic transformation in a knowledge driven economy. Higher education has failed to fully take advantage of the 'demographic dividend' largely due to the failure of all the stakeholders - Government, Universities, Colleges, Teachers and Students. Quality education ought to lead to quality employment and higher incomes. The focus should be enhancing the productivity of the graduates. It is time for us to conclude with the ancient Greek philosopher Diogenes, who said that '**The foundation of every State is the education of its youth'. If we fail the youth, it is disaster for the society and the NATION.**

NOTES & REFERENCES

1. Aspiring Mind, National Employment Report – Engineers (2016),
2. Manash Pratim Gohaini, The Times of India, March 18, 2017
3. J Hillage and E Pollard (1998), "Employability: Developing a Framework for Policy Analysis" London
4. The Higher Education Academy, Embedding Employability into the Curriculum; Learning & Employability, Series 1 & 2,
5. American Commission on Higher Education, Report 2006
6. NAAC & Commonwealth Learning Document
7. Buckminster Fuller, "Knowledge Doubling Curve", (Critical Path (1982) - noticed that until 1900 human knowledge doubled approximately every century. By the end of World War II knowledge was doubling every 25 years. Today things are not as simple as different types of knowledge have different rates of growth. For example, nanotechnology knowledge is doubling every two years and clinical knowledge every 18 months. But on average human knowledge is doubling every 13 months. According to IBM, the build out of the "internet of things" will lead to the doubling of knowledge every 12 hours.
8. Kurup M R, (2014) Involved Learning for Academic Excellence, University News, Vol.52(14), New Delhi
9. Kurup M R (2019), What can Industry Do for Improving Quality and Relevance of Higher Education, University News, 57(06), Feb 11-17, New Delhi
10. Gartner Inc. Report, UK, December 2016
11. Kurup M R (2018), Higher Education in India and Employability, University News, Vol.(56(4), New Delhi,
12. Kurup MR, (2019) Student Satisfaction Survey – Scope and Challenges, NAAC Sponsored Conference Paper, 23rd January; V G Vaze College, Mulund, Mumbai 400081. (3148)

KEYNOTE ADDRESS

Different Dimensions of Teaching, Learning, and Evaluation

Ajit Pratap Singh
Professor and Dean Academics, Department of Civil Engineering,
Birla Institute of Technology and Science Pilani-333031-India
E-mail: aps@pilani.bits-pilani.ac.in

Abstract:
Teaching, learning and evaluation processes adopted at an institute are expected to be an indivisible entity. While the teacher has the freedom to adopt his/her own style of teaching, it is his/her responsibility to carry out student's evaluation in a continuous manner, so that the overall teaching-learning process for a course become effective. Through our experiences and technology, we can evolve different ways of teaching-learning and evaluation. All elements viz. expertise, skill sets, resources, technology etc. can be integrated to exchange the knowledge through teaching, learning, and assessment tools for courses, which are essential for different professional programs. Different dimensions of teaching, learning, and evaluation associated with higher education system has been illustrated with the current best practices. Finally, the evaluation process is discussed to make the teaching-learning system more effective. Thus, this paper highlights certain experiences and practices which have been adopted in teaching, learning and evaluations by underlining on (a) ways to improve the teaching skills, and (b) steps to make the audience (students) interested in learning, and (c) methods to perform effective assessment.

1. Introduction

Higher education institutions have been facing challenges to meet great demands of rapidly changing society, and it's working conditions. The role of these higher education institutes is not only to provide education but also to prepare future generations to be innovative enough in handling the work tasks (Tynjälä, 1999). Though education plays a significant role in developing skills; a few studies suggest that higher education institutes have not been able to fulfill the demand effectively (Porter et al., 2019, Govindasamy, 2001). Higher educational practices have been criticized for not being able to satisfy the prerequisites of the requirement of professional proficiencies (Vila et al., 2012). The question arises whether the actual teaching and assessment tools inculcate professional cognitive attributes among the students. Along with this, the engaging student has been recognized as a significant challenge in the existing higher education system. The reason being abstract symbol manipulation, information being processed along with the mental development, thereby hindering human learning and intelligence (Kivunja, 2014).Edwards-Schacter et al. (2015) put forth's that innovative skills needed have not been yet incorporated to the full extent in conventional the teaching and learning, as well as in the assessment process (Ginns, 2007).
However, in recent decades, there has been nationally and globally; an increase in demand for interactive skills to be integrated with traditional learning and teaching designs. Therefore, this creates a need to update the curriculum of higher education, to be redesigned and modeled. This can be achived by taking an initiative of development of effective operational polices to make future generation efficient. The policies and agenda associated with higher education institutes should be reviewed from time time. All the institutions should highlight their education programs and are expected to work for redesigning and remodeling of each program in making the curriculum efficient and innovative so that the demand of the changing society are met effectively. Such system change can be achieved effectively by exploring and identifying requirement of improvement in different dimensions of teaching, learning, and assessment (e.g. teaching quality, content design etc.) so that innovative skills among students can be developed. Innovative and interactive skills can be introduced using different pedagogic student-centered learning tools (e.g. Resources/Activity/Support /Evaluation (RASE).
Dimensions of teaching, learning, and assessment are used to be an extension of the inclusive research-based framework on understanding for curriculum and instruction (Marzano, 1988). There are five dimensions of teaching and learning along with students are at its center. All the dimensions are interlinked to each other, and no single dimension exists in isolation. Critically, in designing any teaching-learning program, there is a need to understand the readiness of all the learners, selection of curriculum, and also assessing what students have learned. Hence, making it an iterative process, thereby improving the quality and effectiveness of learning.
This paper explores the need and demand for understanding the dimensions of teaching, learning, and evaluation structure associated with higher education. It aims to explore and identify different dimensions of teaching, learning and assessment, and their applicability according to the need of the present education system in India. Thus, making it helpful to incorporate diversified assessment system associated with higher education. The paper also emphasizes to design more effective course curriculum which will enable students to attain greater understanding, self-sufficiency, and to foster innovative temperament skills.

2. Dimensions of teaching, learning, and evaluation

The dimension of teaching, learning, and evaluation is a comprehensive framework which is divided into five dimensions and 13 sub dimensions. The dimension framework is based on investigating, focusing, planning, and assessing the critical aspects of teaching and learning. The five dimensions are viz., purpose, student engagement, curriculum and pedagogy, assessment, and classroom settings. Each of these dimensions is interconnected to each other and have students at their core. They form the basis for every educational institution. The overview of each dimension is as follows (Fig. 1):

Dimension 1: Purpose/aim/intent

It focuses on the requirement and need of the knowledge gained by the learner, and how is it relevant to the learner? The dimension emphasizes on learning target and tries to identify any quantification process which is required. It also focuses on practical information and assists to overcome the understanding of the concentrated/intent curriculum. It helps in scoping, sequencing, and organizing the curriculum according to the need and also covers the premeditation on the skills and knowledge of the learner. The dimension is divided into two sub-dimensions: i) criteria for learning, and ii) goals (knowledge) achieved through learning.

Dimension 2: Student Engagement

Student engagement – or the lack of it – has long been established as a vital question in case of higher education from point of view of learning and teaching. It is a substantive challenge which is required to overcome by the strategic engagement of the students through dialog and helping them to develop effective academic background. It encourages impartial and focused student participation and ensures that learning take place among the students. Students should also be engaged in the class by introducing various assignments using interactive digital technologies, online resources and practice based exercises. The dimension is divided into three sub-dimensions: i) intellectual effort, ii) engagement approaches, and iii) dialog.

Dimension 3: Curriculum and pedagogy

The instruction material (e.g., resources, texts) is to align according to the need of the learning process or course curriculum. The curriculum should be relevant according to the current and futuristic need of the changing world. It should be understandable by the students and based on their learning needs. Appropriate teaching strategies are to be developed, considering in-the-moment decision basis. Through an adequately designed curriculum, the students engaged in any course can develop conceptual understanding and skills sets. Additions of necessary knowledge to the existing curriculum design will help the student significantly and help the system to deliver the essential information efficiently. The dimension is divided into three sub-dimensions: i) program prospect, ii) teaching approaches/strategies, and iii) platform for learning.

Dimension 4: Assessment

Assessment is the focused, methodical, and continuous assortment of information as an indication which is used in making discernments about student learning. This is used as an outcome of the learning and provides a strong base for further improvement. Assessment is integral to the teaching and learning process. It includes a variety of approaches and tools and also provides insights on the learning targets achieved. The dimension is divided into two sub-dimensions: i) evaluations, and ii) modifications.

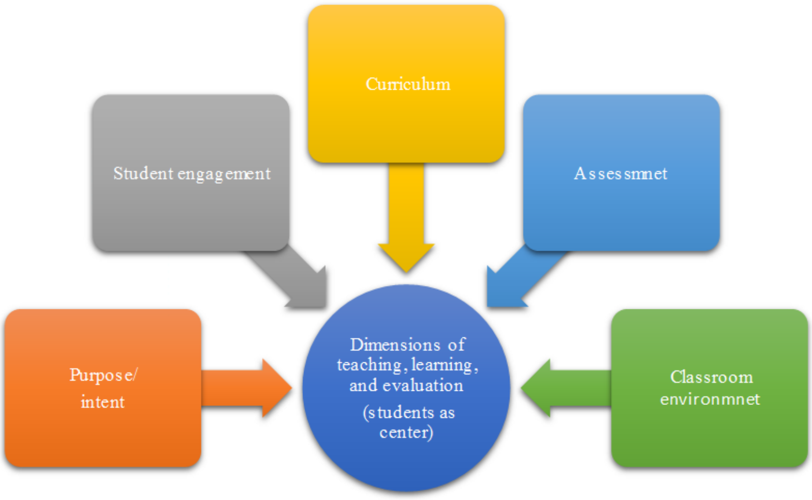


Fig. 1 Different dimensions of teaching-learning

Dimension 5: Classroom environment settings

This dimension is one of the important dimensions from the viewpoint of innovative skills to be gained by the student. It helps the student to acquire knowledge by accessing relevant resources. It also helps the student to raise their intellectual capabilities and to create inclusivity. Well-equipped classroom settings encourage accountability of the learning process. The dimension is divided into three sub-dimensions: i) physical setting, ii) classroom schedules, and iii) classroom environment.

3. Learning culture

The environment in the class as well as outside the class in an educational institute must adhere to the different requirement of the diverse pool of learners. It should club different methodologies that help to support and inspire the learning environment. The learning culture should be employed to fulfill the following aspects:

- There should be a collaborative effort among students and teacher and both of them value each other mutually.
- Active participation of each of the learner is necessary.
- The methodology followed should be interactive, and the response from the learner must be taken care.
- All the available resources should be utilized for better understanding using technological advancements and different media.
- After class learning activities have to be adopted.
- Specific treatment and the uniform opportunity should be given to learners of different backgrounds and different learning capabilities.
- The learning environment should involve real-life applications with research-based emphasis to weigh learner's inquiries.

The environment in the lecture halls is very critical for the development of social and personal skills. The environment must maintain a way that help and encourage the learners to share and participate in different learning activities. An educator needs to be concentrated on building an environment that makes the student more interactive by respecting ideas, feelings, and opinions of other colleagues/students. This can be achieved by performing enjoyable activities through which students get to know each other. Table 1 shows some key practices that need to be followed to make different dimensions of learning more effective.

3.1 Role of an educator and learner

An educator's role is very critical for configuring and managing an active and resourceful education culture. An institution is expected to promote space for adoptive learners by creating conducive environment and encouraging group activities. The primary role of the instructor is to assist and enable learning environment through guiding the learners through the acquisition of the skills and abilities required to establish results. Some of the main points required in education for the involvement in teaching-learning processes are given below:

- An educator can support learners in the accomplishment of different skills and capabilities that enable them to be more responsible and decision maker.
- An educator facilitates guidance and inspiration to learners for making them involved in different personal and collective education tasks.
- He/she can support learners to create and alterethics follows regarding discrete and group behaviors to make a better learning environment.
- Education is also a person of resources for the learners. The broader availability of resources helps the students in innovative learning and research activities.
- Educator consistently observes and make a report based on the progress of students indifferent learning activities.

  Role of learners is also as crucial as educators. They play a vital role in an effective and efficient education system. The most important role of the learners is to be responsible and actively participate in all kind of learning activities and able to demonstrate them in the process of evaluation. Following different points give details of the student's role in the effective education system.
- The learner should have endeavored to possess skills which make their reasoning ability stronger and become more responsible for their decisions.
- They must connect with the learning activities that that connected to their learning pattern and unite their essential knowledge to their ability.
- The learner should be respectful and make a healthy contribution to the group activities irrespective to diversity in the colleague about beliefs and abilities
- They should take responsibility regarding their study, finishing tasks, lab works, and group activities.
- Learners should evaluate themselves regularly their progress of study. They should compile new methods and plans for continuous learning and improvement.

Table 1 Different practices and their role in a teaching-learning environment

Knowledge of basics	Attitude	Maintaining discipline	Personal development of learners
• It enables the students to understand the core subject easily • For research and innovation, it is rather much essential to	• This makes a professional student for the community • Convey the drawback of non-	• Maintaining ethical behavior in students • Maintaining the learning environment • Make them open and compassion to the	• Enhance the personal skills of the learners and make them understand to use them effectively • Teach them to develop interpersonal

convey basic conceptual knowledge	professionalism • Enable the learners to identify, analyze and resolve the problems in this working environment	different culture, age, gender and disables	relationships • Enable the students to encourage decision-making skills.

3.2 Teaching methodology

The teaching methodology has been dealt with three important elements which are described in subsequent sections.

3.2.1Techniques used for visual communication

The visual communication with blackboard presentation method has been used quite extensively through ages. Following are the salient points that need to be followed by an educator in this methodology:

- A prior plan is always better before entering class, like how the blackboard will be used and what needs to be written on blackboard?
- There should be legible, and the letter must be well spaced to distinguish. Also, the letter should be bold and thick.
- The speed of writing should be fast but not on account of clarity.
- Blackboard may be divided into different segments as per the requirement.
- Standard abbreviation should be used throughout. However, if the self-defined abbreviation is used, then they should be consistent.
- Overcrowding of writing or drawing must be avoided as much as possible.
- For better separation of different topics, a line on the board can be used to divide them.
- Care is required before drawing a diagram. They should be neat. Different colour chalks can be used for a better representation.
- Important topics should be numbered at a side of the board. It will be helpful to both students and learners.
- Besides the blackboard, oneshould think of other props, such as prepared models.

3.2.2 Techniques used for oral communication

In oral communication with the students, it is important for the educator to prepare well not only to the subject but also the way the topic presented to the students. Following key points must be looked after for good oral communication in teaching.

- The pronunciation of the word should be clear and distinct (especially technical one). Proper stress should be given to the different syllables used in the talk.
- The poor articulation if unable to avoided and not understood by students, then it can compensate by writing on board.
- The pause while delivering a lecture is significant, and it should be on appropriate time. It helps to connect with learners.
- The style of speaking should be natural, not a formal speech type. Also, it should be sufficiently loud and clear.
- Long sentences, while speaking, should be avoided. They can be fragmented into a simple one.
- Some visual props, like different geometrical shapes and models, can be used to breakup the monotony of the lecture.
- There should be a good connection followed between the writing part on blackboard and lecture.
- Many of the educators have a habit of repeatedly using some works like “is it?”, “OK,”“like,” “then,” etc. One should be conscious and avoid them as much as possible.
- It is always better to present the ideas in the flow chart or a good sequence form.
- It's good to avoid going out of the context of the main topic. A fix outline should be followed in a lecture. A summary at the end of lecture very important, and this will help to make a summary statement at the closure.
- The critical points need to be focused more, use of voice modulation and repeatedly use of those critical points help in this.
- The hard copy of lectures should be in reach of the educator.
- Keep remembering some key outcomes and general points with regards to lecture for value addition for the next lecture.

3.2.3 Awareness level of the audience

Connection of a presenter/educator with the audience/students is very important. In the teaching-learning process, the understanding of the topic to the student is most important, and this cannot be achieved without proper connecting with students while teaching. Following important points need to be kept in mind while delivering a lecture.

- While delivering a lecture, one should face the students, and proper eye contact is necessary
- Staying in a single place without any movement will make the lecture boring and unfruitful. Full scanning of all the students, even though presenting at the board is necessary.
- It is always better to connect the subject with real-life objects or other subjects.

- A good linking of lecture with the earlier delivered lectures is utmost necessary.
- Make the student attentive through dialogues and fruitful conversation.
- Always remain in the class. Never go so deep into the subject that you forgot the class.
- The level of the student should be known to educators before the lecture, and the lecture always delivered keeping it into the mind.
- The instructions that the educator wants to give to the students must be clear, and the teacher should know what are his/her expectations from the students regarding the requirement from the students.
- While changing the topic, it is good to physically shift your position. This gesture works well to connect with the class.

4. The Processes of Evaluation

Nowadays, the teaching-learning process is highly influenced by different technological advancements in each medium of the learning process, which may be performed by face to face learning or from web-based learning. The main participants in the education system are learners, educators, coordinators, and administrators. Fig. 2 details the different participants and their role in the teaching-learning process. Technological improvements have influenced all the participants and provide useful assistance to them. The quality of learning along with research and innovation, has been improved many folds due to this advancement (Wang et al., 2012; Qiu and Lee, 2013; Liu and Peng, 2013). Ine-learning, the mode of education, has drastically impacted on the education system. The continuous evaluation process of all the participants of the teaching-learning system, along with learner, is utmost necessary. This should include the interaction level of the above participants; the pedagogy followed, initiatives taken to improve the students learning abilities, utilization of audiovisual platforms, coordination between management and educators and improvement in the institutional policy by the management and administrators through the observations (Sankar and Clayton, 2010).

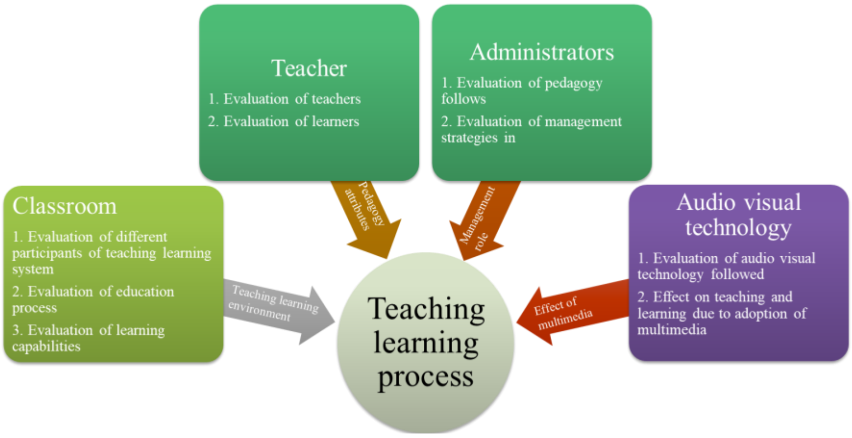


Fig. 2 Different participants and their corresponding evaluation

4.1 Choosing assessment methods

In the teaching-learning process, a diverse assessment of students is essential. There are many methods of assessment used in the evaluation of students. They have their own benefits and limitations. Different forms of evaluation are detailed in Table 2, with their advantages and constraints.

Table 2 Different evaluation methods with advantages and constraints

Forms of Evaluation	Advantages of Evaluation	Constraints
1. Performing work related to practical	• Make the students engage in tasks • Learning within the reference time • Prior assessment help to make adjustments in teaching methodology according to performance	• Time taken process • Can be done casually without fulfilling its aim
2. Evaluation in the end sem exams	• Check the individual quality of knowledge attainment and skill gained by the students. • Economical and less time taking	• It's a typical mathematical submission • Sometime a measuring parameter of giving results under stress condition. • Due to time constraint it to reproduce information rather transformation.
3. Assignment in the form of problems	• Help in developinga prolonged	• Lengthy time is taken the

and content writing	problem-solving approach • A more detailed learning outcome • Students will able to make an inference, implement and critically evaluate the problem • Explore new horizon of learning that they didn't know earlier	process • A subjective assessment need a more contribution of the teachers • Many time it happens at the end of the course. Hence there will be no opportunity left to utilize the feedback. •
4. Compilation of field reports	• Very Authentic and universally adopted kind of assessment • Enhance the learners observation and recalling ability • Built corporation and organizational skill	• Supervision is costly • hard to form timetable • Safety and ethical concerns need to be taken care
5. Perform critical review on the articles	• Develop interpretation and assessment skill • Make them understand how the specialist do the job	• It requires to teach the review process to learners
6. Group tasks	• Able to work in collaboration and develop communication skill • Make them independent	• Individual contribution is hard to evaluate • Time is taken for both students and educators • if the whole group is not supportive or only one member supportive then a fair evaluation is difficult
7. Engaging in different portfolios	• Student able to present progress towards the mixed zone of work • Got the understanding of problem associated with different roles • The evaluation will be more valid and authentic as they deal with actual world issues • Make their thinking higher • Student become more responsible	• Framing of the portfolio requires more attention • The learner has less consistency between them • Time constraints for the students and educators
8. Demonstration in class	• Learners are inspired to deliver the presentation • Enhance the cohesion of the group and collaboration between them • A peer response become a useful tool for self-evaluation of students	• Processes are time taken for both students and educators • The method may be upsetting and depressing for some of the students • A quick evaluation is needed unless recorded • Sometime choice of topic make the results bias
9. Involvement in different learning tasks	• Healthy active participation in education • Foster proactive engagement	• Good assessment rules required • Some difficult to assess due to the heavily subjective nature of the activity

4.2Assessment and monitoring of teaching

The students in the teaching-learning process are performed as an active learner. However, the teacher or the tutor works as a facilitator who interacted with learners. Caballe et al. (2008) and Shahiri et al. (2015) recommend self-evaluation as an optimum process to make the process of learning better. Researchers (Hongxia and Yao, 2008; Guleria and Sood, 20140) suggested a more comprehensive didactic pedagogical approach is a practical approach to learning. In which teachers elaborate necessary skills of reading and writing along with the subject knowledge. This helps the students who are unable to organize their work and need a guide.

4.3Assessment and Monitoring of learning

The monitoring in the traditional classroom is easier for educator's point of view. Also, the students are more attentive in the classroom. However, in the e-learning platform, the learners are more vulnerable to loosen their attention as the perception of the presence of educator is missing. Researchers propose that the online chat and using the forum for discussion will work effectively to make online learning more interactive (Hew, 2016). Different group discussion techniques, along with study specific rules, will be helpful to seek learner's attention and active involvement in the e-learning.

4.4 Evaluation of e-learning and multimedia resources in a traditional classroom

In teaching-learning platform, audio-visual learning material help to enhance the connection between learner and educator. Tretsiakova et al. (2017) suggest that the didactic pedagogy material is an asset for the e-learning system, and using that the teaching process becomes more active. This will help to raise the student's level of satisfaction, which leads to improvement in their performance. A difference between different learners and their learning capability in the different part of the subject is easily evaluated. Recommendation of multimedia content by the pool of committee for the classroom will enhance the satisfaction level of learners and improves their performance (Liu and Shih, 2007). Along with that, a person-specific resource recommendation using machine learning tools and will help in the evaluation and enhancing the capability of each of the learner (Lu et al., 2015). The e-learning process generated a significant amount of data in the form of log files which contains all the details of the interaction between educator and learner, details of multimedia content used, and other different activities performed in the e-learning platform. To explore and find the information from the generated data Pascual-Cid et al. (2010) made a platform which analyzes these data through different statistical techniques and web-mining and gives the behaviors pattern of the learner and educator. This evaluation facilitates the educator to adopt appropriate teaching practice. Liu and Peng (2013) performed clustering of data, applied related rules, and used decision tree techniques to formulate a combination of rules for education multimedia content and associated teaching plans. This evaluation helps the administrators to improve the teaching-learning process.

4.5 Evaluation of pedagogy

A proper evaluation of pedagogy technique used by educators will help to improve the teaching. If there is a harmony between teacher and student them, the used teaching technique will serve its purpose. It includes the assessment of the interactive nature of the education system, how the pedagogy affects the students and whether it provides a future improvement in the learning methodology. Evaluation of the adopted teaching methodology is a way to enhance the teaching level by modification and changes in the teaching practices (Schmidt et al., 2009; Liu and Xia, 2011). Researches used fuzzy theory approach to evaluate score the efficiency of teaching and association rules technique is applied to find out redundancy (Liu and Xia, 2011; Shahiri et al., 2015). This evaluation is more consistent, and the results are efficient and more valuable.

4.6 Assessment of/by management and administrator in the learning environment

Administrator and management part of the institute is accountable to all steps of the teaching-learning process. Hence, it is essential they must possess specific skill (technical and human behavior) along with an in-depth overview of the instate its structure and aim. Those experienced management persons should actively take part in the evaluation process. It is recommended that they should know the different issues arises in the different level of the organization. The quality of education and accessibility of material required for teaching (Dongsheng and Wenjing, 2009; Wang and Lin, 2012). The evaluation of the administration point of view the interaction between education and student is assessed first to know the learner's performance in the current teaching-learning environment. This facilitates the administrator student's requirements and future analysis for the disapproval and chaos (Rosales et al., 2011). It may be possible that the data available from the student's records and activity logs from the e-learning platform is not sufficient to assess the student behavior and complex acts. To overcome this, Rosales et al. (2011) developed a different approach of monitoring of educators and students both. Fuzzy logic and Ontologies-based approach are used aiming to find out a decrement in the learning outcome, make the class more interactive students and teachers, altered the methodology to improve learner's performance.

5. Conclusions

In the current study, five critical dimensions of teaching-learning have been discussed. It reveals the aims of teaching and learning in the current world and how it meets the delivery standard of content knowledge. The amount of interactive behaviors in leaching-learning is also identified through the study of dimensions. Different dimensions of teaching and learning, purpose/aim/intent, engagement of students, pedagogy, assessment, or classroom environment all are depending on the teaching-learning environment. The role of an educator, the responsibility of a learner, and the duties of the administrator and management of the institute are vital for an effective education system. The evaluation process at all stages in any Institution is utmost necessary for the betterment of the learning environment. Future of our society is heavily influenced by technology, technology-driven web-based learning is the need of the hour. There is a scope of improvement in all the available teaching-learning methods and available evaluation methodologies.

References

1. Badcock, P., Pattison, P., & Harris, K. (2010). Developing generic skills through university study: A study of arts, science and engineering in Australia. Higher Education, 60(4), 441–458.
2. Caballé, S., Xhafa, F., & Abraham, A. (2008, November). Towards an automatic real-time assessment of online discussions in computer-supported collaborative learning practices. In 2008 Third International Conference on Digital

Information Management (pp. 470-475).
3. Dongsheng, Z., & Wenjing, J. (2009, December). Design and implementation of university educational decision support system on the students satisfaction survey. In 2009 International Forum on Computer Science-Technology and Applications (Vol. 3, pp. 428-430).
4. Edwards-Schachter, M., García-Granero, A., Sánchez-Barrioluengo, M., Quesada-Pineda, H., & Amara, N. (2015). Disentangling competences: Interrelationships on creativity, innovation and entrepreneurship. Thinking Skills and Creativity, 16, 27-39.
5. Ginns, P., Prosser, M., & Barrie, S. (2007). Students' perceptions of teaching quality in higher education: The perspective of currently enrolled students. Studies in Higher Education, 32(5), 603-615.
6. Govindasamy, T. (2001). Successful implementation of e-learning: Pedagogical considerations. The internet and higher education, 4(3-4), 287-299.
7. Guleria, P., & Sood, M. (2014). Data Mining in Education: A review on the knowledge discovery perspective. International Journal of Data Mining & Knowledge Management Process, 4(5), 47.
8. Hew, K. F. (2016). Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS. British Journal of Educational Technology, 47(2), 320-341.
9. Hongxia, J., & Yao, H. (2008, October). Classroom teaching quality evaluation based on neuro-fuzzy id3 algorithm. In 2008 International Symposium on Computational Intelligence and Design (Vol. 1, pp. 166-169).
10. Kivunja, C. (2014). Innovative Pedagogies in Higher Education to Become Effective Teachers of 21st Century Skills: Unpacking the Learning and Innovations Skills Domain of the New Learning Paradigm. International Journal of Higher Education, 3(4), 37-48.
11. Liu, H., & Xia, Y. (2011). Teaching evaluation system based on association rule mining. In 2011 Third Pacific-Asia Conference on Circuits, Communications and System (PACCS), (pp. 1-3).
12. Liu, Q., & Peng, Y. (2013, April). A method of unstructured information process in computer teaching evaluation system based on data mining technology. In 2013 International Conference on communication Systems and Network Technologies (pp. 688-692).
13. Lu, J., Wu, D., Mao, M., Wang, W., & Zhang, G. (2015). Recommender system application developments: a survey. Decision Support Systems, 74, 12-32.
14. Marzano, R. J. (1988). Dimensions of thinking: A framework for curriculum and instruction. The Association for Supervision and Curriculum Development, 125 N. West St., Alexandria, VA 22314-2798.
15. Pascual-Cid, V., Vigentini, L., & Quixal, M. (2010, July). Visualising virtual learning environments: Case studies of the website exploration tool. In 2010 14th International Conference Information Visualisation (pp. 149-155).
16. Porter, M. E., & Kramer, M. R. (2019). Creating shared value. In Managing sustainable business (pp. 323-346). Springer, Dordrecht.
17. Qiu, R. G., & Lee, D. (2013, May). Transformative education web 2.0 systems for enriching high school stem education. In 2013 IEEE 4th International Conference on Software Engineering and Service Science (pp. 352-356).
18. Rosales, G. C. M., de Araujo, R. B., Otsuka, J. L., & da Rocha, R. V. (2011, July). Using logical sensors network to the accurate monitoring of the learning process in distance education courses. In 2011 IEEE 11th International Conference on Advanced Learning Technologies (pp. 573-575).
19. Sankar, C. S., & Clayton, H. (2010). An evaluation of use of multimedia case studies to improve an introduction to information technology course. International Journal of Information and Communication Technology Education (IJICTE), 6(3), 25-37.
20. Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers. Journal of research on Technology in Education, 42(2), 123-149.
21. Shahiri, A. M., & Husain, W. (2015). A review on predicting student's performance using data mining techniques. Procedia Computer Science, 72, 414-422.
22. Tretsiakova-McNally, S., Maranne, E., Verbecke, F., & Molkov, V. (2017). Mixed e-learning and virtual reality pedagogical approach for innovative hydrogen safety training of first responders. International Journal of Hydrogen Energy, 42(11), 7504-7512.
23. Tynjälä, P. (1999). Towards expert knowledge? A comparison between a constructivist and a traditional learning environment in the university. International journal of educational research, 31(5), 357-442.
24. Vila, L., Perez, P., & Morillas, F. (2012). Higher education and the development of competencies for innovation in the workplace. Management Decision, 50(9), 1634–1648.
25. Virtanen, A., & Tynjälä, P. (2016). Factors explaining learning of generic skill: A study of university students´ experiences. July Paper Presented at the Higher Education Conference.
26. Wang, C. S., & Lin, S. L. (2012, August). Combining fuzzy AHP and association rule to evaluate the activity processes of e-learning system. In 2012 Sixth International Conference on Genetic and Evolutionary Computing (pp. 566-570).
27. Wang, J., Lu, Z., Wu, W., & Li, Y. (2012, July). The application of data mining technology based on teaching information. In 2012 7th International Conference on Computer Science & Education (ICCSE) (pp. 652-657).

KEYNOTE ADDRESS

Faculty and Academic Leadership
The importance of Academic leadership in the Institute (University)

Dr. Mrs. S. S. Kulkarni
Director, **Rajarambapu Institute of Technology (RIT),** Rajaramnagar, Islampur,
Dist. Sangli, Maharashtra, India - 415414.
director@ritindia.edu

1.0 The Domains of Academic Leadership

Leadership can and does occur in the domains of teaching, research and administration. Teachers define who will be taught, what will be taught, how it will be taught and the standards of evaluation of what has been learned. Leaders in teaching are imbued with an extraordinary ability to know what knowledge is more critical to teach, excite students and peers about learning, know what teaching practices are most effective, and invest their considerable energies in the promotion of student learning.

Researchers define questions and seek answers. Leaders in research have the ability to identify and answer particularly important questions, seek connectivity and are driven to communicate their work to others.

Administrative leadership is the force which guides the university as a whole. Administrative positions at senior level are vested with the responsibility, whether derived by statute, charter or articles of incorporation, for ensuring that the institution and its members fulfil their educational, social and ethical mandates. In a university, leadership responsibilities reside both in the position and with the individual who holds the office at any point in time. Administrative leaders may or may not be leaders in either teaching or research but are respected for their judgement, institutional knowledge and predictive powers. Such individuals are usually drawn into the institutional structure through appointment to senior administrative posts.

The point here is while holding a leadership position does not in itself guarantee that a person is a leader. The administrative leader speaks to its students, staff and external constituencies, about what the academy is, what it is doing or could be doing better, and provides a contextual framework with which to guide the institution's progress towards its goals.

In so doing, the senior administrator, through the use of influence, shapes the standards and, through the judicious use of authority, monitors the application of those standards to the appointment of those admitted to the professoriate and those identified as leaders.

Therefore, what leaders in the university community have in common is an extraordinary drive and ability to communicate and a passionate belief in what they are trying to achieve. (Reference Sheryl L. Bond EdD)

2.0 An Analytical Model of Leadership

To think about academic leadership, the leader should possess at least four significant attributes (vision, voice, action and credibility). The extent to which five elements (personal principles or axiom, capacity, competence, capability and confidence) are developed increases the likelihood that the individual will be an effective leader.

2.1 Significant Attributes of Leaders

While leaders may look different and think differently, it is likely that they share the following attributes:

Vision (the ability to communicate to others what a destination may look and be like and instil the motivation in others to move towards that destination);

Voice (the ability to listen to what is said and not said by members of the group and to express those wants, needs, hopes and fears to others);

Credibility (the ability to do what one commits to do);

Commitment to action (a sustained focus over time in often very difficult circumstances).

The likelihood that a particular person will have these leadership attributes depends in large measure on who they are and the environment in which they have been raised and work. The degree to which each of these attributes is developed depends on the person's life experience, including cultural norms and values, education and training, personality, experience and access to power.

3.0 Why Academic Leadership?

Academic leadership is the name given to leadership in an academic setting or organization as a special subdivision of overall leadership. Academic leadership is a leadership that includes such roles as creating vision and mission based on science and research data for the organization, setting up creative ideas, doing and providing teamwork.

Academics can be related to work done in school and colleges and Universities, especially work that involves studying and reasoning.

Some questions which come up in college Teacher's mind are:

- What is the role of faculty in Academic Leadership
- Role of Faculty as part of Education System
- Relation between Education and Academics

3.1 Academics is Part of Education:

If we study education as a system in general, then we will find these are five Important Elements of system as shown in the figure below along with their relationships. A System is a set of elements that function as a whole to achieve a common purpose.

- Input
- Process
- Output
- Feedback
- Environment

The figure of Education system shows that Faculty is the common thread in all the elements of the system.

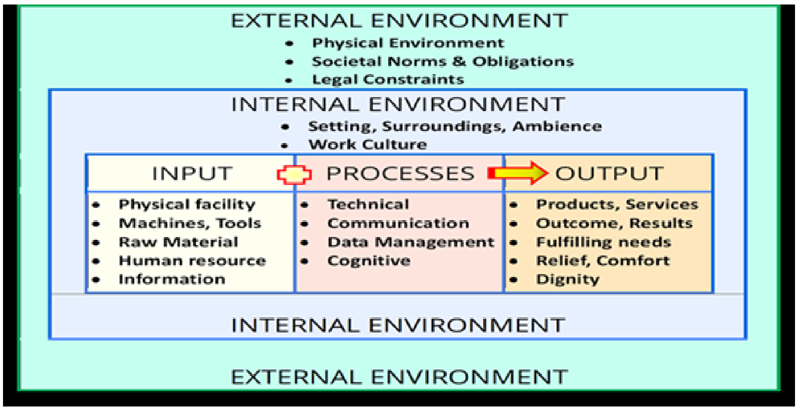


Figure 1 : Education System

4.0 Some Thoughts About the Education System and Academics –

- In this education, system what and where is the role of faculty.
- Faculty is a vital component of Education System because the Input, Process, and Output everything is dependent on the performance of the faculty.
- If we want our Institute to be NBA, NAAC accredited or we wish to benchmark ourselves in NIRF ranking survey the important element is Faculty performance and involvement that is derived from Academic Leadership.
- Academic Leadership is a combination of performance of teacher in academics i.e. teaching learning process, curriculum design, delivery and evaluation. It is also about Leadership of teacher in the domain of Teaching, Research and Administration. A teacher demonstrates Academic Leadership, which is combination of role of teacher in Academics and demonstrating Leadership qualities for growth and development of Institute to guide the Institution progress towards its goal.
- Beginning of the career the role of teacher is as leader in the Class Room or Laboratory. As leader, the role is handling the 60+ students, counselling, mentoring them. Creating the interest in the course being taught by them and keeping, the students motivated to learning, making them do and submit the assignments on time, making them realize their mistakes in the assignments submitted, Teacher as a Leader in Class Room should demonstrate extraordinary drive and ability to communicate and passionate belief in what they are trying to do. It is all about transforming the lives of students in the class.
- Gradually, with 2-4 years of experience in teaching it is expected that some administrative responsibilities be also taken up which are required for development of department. It may be a role as Monitor for a class to improve the performance of class in terms of Attendance/ Results / Career Counseling etc. Teacher may have to analyze the attendance daily or results of the class to identify the low performers so that the teacher can provide a support system to improve their performance. There will be always 3 components of Faculty Development throughout their career –

- Teaching - Learning and academics
- Administration
- Research

Academic Leadership includes Administration Leadership too. A faculty has to prepare himself or herself for higher position such as Head of Department, Cell Co-coordinator, Dean and Principal of Institute.

As part of Research, it also includes Organizing Workshops / Seminars and Conferences, getting funding, preparing proposals for research funding, preparing reports, policy documents etc.

It is important to note that how to prepare faculty for all the roles because for a successful career in Education Field all aspects are required.

5.0 Academic Development - Two Dimensional Effective Teaching Model :

Joseph Lowman has developed the Two-dimensional model of Effective College Teaching in 1984 (UNC-North Carolina University). – (reference Joseph Lowman, Mastering the Techniques of Teaching). **Figure 2- Two dimension effective teaching Model**

The specific lessons in this paper are based on two-dimensional model of teaching effectiveness in which the quality of instruction results from a college teacher's skill at creating both intellectual excitement in and interpersonal rapport with students – the kinds of emotions and relationships that motivate them to do their best work. The skill to generate excitement and the skill to establish rapport are relatively independent. Excellence at either can ensure effective teaching with some students and in certain kinds of classes; a teacher who is accomplished at both is most likely to be outstanding in meeting a variety of goals for all students and in any setting. Instructors who can promote each of these desired states boost their students learning by increasing the degree to which students care about the subject and will work hard to master it.

5.1 Dimension I : Intellectual Excitement

Skill at creating intellectual excitement has two components: the clarity of an instructor's presentation and their stimulating emotional impact on students. Clarity is related to *what* one presents, and stimulating the emotional impact results from the *way* in which material is presented.

5.2 Dimension II : Interpersonal Rapport

In theory, the college classroom is strictly intellectual and rational setting. In reality, a classroom is an emotionally charged interpersonal arena in which a wide range of psychological phenomena occurs. For example, students' motivation to work outside of class will be reduced if they feel that they are disliked by their instructor or controlled in heavy-handed or autocratic ways. All students are vulnerable to such disrupting emotions, and some students are especially sensitive to them. In addition, like anyone else, students have a potential to react emotionally when they are being challenged and evaluated in-group settings. Even students whose work is superior will become angry if testing and grading practices seem unfair.

Dimension II deals with an instructor's awareness of these interpersonal phenomena and with his or her skill at communicating with students in ways that increase motivation, enjoyment and independent learning. This is done in essentially two ways. The first is to avoid stimulating negative emotions – notably, excessive anxiety and anger towards the teacher. The second is to promote positive emotions, such as the feeling that the instructor respects the students as individuals and sees them as capable of performing well. These sets of emotions strongly affect students' motivation to complete their assignments and learn material, whether their motivation is a desire for approval from the teacher or an attempt to meet their own personal standards.

The figure 2 below explains the two dimensions with the intensity as "low" to "high" for both the dimensions on X and Y axis. In the model the LOW-LOW quadrant indicates "Inadequates" Teacher who is unable to motivate students as well as poor in class room delivery. Similarly HIGH –HIGH quadrant indicates high on both the dimensions and thus excellent in Interpersonal Rapport (emotional excitement) and also excellent in Intellectually exciting the students to create interest in Teaching Learning process. The "Competents" will be mediocre in both the dimensions and thus those teachers need to focus on developing themselves in both the dimensions. "Exemplary" Instructors, then are those who excel at one or both of these two dimensions of teaching effectiveness, and who are at least adequate at each. Every "competent" teacher must have at least moderate skill in each dimension but there is considerable room for variation.

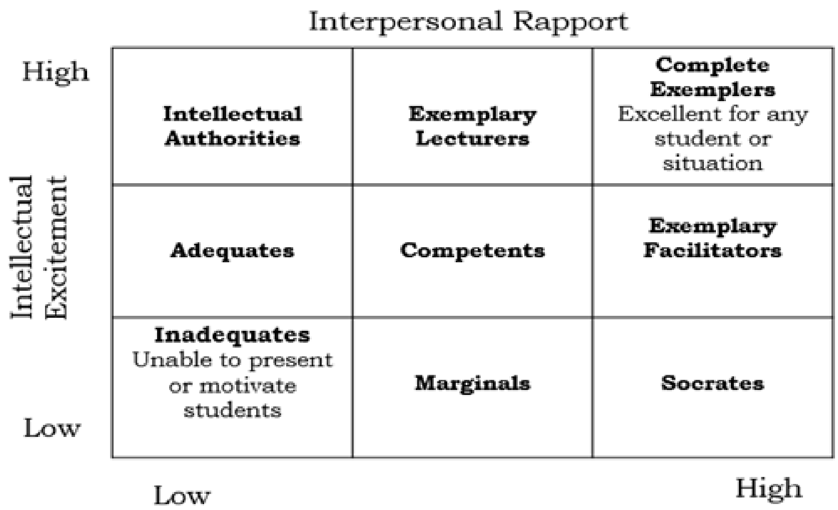


Figure 2 - Two-Dimension Effective Teaching Model

6.0 Leadership Model -Blake and Mouton Management Grid

For a college teacher the two dimensions of the Blake and Mouton model is perfect guidelines for Leadership in academics and administration.

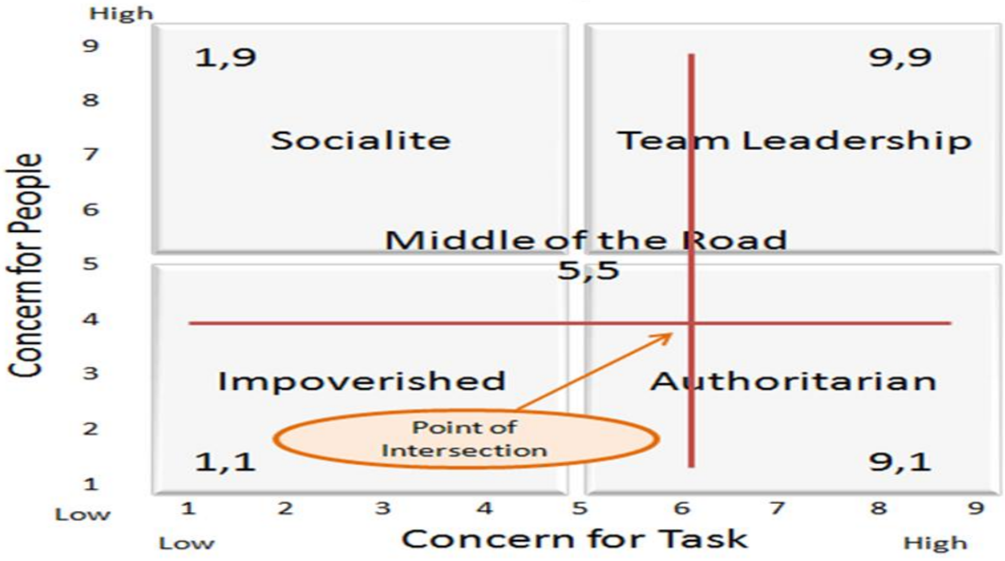


Figure 3 : Blake and Mouton Management Grid Model

About the Management Grid Model:

The treatment of task orientation and people orientation as two independent dimensions was a major step in leadership studies. Many of the leadership studies conducted in the 1950s at the University of Michigan and the Ohio State University focused on these two dimensions.

Building on the work of the researchers at these Universities, Robert Blake and Jane Mouton (1960s) proposed a graphic portrayal of leadership styles through a **managerial grid** (sometimes called *leadership grid*) (figure above). The grid depicted two dimensions of leader behavior, **concern for people** (accommodating people's needs and giving them priority) on y-axis and **concern for production (Task)** (keeping tight schedules) on x-axis, with each dimension ranging from low (1) to high (9), thus creating 81 different positions in which the leader's style may fall. (See figure 3).

The five resulting leadership styles are as follows when compared with Concern for students (people) and concern for Teaching learning (Task) in this model for a College teacher:

i) **Impoverished Management (1, 1):**
College Teacher with this approach are low on both the dimensions and exercise minimum effort to get the work done from subordinates (Students). The leader has low concern for student satisfaction and task deadlines and as a result disharmony and disorganization prevail within the organization. The leaders are termed ineffective wherein their action is merely aimed at preserving job and seniority.

ii) **Authoritarian (Task Management) (9, 1):**
Also called dictatorial or perish style. Here leaders are more concerned about task and have less concern for Students (people). The style is based on theory X of McGregor. The student's needs are not taken care of and they are simply a means to an end. The leader (Teacher) believes that efficiency can result only through proper organization of work systems and through punishment of people wherever possible. Such a style can definitely increase the output of organization in short run but create dissatisfaction amongst students (people).

iii) **Middle-of-the-Road (5, 5):**
This is basically a compromising style wherein the leader tries to maintain a balance between goals of organization and the needs of Students (people). The leader does not push the boundaries of achievement resulting in average performance for organization. Here neither Teacher (employee) nor outcomes (task) needs are fully met.

iv) **Socialite (Country Club) (1, 9):**
This is a collegial style characterized by low task and high people orientation where the leader gives thoughtful attention to the needs of people (Students) thus providing them with a friendly and comfortable environment. The leader) feels that such a treatment with employees will lead to self-motivation and will find people working hard on their own. However, a low focus on tasks can hamper student outcomes and lead to questionable results.

v) **Team Leadership (Management) (9, 9):**
Characterized by high people and task focus, the style is based on the theory Y of McGregor and has been termed as most effective style according to Blake and Mouton. The leader feels that empowerment, commitment, trust, and respect

are the key elements in creating a team atmosphere which will automatically result in high employee (Teacher) satisfaction and Student Outcomes (production).

6.1 Advantages of Blake and Mouton's Managerial Grid

The Managerial or Leadership Grid is used to help Teachers (manager) analyze their own leadership styles through a technique known as grid training. This is done by administering a questionnaire that helps managers identify how they stand with respect to their concern for production and people. The training is aimed at helping leaders reach to the ideal state of 9, 9.

6.2 Limitations of Blake and Mouton's Managerial Grid

The model ignores the importance of internal and external limits, matter and scenario. Also, there are some more aspects of leadership that can be covered but are not.

If teachers develop their leadership skills by understanding the science behind it and follow the art of leadership by practising it then it will surely help them to enhance their performance as a Roles of an Educator

7.0Execution - An important component of Academic Leadership - The Discipline of Getting Things Done (Ref. Larry Bossidy and Ram Charan)

Academic Leader should be a person who knows Execution. Execution is a systematic process of rigorously discussing how's and what's, questioning, tenaciously following through, and ensuring accountability. Important component of Leadership is Execution.

- No organization can deliver on its commitments or adapt well to change unless all leaders practice the discipline of execution at all levels.
- You need robust dialogue to surface the realities of the business.
- How people talk to each other absolutely determines how well the organization will function.
- Organizations don't execute unless the right people, individually and collectively, focus on the right details at the right time.
- People imitate their leaders.
- Leadership without execution is incomplete and ineffective.
- Leader must show up. You cannot be detached and removed and absent.
- Good people liked to be quizzed – when you probe, you can learn things and your people learn things. Everyone gains from the dialogue.
- Realism is at the heart of execution; don't try to avoid or shade reality.

7.1 Three Core Processes of Execution

- People
- Strategy
- Operations

If you have leaders with the right behavior, a culture that rewards execution, and a consistent system for getting the right people in the right jobs, the foundation is in place for operating and managing each of the core processes effectively.

The strategy process defines where an Institute wants to go, and the people process defines who's going to get it there. The operating plan provides the path for those people. It breaks long-term output into short-term targets.

7.2 The Building Blocks of Execution

What exactly does a leader who's in charge of execution do? How does he keep from being a micromanager, caught up in the details? (eg. implement OBE)

- Know your people (Students) and your business (Task).
- Insist of realism.(know the weaknesses)
- Set clear goals and priorities. (Top 5)
- Follow through.
- Reward the doers.
- Expand people's capabilities (Emotional Fortitude).
- Know yourself.(Self mastery, awareness, authenticity, humility)

7.3 Fundamentals in Creating a Great faculty - (Ref Verne Harnish)

"Anyone with children will recognize the fundamentals I've summarized as:

1. *Have a handful of rules*
2. *Repeat yourself a lot*
3. *Act consistently with those rules (which is why you better have only a few rules)"*

8.0 Roles and Responsibilities of a College Teacher

Finally, we can be broadly classify the roles and responsibilities of an Academic Leader, as a Teacher, as an Administrator and as a Researcher. In all the three roles, one has to focus from the commencement of career. It is a continuous process of development that should be supported by training, retraining, keeping your mind open for change with clearly defined goals for oneself. A successful career in education field can be properly planned and one can reach the top positions by determined, planned and disciplined approach from the beginning of the career.

8.1 As a Teacher

- Teacher as leader in classroom
- A Performer on stage in the classroom
- A great communicator and Motivator
- Gets the task done from students
- Creates interest in whatever students are doing
- Change with time and adopt with time and technology for curriculum upgradation

8.2 In Administration

As administrator, a teacher has to coordinate the task of all the 60+ students in classroom

- Collaborate with peers, seniors & juniors in the Institute and perform the tasks assigned
- Complete tasks like filling attendance, ERP like syllabus completed, marks, performance related record, papers published, OBE related data etc.
- Work as counselor, monitor, parent and guide for career. Management skills for students
- Organising conferences, workshops and seminars, prepare for NBA, NAAC
- Change with time and adopt with time and technology

8.3 As a Researcher

- To be a great teacher you need to be a researcher
- You need to develop the problem solving ability, inquisitiveness should be increased
- Research and development should lead to dissemination of knowledge by research papers publication.
- Should get research funding from external sources, do consultancy for Government and non-Government organizations
- Patent and Product development
- Commercialization of products and encourage start ups

9.0 Conclusion

It is essential that a faculty realize its role to develop a career in teaching profession. The teacher has to develop as an Academic Leader to fulfill the dream of a successful career in teaching profession. Academics is essential component but to be successful in education system leadership role is equally important and hence developing the capabilities as leader for effective administration is equally essential.

KEYNOTE ADDRESS

Faculty Development

Prof. Suvasish Mukhopadhyay
Head of Department (Civil Engineering)
Government College of Engineering, Chandrapur, Maharashtra 442403
professor_sm@rediffmail.com

At the very starting let me say why this topic is coming to the picture. Before one hundred years also there were colleges but the term Faculty Development was not there. It is synonymous to Quality Control in Management. Before hundred years the term 'Quality Control' was not there, but Quality was there. Today Quality is not there, for that 'Quality Control' came to the picture. So we must ask ourselves why today the topic of Faculty Development is coming to the picture, which was not there even fifty years ago.

When before 50-years the teachers used to get minimal salary then there was no dearth of good faculties, but today in spite of having good salary and ambience there is a severe crunch of good faculties and for that we are only responsible. My speeches are always very candid and sometimes bitter and pungent to some extent, because truth is always bitter.

There are hundreds of faculties in this conference. May I ask all you how many of you joined teaching profession by choice but not by force? In India the population is 130 crores plus, but quality population is not there. In 130 crores population we will not get even 130 good teachers of Fluid Mechanics. When we joined teaching profession, then we didn't compromise, we came by our choice and no force under the sky could prevent us from entering the teaching field, but in today's scenario if you ask the students what they want to be the answer becomes CEO, CFO, GM, DGM and MD of MNCs, but rarely someone will say that he or she wants to be a teacher. So the problem lies in the root. If a man is asleep you can awaken him, but if a person pretends to sleep then how to awaken him? It is impossible. It is my personal observation that now-a-days teaching profession becomes the last choice and everyone wants to go for UPSC or MPSC for being the commissioner, secretary, collector, deputy collector and last but not the least the post of Tahashildar and for Tahasildar there is no English Terminology. Why they want to go there? The answer is known to both you people and me, only we can't say that publicly and officially. When they developed so much love for the country? For all of them teaching is the last choice. Bernard Shaw said, "Politics is the last resort of the Scoundrels." In the same way I would like to say, "Teaching is the last resort of the greedy mass, who failed everywhere." It's a nation of compromise. *Gulab Jamun Khane Ka IcchaHuyi, toh Gulab Jamunhi Khao. But in today's scenario if they don't get Gulab Jamun Samosa can be the alternative. Kuchbhichaltahai pet bhadnekeliye.*

I still remember I left one after another job and most of them were Govt. jobs and my father used to forcibly send me for the interviews and examinations. It was easy for me to clear those tests and interviews, but difficult for me to accept them. India is a country where an M.sc in Mathematics spends his whole life as the cashier of a bank. How unfortunate it is! That is only possible in a country like India where the three main problems are population, pollution and politics. In Eastern Railway for a Class-I post I stood fourth in the written examination but in the interview I clearly expressed that "I hate that job." Obviously I was failed. In my life either I wanted to be a teacher or a vegetable vendor. No Compromise. The moment you compromise you are lost forever. Till I am talking and that can be compared with the preamble of this Key Note Speech, I am yet to come to the main topic. The topic is faculty development. If a person wants to be deputy collector, fails once, twice and thrice and afterwards join teaching, then that type of teacher should be kicked out from the system, because these frustrated creatures will never perform, on the contrary they will harass the students and throughout the life canalize their frustration on the students' community. I authored 27 books and 29 books are in pipeline. One of the very famous book authored by me is entitled 'My Students My Love." How could I author this book? It is the only book in the whole world written by a faculty about his students. How could I make it, because I love my students, I know them by names and even by roll numbers. How it is possible? Only due to attachment. After 30 years of graduation one may forget most of the names of the boys who were with him, but within fraction of minute he can recall all the names of the girls of his class. Why is it so? Because he had more interest in girls and that is quite natural and obvious. The question of development of the faculty will come then only when one accepts the profession from the core of his mind. Whatever the field may be it is difficult to be number one.

Teaching is the only field where with seniority the load decreases. For an Assistant Professor the loads is 16, for an Associate Professor the load is 14, for a Professor the load is 12, though in recent days AICTE has changed something and I think now-a-days the loads of all the faculties are same. There are so many questions. Inspite of college why the students go to Tuition? No one will beg outside provided they get the food in their home. The students who go to Tuition must not be happy with the college teaching and he not only spends time, but also spends money. In this system there is a rule of 75% attendance. I authentically state this is a useless rule. I remember one in COEP one student used to attend three lectures continuously and every fourth lecture he used to be absent. I took total 40 lectures and the particular student was absent in

4th, 8th, 12th, 16th and 20th lecture. I observed this systematic indiscipline and when I asked about this irregularity he answered, “Sir, I am maintaining 75% attendance.” Technically he was correct. But he forgot that it was a class of Fluid Mechanics, not a class of Cooking. It is not *KhanaKhazana.* In cooking class if you bunk the class of *Aloo Ka Partha,* you can easily attend the next class of *Methi Ka Paratha,* because they are not interlinked. But in teaching without attending the class of Differentiation, can you attend the class of Integration? The question doesn’t arise? Because they are interlinked. Can you be an engineer without knowing Trigonometry? Certainly not. So it is challenge in front of the whole world how to Develop the faculties. Good faculty is a global crunch and the main enemy is computer. In older days people used to use slide rules, then came the era of calculator and now it is the age of computer and MAT LAB. People are using MAT LAB without knowing Mathematics. It is just like attempting to ride a bike without knowing cycling. With each passing year both the teaching and students’ community are being separated from the origin. If you talk of Logarithm then why the conversion factor is 2.303 for 10 base logarithm and natural e- base logarithm? What is ‘e’? One must know these basic things. Influence of mind over mind is the biggest influence of the world. A teacher can influence his or her students to the maximum possible way, but now-a-days teachers don’t even bother to remember the names of the students. For the Faculty the first and foremost thing is to accept his profession. Whether it is teaching or prostitution the acceptance of the profession is the most important part and it is not so easy to be a good prostitute also. She has to be beautiful, she has to be punctual, she has to be professional, she must know how to satisfy and retain her clients and last but not the least the profession must suit her. It is extremely difficult to be number one in any field. It is equally difficult to be Einstein and Dawood. Both are master in their own field.

Teaching Sector Kamchoroi Ka Sector Hai. I have personally seen a very senior faulty who doesn’t want first lecture, who doesn’t want last lecture, who doesn’t want lecture just before lunch, who doesn’t want lecture just after the lunch, who doesn’t want two successive lectures. Then the question comes in mind what does he want? And the incharge of time table is a junior faculty. Ultimately it was decided that the senior faculty will take only one subject of PG and two students for PG Dissertation. This is the best example of Kamchori? Actually he was afraid of teaching and it needs courage to face the mass of UG classes. Once one famous painter was asked whether painting is easy or difficult. He replied. “It is either easy or impossible.”Same is the case with teaching. Some profession are such for which you need talent by birth.

Who is more loaded? This kind of professors who are afraid of lectures or the poor ST driver who drives continuously a bus from Pune to Jalgaon in the month of May for 8-9 years? You know the answer. For faculty development first the seniors should create examples. In my whole life I never went to the class with bunch of books and notes for teaching Fluid Mechanics. A student handles 5-6 subjects within one semester and we the professors handle one subject for 25 years. If I don’t have the capacity to teach them without books and notes how do I expect them not to copy in the examination?

So first practise, and then preach. Once there was a little boy who used to consume huge amount of sugar. There was a saint in that village and he used to counsel many people. One day the mother of that little boy went to the saint and told about his habit of consuming excess sugar. The sain advised her to come with the child after one month. Exactly after one month the ldy visited him again along with the child. This time she was advised to come after three months. She was a bit upset. Then after two months when she visited again along with her child then the saint told her to come after two weeks. The lady was a bit irritated, but didn’t say anything. After fifteen days again she visited the saint along with her child, but she went with a negative mood. But this time the saint told the children to leave the consummation of sugar. The lady was awestruck. She openly asked the saint, “Sir, Why did you return us twice and saying this one line of counselling why didn’t you advise on the very first day.” The saint smiled and replied, “My dear, I took three and half months time to abstain myself from sugar. So I didn’t have the right to preach unless I practise it.” This is the crux of life.

The one of the most important parameters for the development of the faculty is to love your students. However, great you are if you don’t love your students then you can never be a good teacher. A teacher who engages most of his lectures on the different field sitesis called as practical teacher and it comes from within. No one can motivate you for this. Only self-motivation can do it. Teaching is a field where you need to explore the latent talent of your students and in this world all the teachers are ready to guide the project group whose average CGPA is 8+ or 9+, but no one is ready to accept the academically poor students whose average CGPA is 5+ or 6+.Then who will take them? *SabkoAagadMalaiKhana Hai TohTaak Kon Piyega?*

In my life from day one I have chosen to guide these academically poor boys and girls for whom no teacher was ready to guide them. In COEP I am famous as Mukho Sir For Back Log Students. We must know their need. In this era of Google and You Tube far better lectures are available online than the lecture what you or me deliver. Then we must try to give something which is not available in GOOGLE.

Let me ask you a simple question.

One, one panel door is half closed. Does it half open? If the answer is yes then one would say;

½ closed = ½ open.

Multiply both side by two. Then OPEN= CLOSED. But can it be. If you really observe then you can prove OPEN = -CLOSED(by the help of Trigonometry).

So OPEN + CLOSED = ZERO

LOVE + HATE = ZERO

YES+ NO= ZERO

One more thing is regular practice. There is a famous saying of a violinist. He told,
"If I don't practise for one month my audience will realize it
If I don't practise for one week my wife will realize that
And If I don't practise for one day I will realize that."
How true he was! So continuous practise is required. I don't carry books or notes in the classroom, but I need to practise the heavy derivations twice or thrice before going to the class.
Apart from that a good teachers needs to have so many qualities. As for example he should have these following qualities.

i) A faculty must not scold his student publicly
ii) He should be impartial
iii) He must possess sound knowledge of the subject handled by him
iv) He must give clear cut instructions to his students
v) Deadlines of submission must be announced in advance
vi) Never use your student for your favour and teaching politics
vii) Accept your mistakes and improve yourself based on the feedback of your students
viii) Support your students when they need it
ix) Believe them and respect them. Faith is the foundation of all relationship
x) Teach them team spirit
xi) Trust them totally, because students' community is the most innocent and neglected community in our country
xii) Never gossip with them about the official matters and personal grievances against the system or management
xiii) Know how to motivate them and give them credit
xiv) Try to provide adequate materials and facilities. If required get the book issued in your name from the library and give it to them
xv) Teach them how to take decisions
xvi) Treat them as your close associate, never belittle them
xvii) Don't display too much authority, because it is teaching, not admin
xviii) Be with them for 24 X 7. Sun never sets.
xix) Never allow them to say 'It's impossible', let them realize 'I am possible.'
xx) Let them know when an ordinary person puts some extra effort he becomes an extra ordinary person.
xxi) They need to unlearn some old thoughts to learn something new. So motivate them.
xxii) They must listen to learn and learn to listen.

There is crunch of time. I would say Teach and Cheat comprise of the same letters, only they are arranged in different forms. So either you teach, or you cheat. There is no middle path.

One more very important thing is the selection criteria and now-a-days throughout the world the trend is that while selecting a faculty his record of publication must be seen. More the numbers of publications in the reputed journals more is the chance of selection and apart from that if the candidate possesses one or two PDF after Ph.D then it is the golden opportunity for the candidate to be selected.

There are few profession of field like Teaching, Law and Politics where if you can't talk then you will perish and you will not be accepted. *Chaiyewalachalegalekin double Ph.D without any oratory skill will not be accepted.* There are so many IITs and IIMs, they are full of faculties with thousands of publications. In IIT Kharagpur I personally witnessed a Ph.D, PDF in welding technology depending on an illiterate garage boy for the repairing of his Activa. This is our education system. Miles apart from practical knowledge. An ITI pass out is more confident than a Ph.D holder. At least an ITI pass out knows how to use a lathe machine. More the degrees, more is the Ego, but this Ego doesn't have any base. You must try to understand how much useful you are to the society. So the selection process is totally wrong. You are recruiting teachers, not researches. If a researchers can't talk it will do, but a teacher must know how to motivate the mass. A teacher is nothing but a leader who leads from the front. So in spite of giving weight age to their publications the candidate must be left in an UG class and allowed to teach any topic as per his/her choice. The authority should select the faculty after observing their teaching capabilities.

I am still in touch with the students who passed in 1990. Only small difference is there. In those days the age gap between my students and me was only 4 and now it is 32. Every year my age increased by one year, but the band width of the students is a constant i.e. 18-22. Then I was friendly, now I am fatherly. But within every father there is a friend. The day this friend will dead that day the teacher should leave this profession. So 'N' numbers of points are there which can be discussed for developing a faculty. But one faculty knows him better than anyone. Each of the faculties must go for SWOT analysis(Strength, Weakness, Opportunity and Threat) and automatically he will come to know how to develop his or her skills.

Something is basically bad like my hand writing. But my mother who left this world 42 years back suggested me never to try to improve my hand writing. She was a semi literate lady, but her vision was very clear. She told me, "If anything is weak, never spend energy for that, but it can never be strong, better you strengthen your strong points." She only told me, "Don't learn any subject, just learn English and Mathematics and you can rule the academic world by left hand."Today I realize how true she was. Today I realize teaching is not only my profession, it's my passion and when there is synchronization between your profession and passion you never feel the pressure of the work.

Lastly I would say that the concept of teaching by Power Point is not at all accepted for Mathematical Subjects like Mathematics, Geotechnical Engineering, Theory of Structures, Control System, VLSI and Fluid Mechanics. You must go for black board teaching. There is no substitute of Dal Chawal, you can't have Biryani every day. Similarly there is no substitute of Black Board Teaching.

When we were students then LCD was not there, AC was not there, Computer was just coming, no facilities were there, communication was very poor but we had good teachers, and today all the facilities are there, but the main thing Good Teacher is absent. Good Teacher is also an extinct community. Not only in India, it is happening across the whole Globe. In most of the famous American Universities my students were there and are there. I have personally recommended 100+ students for their MS programme from US, but there also the picture is mostly same, still Asians are far better than Americans in Mathematics, but there also most of the professors are busy with their research and consultancy and most of the teachings are done by the graduate and Ph.D scholars and in the name of teaching in US they get the assignments done in a robotic style. We forgot that teaching is a flower and teaching-learning is a mutual process. The last part of every problem is solution; similarly if learning is absent then teaching loses its value like the grain of sands under the rough waves of a sea. Still there is time. Let us come together, do the self analysis and go ahead. The sunrise of tomorrow is in store for us. It's you the next generation who is expected to illuminate the technical landscape of the teaching field by your knowledge, wisdom and vision.

I will finish with four lines of a famous anonymous quote.

"Good, Better, Best Do Not Rest Till Good Be Better And Better Best."

-Anonymous

KEYNOTE ADDRESS

Research and Innovation Opportunities for Technical Institutes

Prof. Purnanand Savoikar

Professor in Civil Engineering
Goa Engineering College, Farmagudi, Goa
pps@gec.ac.in, psavoikar@gmail.com

Abstract:
Research and development involves acquiring new knowledge which can be converted into new technology, products or services which may be useful to institution, organisation and community as a whole. Innovation is a deliberate attempt of combining information, imagination and initiative so as to derive better products or services from the available inputs utilising the technology developed. The Government of India is extensively promoting research parks (RPs) and technology business incubators (TBIs) to promote the innovative ideas till they become commercial ventures. Indian Institute of Science (IISc), Indian Institutes of Technologies (IITs) and National Institutes of technologies (NITs) are the leading technological institutes in India involved in extensive research and development activities. The main issues as regards R& D activites in any institute is the resource crunch and non-availability of sophisticated equipment in the laboratories. Many schemes are available with DST, AICTE, MHRD for funding research activities in institutes. More focus should be on applied research which finally leads to innovative product and service development. In the present paper, discusses about R &D and innovation models and research experiences in Goa.

Keywords: Applied research, R & D, Innovations, Research opportunities, product development.

1. Introduction

Research and development involves acquiring new knowledge which can be converted into new technology, products or services which may be useful to institution, organisation and community as a whole. R & D can happen in institutes or public sector or private sector which ultimately serves the community in general, thereby achieving development and growth of country. For an educational institute, R & D will enhance its reputation and market standing and knowledge gained can be useful to industry and finally community as well. R & D in industry leads to developments of new products and services which are utilized by the community.
An idea can culminate into innovation if it is economical, suits the community and serves the purpose for which it is intended. Innovation is a deliberate attempt of combining information, imagination and initiative so as to derive better products or services from the available inputs utilising the technology developed. In other words, innovation is often intended to meet the needs of customers in better way to the best of his/her satisfaction.

2. R & D as a paradigm of invention

Research can be classified as basic research or applied research. Basic research results in acquiring new knowledge and neither it is done with a specific goal in the mind nor the product or a service. Applied research is done with a specific goal, idea or a product in mind. It further leads to new product or service development. Research and Development plays a critical role in the innovation process. It is essentially an investment in technology and future capabilities which is transformed into new products, processes, and services. Mahdjoubi (2009) remarked that the R&D model assumes that science has a monopoly over knowledge, technology is an outcome of science, and economic development is due to technology development. He presented R & D as paradigm of innovation and brought about how the focus has shifted from 1775 industrial revolution wherein trial and error invention was dominating factor to the R & D, technology and customer driven products and finally the user created contents. The model presented by Mahdjoubi (2009) is shown in Fig. 1.

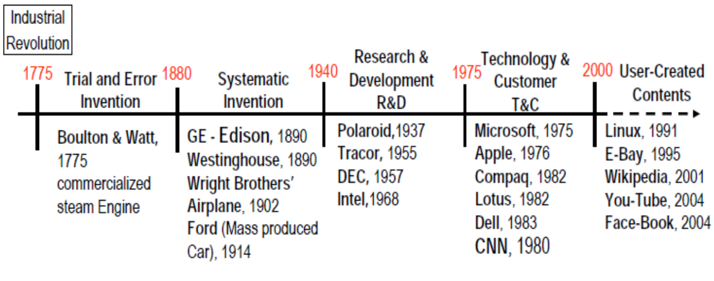


Fig. 1 R & D as paradigm of invention (Mahdjoubi, 2009)

3. R & D as a three pronged approach

Sembmarine Group presented an interesting three-pronged approach to research, develop and collaborate on innovation and solutions development. Basic research leads to accumulation of knowledge while applied research leads to product development. These two concepts along with in-house expertise and an extensive network of collaborating partners, lead to creation of emerging technology, new opportunities, new products and processes. This three-pronged approach is very innovative and leads to initiation of new ideas culminating into core technologies and product solutions. Research and development (R&D) can foster sustainable development by building greener, more inclusive societies. To be effective, infrastructure development, technology transfer and both public and private R&D need to be nurtured and regulated via effective policies.

Fig. 2 Research and development as three pronged approach.
https://www.sembmarine.com/sustainability/innovation-and-solutions-development)

4. Linking research to design and product development

The relationship between R&D and innovation is highly complex in nature. Branscomb and Auerswald (2002) presented a simplified linear model (Fig. 3) linking research, design and product development. It was proposed that innovation does not necessarily require following linear successive steps but can allow multiple entry points. The proposed downstream approach progresses from research to design and development, while the upstream approach progresses from the development and design to research.

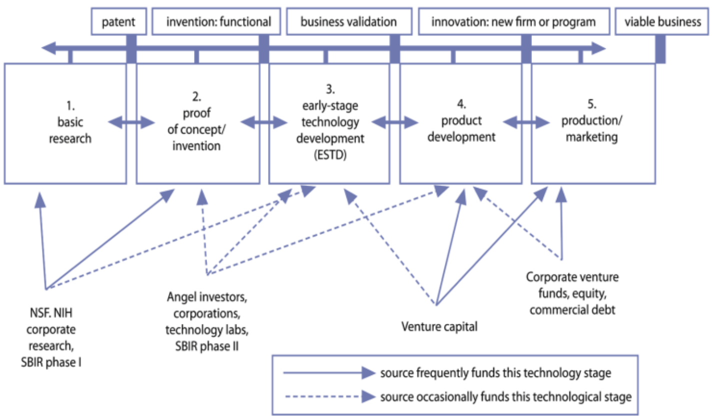


Fig. 3 Research, design and product development (Branscomb and Auerswald, 2002)

5. India's current research scenario

Development of science and technology is a key element of economic growth of a country. India has proven to be among the top nations in the world in the scientific research, arena and enjoys place in the top five nations in the field of space exploration. According to Indian Brand Equity Foundation (IBEF, 2019) data, India ranks third among the most attractive investment destinations for technology transactions in the world, 6^{th} position for scientific publications, 10^{th} position for patents by Indian residents and ranks 13th position at the Nature Index in 2017, based on counts of high-quality research outputs in natural sciences. In the field of Global Innovation Index, India has consolidated its position from the 81st in 2015 to 60th position in 2017.

The Government of India is extensively promoting research parks (RPs) and technology business incubators (TBIs) to promote the innovative ideas till they become commercial ventures. India is world's third largest technology start-up hub with incorporation of 1,000 new companies in 2017.

It is welcome news that as many as 892 Indian scientists have returned back to India in the decade 2007-2017 to pursue research opportunities in India (IBEF, 2019). Apart from the several schemes of Department of Science & Technology (DST) and All India Council for Technical Education Schemes, Government of India has implemented following schemes to promote scientific and technical research in India:

1. Prime Minister Research Fellows (PMRF) scheme to promote the mission of development through innovation.
2. DST and MHRD scheme of the second phase of Impacting Research Innovation and Technology (IMPRINT),
3. Atal Innovation Mission for the academicians, entrepreneurs and researchers to work towards innovation.

5. Research in Technical Institutes in India

Indian Institute of Science (IISc), Indian Institutes of Technologies (IITs) and National Institutes of technologies (NITs) are the leading technological institutes in India involved in extensive research and development activities. Many Government Engineering Colleges and private engineering colleges and institutes are also in forefront in R & D and innovations. But it does not become easy for any institute to undertake R & D activity. The main issue underlying this is the resource crunch and availability of sophisticated equipment. In such a situation aspiring researchers prefers to visit foreign universities for research work.

The crux of the problem lies in solving the million dollar question - How could the institutional environment for education, research, technological development and innovation be improved?

A many examples, including the top institutes mentioned above, can be cited wherein educational institutes and industry have understood the need of research and innovation and have started collaborative efforts. Industry Institute linkages are very important in developing the R & D and innovation, that is promoting the applied research with the aim of new product and technology developments.

For instance, one of the premier technological institute of repute, MNIT Jaipur has set up the Materials Research Centre (MRC) to augment the infrastructure for advanced research and to attain excellence in innovative research in materials technology. It promotes interdisciplinary research in appropriate materials technologies and caters to the research needs of faculty, students, other institutes and industry as well. To cite an example from industry one can quote the recent example of developing R & D laboratory my M/s. Alcon Constructions in Goa under the visionary leadership of Mr. Anil Counto from Goa who is a proud alumni of VJTI, Mumbai. This lab has created a hub of sophisticated instruments and technologies to promote research in Goa. Few research scholars are doing their research work under the guidance of the experts in industry.

Every institute must strive to do research activities in their institute by taking at least one research projects. Though resource crunch is the major issue, several schemes in India under DST, AICTE, MHRD are available for funding. Many European countries are also promoting research in India. Some of these schemes are Newton Bhabha Fund, Science for Humanitarian Emergencies and Resilience (SHEAR, UK), Royal Academy of Engineering projects, United Kingdom India Education Research Initiatives (UKIERI) are few of them promoting research activities in India by providing function and technical assistance by partnering with UK Universities.

6. A case study of Research – Goa Experience

State of Goa was very fortunate to have research funding form UKIERI for its one of the project in Civil Engineering initiated from Government Polytechnic, Mayem–Bicholim Goa in the year 2014-16. The purpose to share this experience is to highlight the benefits accrued from undertaking such research projects to the Goan students and engineers leading to product development.

This project was initiated by the author with whole-hearted support from Mr. Subhash Borkar, Principal of Government Polytechnic, Mayem Bicholim Goa under the scheme UKIERI. This project titled "Development of structural concrete with help of plastic waste as a partial replacement for natural sand" a project highlighting sustainability and green technologies. The main underlying issues selection of this very topic were ban on extraction of natural sand and collection of huge amount of plastic wastes in the State. University of Bath, UK under the leadership of Dr John Orr (presently at Cambridge University), Dr. Richard Ball, Dr. Andrew Heath and Dr. Mark Evernden all from University of Bath, UK. The industry affiliation for this project from Goa was provided by M/s. Alcon Industries. This project was successfully completed in July 2016 with support from Government Polytechnic, Mayem – Bicholim, Goa Engineering College, M/s Alcon Industries and Bath University, UK which was a joint venture of Indian Institute – Industry and Foreign University which was very well executed. The underlying benefits were several, few of them listed below:

- **Faculty Interaction** –
  Six visits of Goa faculty from three colleges in Goa to Bath University for learning new technologies, skills and doing experiments on sophisticated machinery in Bath.

- **Exchange programme** –
  four visits by five faculty and group of research scholars and PG students from Bath University visiting Goa. During each visit of UK faculty, National Workshop, Seminars and International Conferences were conducted in Goa.
- **Technical Events–**
  One national Workshop, One International Conference and three seminars were conducted in Goa with resource persons from Bath University and India. These workshops and conferences drew wide support from all over India.
- **Joint research publications –**
  Seven International Conference papers in India and Scotland were published. One journal paper was published in International Journal Construction and Building Materials (Elsevier Science Direct) and this paper was awarded prestigious Atlas Award in September 2018 by Elsevier Science Direct.
- **International Publicity –**
  This project and research work got international publicity in reputed newspapers, magazine, websites, etc. British Broadcasting Corporation (BBC) took cognizance of this project and all the way came to Goa to interview project leader in Goa and the same audio was incorporated in their popular project "End of Sand" broadcasted by BBC in July 2017.
- **Further research activities after the completion of UKIERI project –**
  Three undergraduate students groups and two PG dissertations were conducted on the topics emerging from UKIERI project which aimed at utilising agricultural and industrial waste in concrete as partial replacement for sand.
- **Ph D research works –**
  Two research scholars are now working the area of utilising agricultural and industrial waste in concrete.
- **Product development –**
  Further research is going on and in final stages of developing "Plastic sand", from plastic waste and will be shortly available in the market.

This project highlights the benefits to students, engineers and the society resulting from the research project wherein the research was not restricted to basic research but taken to further heights and to product development stage.

7. Conclusions

Development of science and technology is a key element of economic growth of a country. R & D and innovation and product development are the key issues and government has realised the importance of these activities for growth of the country and has several schemes to promote R & D and innovation in India. A joint collaboration between government-industry-academic institutes is the need of hour and the positive steps have already been undertaken in this direction. Every research activity needs to be converted in an invention for the benefit of society at large. Technical institutes should promote continuous research leading to development of new products and services by encouraging the students to undertake the research project and this research needs to be carried forward in subsequent years.

References

Branscomb, LM &AuerswaldPE (2002) Between Invention and Innovation: An Analysis of Funding for Early-Stage Technology Development.
Mahdjoubi D (2009) Four types of R & D. Stavangar, Norway.
India Brand Equity Foundation (2019), www.ibef.org
https://www.sembmarine.com/sustainability/innovation-and-solutions-development

KEYNOTE ADDRESS

Exploring New Dimensions in Teaching – Learning for Quality Education

Prof. Dr. Ramesh Kasetwar
Vice Chancellor ((Retd), CP University, Kota (Rajasthan)
ramesh.kasetwar@gmail.com

Quality Education: This does not mean anything to any stake holder.

a) What is the exact meaning of quality education?
b) Why there is a need to have quality in education?
c) What is quality?
d) What is education?
e) Does it mean passing on the information from the book to the students.

Teaching – Learning

a) Teaching for the sake of teaching
b) Teaching by the teachers for learning by the students.
c) Do the students need the teachers today?
d) What is more important today
e) What was more important earlier than today>>teaching or learning
f) I feel learning was always of prime importance since ages.
g) We lost the legacy of teaching and it is done for the sake of doing.
h) Are the teachers teaching engg subject are qualified to teach?
i) Qualification of PG or PhD is not the certificate to teach.
j) Our teaching has to be learning centric.

New Dimensions in>>Teaching – Learning

a) Why we felt that there is the need today?
b) There is no smoke without fire, somewhere
c) We must have realised that our teaching has no more remained effective.
d) Teaching is the process of knowledge management
e) Firstly we must know as what is knowledge and how it is created for the target audience and for “the” purpose.
f) Various types of skills are needed to be embedded in the curriculum for all the courses.
g) Only information about the engineering field is not sufficient today. Application of the knowledge has taken a new dimension.

Exploring

a) Why this need has been felt today.
b) Because we have lost the track for prime importanceof **learning and then compatible process of teaching.**
c) Do we ever define or teach as “what is quality of teaching”?.
d) So today we will have to explore to find out the new and newer methods of teaching though which “**learning will become effective.**
e) Can we all have uniqueness in our style of teaching. It is also called as USP.
Example of uniqueness:
(i) Prof Sunil Kute does not have mobile today; also
(ii) Prof Ramesh Kasetwar Wears a wrist watch which waspurchasedduring1985.Itneedswindingofthe internal springs everyday.
f) We all are unique. Our face is Unique. Our voice is unique. Can we have an unique “teaching style” by which everyone will beknown.

Conclusion

I very well know that I am here to deliver a Key Note address and not afull-fledged presentation.

Outcome of using Information and Communication Technologies to Implement Flipped Classroom to Enhance Programming Skills in Undergraduate Students Undergoing Technical Education

Deepa B. Patil

Department of Computer Engineering, VIIT, Kondhwa, Pune
deepa.patil@viit.ac.in
Track No: 01
Track Name: Different dimensions of Teaching-Learning

Abstract: - The concept of flipped classroom is in practice at high school level and is popular at junior college level since last few years. With the advancement in information and communication technologies, is has become a painless task to create electronic educational material. It has become easy to create and publish video about any technical concept using freely available information and communication technologies. This has significantly helped in implementation of flipped classroom concept. This paper highlights the advantages of using flipped classroom concept implemented with the help of technical videos and online quiz. The study was carried out with participation of first year engineering students. As part of study, video lectures and quiz were prepared on various concepts of C language. The students were asked to watch and listen to video lecture before coming to class. The concept presented in the video was again discussed during regular class with the help of examples. The performance of students was studied during the practical sessions. It was observed that students implemented C concepts for a given problem statements more fluently and confidently. Also, students were encouraged to solve the quiz during lecture with the help of smart phone. It was observed that, students were able to answer the quiz more accurately and with greater enthusiasm. The study concludes that concept of flipped classroom implemented with the help of information and communication technologies have immensely helped students to understand importance of active learning and motivated them for self study.

Keywords:-flipped classroom, information and communication technologies, electronic educational material, active learning

1. Introduction

Use and popularity of internet is increasing day by day. With the advancement in internet technology and advent of smart phones, accessing internet is no more restricted to desktop machines. People from all walks of life have become technology savvy. With the advancement in information technology, many tools are available to create electronic study material. Amalgamation of internet and electronic study material can create wonders in the field of education. One such outcome is flipped classroom concept implemented with the help of video lectures created using Information and Communication Technologies (ICT) tools. Traditional way of teaching which adopts 'I teach you learn' strategy, though effective, is not efficient and does not help much for cognitive development of students. Students tend to focus on what teachers teach and rarely think something out of box. A flipped classroom is a blended learning environment which combines digital media and traditional classroom methods. In flipped classroom environment, students are given some assignments for self study. It is expected that students have done their homework before attending the class. During the regular lecture, the assignments are discussed and difficulties are resolved. At times, students are given some assignments to solve during the lecture, to test the understanding. This way of teaching/learning process helps active learning with participation of all students in the class. This paper discusses outcome of using flipped classroom with the help of ICT tools. With the availability of wide range of audio visual recording tools, it has become an easy task to create video pertaining to any subject. Videos on any subject including difficult technical subjects can be created and shared using video sharing service such as YouTube. People from every walks of life search Youtube for their answers and student community is not exception. Students are more inclined towards audiovisuals instead of learning from text books. Keeping this in mind, a study was conducted with participation of around 140 first year engineering students. As part of implementation of flipped class room concept, video lectures were created based on various concepts of C language and students were asked to study video lectures before coming for lectures. During the lecture the concepts explained in the video lecture were again discussed and difficulties were solved. It was observed that students actively participated in the discussion and raised their doubt without fear. It was also observed that this practice helped students to develop interest in the subject

A. Related Work

Professor Eric Mazur an educator at Harvard University played major role in popularizing use flipped classroom. Prof. Mazur started implementing now popularly known concept called flipped classroom in 1991. Prof Mazur called this method of teaching Peer Instruction. Prof. Mazur made his students read the text book before coming for class. Prof. Mazur published a book titles 'Peer Instruction: A User's Manual'[1] in 1997 and based on this effective method 'Peer Instruction' discussed in the book , he published paper titled 'Peer Instruction: Ten years of experience and results'(year 2000) [2]. As explained in [1], Prof. Mazur adopted Peer Instruction method. The basic goal of Peer Instruction was to exploit student interaction during lecture. As part of Peer Instruction, Prof. Mazur prepared presentations on key points and based on each key point concept test based on conceptual questions were created. After discussion of each point, students were made to solve this test and asked to discuss the answer amongst themselves. Prof. Mazur found that this method helped students to develop thinking ability and prepared students for active learning. In [2] Mazur and Crouch observed that after implementing Peer Instruction method, there was increase in problem solving ability among students studying introductory Physics course. Outcome of flipped classroom using video lectures is disused in [3]. Video lectures were prepared for the course educational psychology. It was observed that students who frequently watched the videos outperformed than those who rarely or did not watch the videos. Use of flipped classroom in medical field is discussed in [4] and [5]. Short video lectures based on medical topic were created and uploaded on YouTube. Students were asked to watch the video before coming for the class. During the classroom session, case study based on the topic discussed in video lecture was discussed. This activity made students to actively participate in the classroom session. Use of flipped classroom at high school level is discussed in [6].It was observed that with the implementation of flipped classroom, failure of students dropped down from 30 percent to 10 percent. In [7] and [8] implementation of flipped classroom for physics course is discussed. Videos created by Khan Academy [9][10] are widely used for flipped classroom.

2. Experimental Details

To find the effect of flipped classroom on students' learning ability, video lectures were created using ICT tool - Active Presenter. Active presenter is a screen casting tool useful in e learning. This tool is available for Microsoft Windows and Mac OS X platforms. For the experimental purpose, free edition of active presenter for windows platform is used. The video lectures were created based on basics of C language and other concepts such as constants and variables, loop construct, conditional construct etc. To demonstrate C language concept, NetBeans IDE was also used. The recording of demo programs being typed, compile and run using NetBeans IDE was recording using Active Presenter along with the narration. The detailed explanation of C program being demonstrated was recorded. The recording also captured the output of the program and its explanation was also recorded. Figure 1 and Figure 2 represents screen shots of recorded video. Figure 1 represents C program being typed and Figure 2 represents the output of the program after successful compilation of the program.

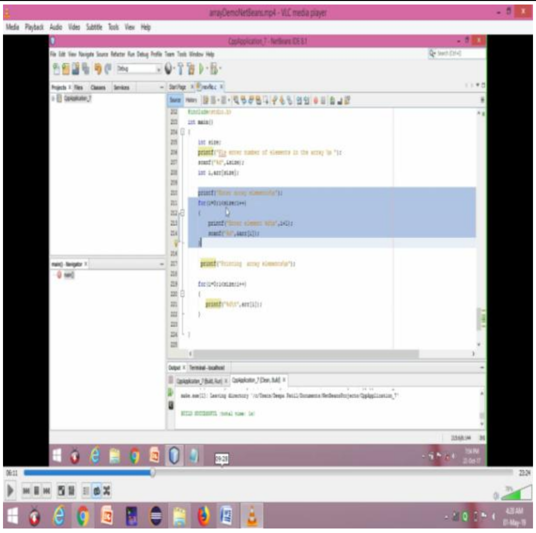


Fig. 1

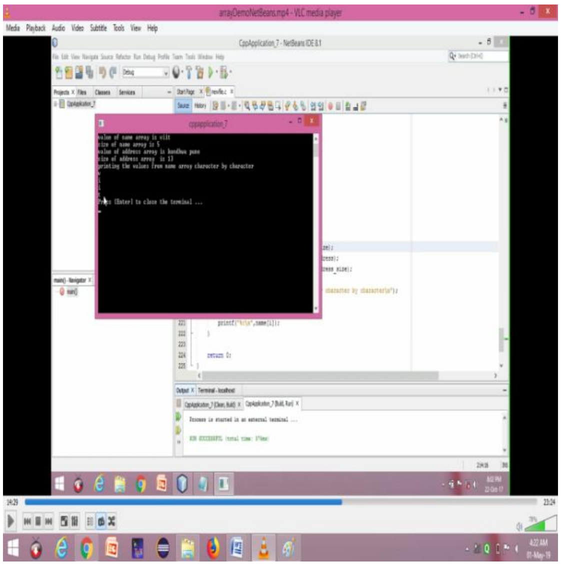


Fig. 2

These videos were uploaded on Google classroom, two days before the intended lecture. Accordingly, students were informed to study the video. In the initial stage of this experiment, the video lectures were again played during classroom session. The concepts in video lecture were discussed, and students' queries were answered. Based on the discussed concept, students were given C problem statement. Students wrote C program in the notebook which were verified during the lecture itself. During the practical session, students were given different set of problem statements, based on same concept which was discussed in video lecture and later in the class. It was observed that whenever students faced any difficulty, they saw the video lecture again and again and solved the problem on their own. This technique motivated students for self study. Later at the end of semester, Quiz was prepared using another ICT tool Hot Potatoes and also using Google Quiz to test their knowledge.

A. Results

It was observed during practical session that students were much more comfortable in programming and completed given assignments with greater confidents with little help from faculty. Students watched video lectures over and over again to solve their difficulty. A concept test was designed based on C concepts. The type of questions included 'Find output of code snippet' and other concept based questions. It was observed that almost 90% students scored above 80% of marks.

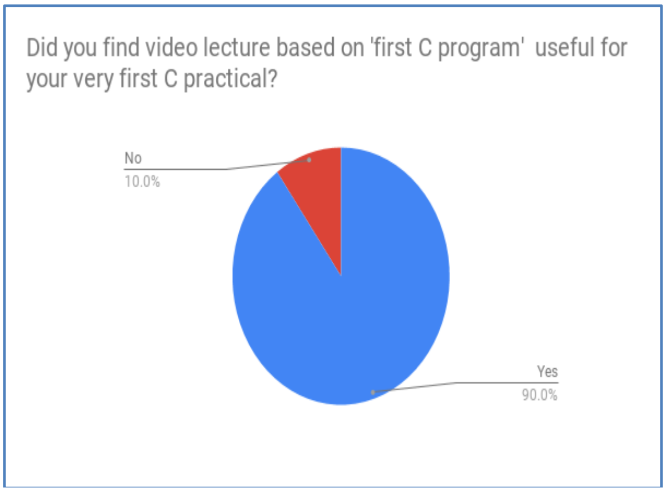
B. Discussion

To get feedback about the video lectures, feedback form using Google forms were created. Students were asked to fill this feedback form. The analysis of the feedback form was astonishing. Table 1 shows the questions asked in the feedback form and count of students answering Yes/No for particular question. Graph 1 to 10 shows analysis of the feedback form.

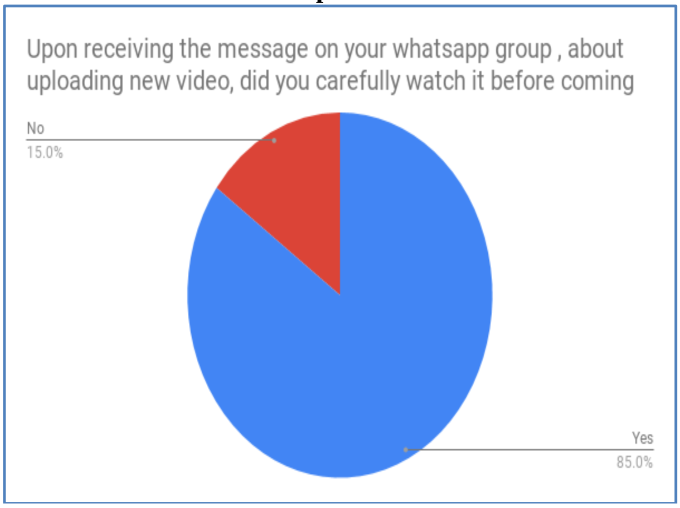
Table 1

Sr. No.	Question	Yes	No
1	Did you find video lecture based on 'first C program' useful for your very first C practical?	126	14
2	Upon receiving the message on your Whatsapp group, about uploading new video, did you carefully watch it before coming to lecture?	119	21
3	If you have not understood any particular concept in C language, did you watch the respective video repeatedly to understand the concept?	120	20
4	Did u find the method of watching the video lecture repeatedly helpful to clear the concept?	121	19
5	Did you find the method used in the videos to explain particular concept useful?	129	11
6	Did you find this way of learning fast and effective as well as thought provocative?	115	25
7	Did you find the Google quiz helpful while solving online exam?	126	14
8	Which method would you prefer to learn C concepts- 8.1 Listening to and watching the video before attending lecture/practical	117	23
	8.2 studying the concept straightaway for the first time during the lecture/practical	23	117
9	Have you preserved the videos for future reference and recommended to your friends?	117	23
10	In future will you prefer this method of learning?	132	08

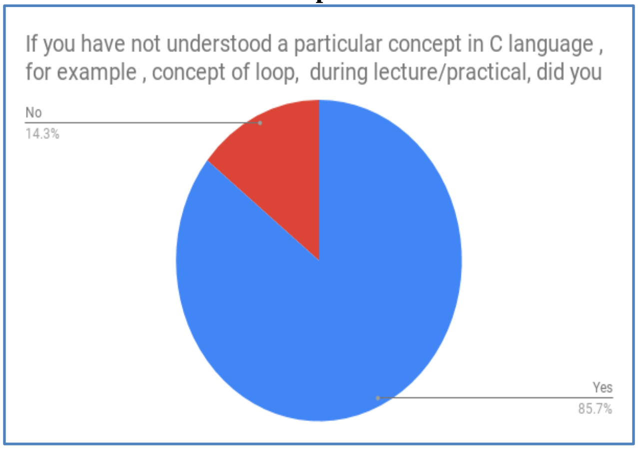
From the above feedback analysis, it can be inferred that nowadays students are willing to self study with the help of technical videos. Graph 1 to 10 shows analysis of each question in Table 1.



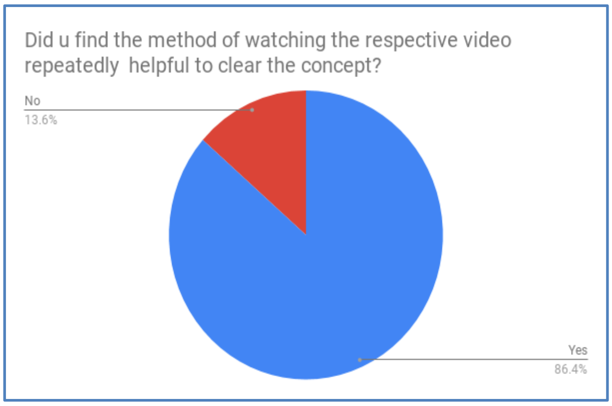
Graph 1



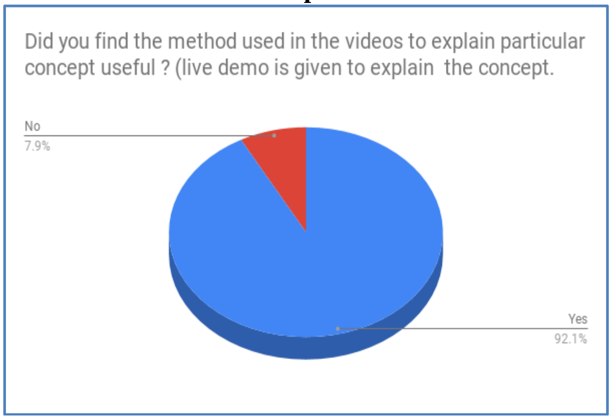
Graph 2



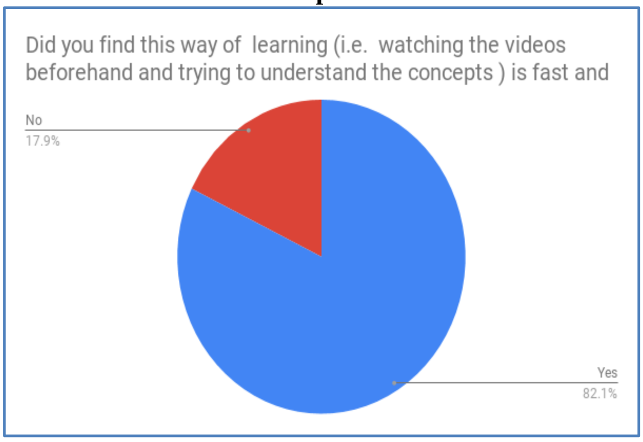
Graph 3



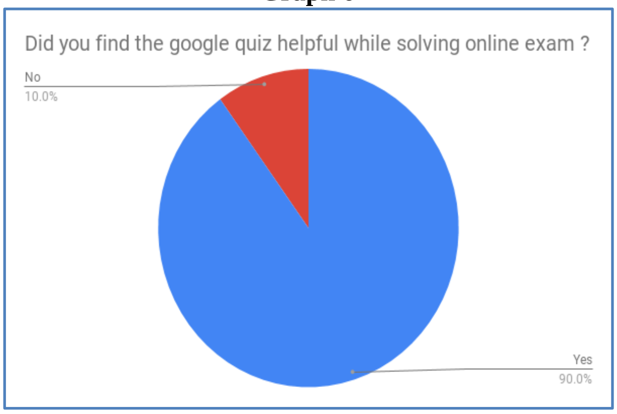
Graph 4



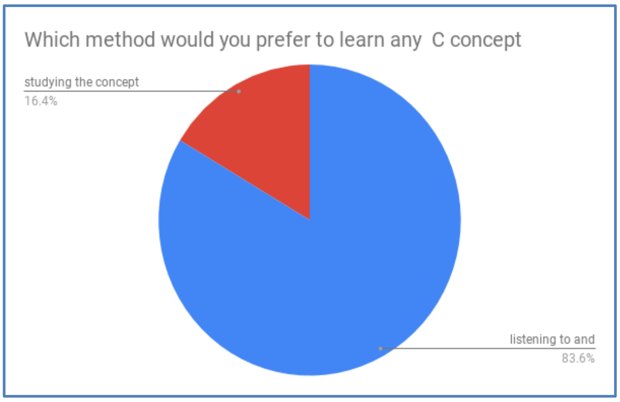
Graph 5



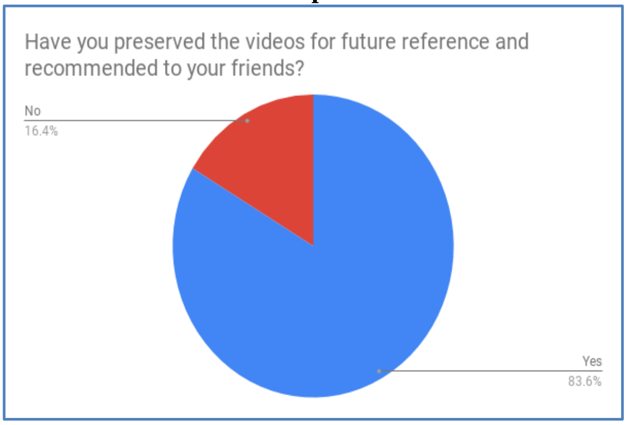
Graph 6



Graph 7

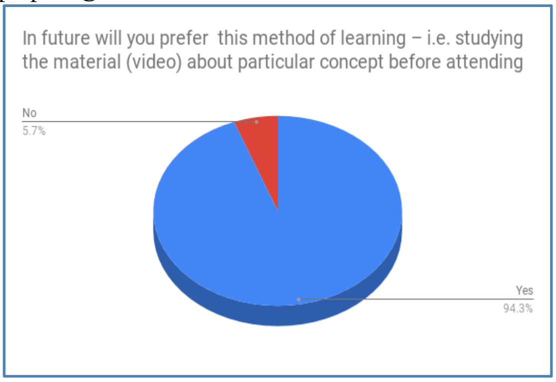


Graph 8



Graph 9

Corresponding Author
Department of Computer Engineering, VIIT, Pune
deepa.patil@viit.ac.in



Graph 10

3. Conclusion

When flipped classroom was implemented to teach course on C language, students were more confident and fluent during practical session. This technique helped in cognitive development. Students were eager to solve more difficult C programmes. This technique also helped students to develop active learning. During the interaction with the students in the subsequent year, they gave positive feedback about using this technique, stating that this helped them to understand C concepts thoroughly.

References:-

1. Eric Mazur (1997). Peer Instruction: A User's Manual Series in Educational Innovation. Prentice Hall, Upper Saddle River, NJ
2. C. Crouch and E. Mazur (2001). Peer Instruction: Ten Years of Experience and Results, Am. J. Phys., v69, 970-977
3. Silke Luttenberger, Daniel Macher, Verena Maidl, Christian Rominger, Nilufer Aydin, Manuela Paechter *(2018-01-01). "Different patterns of university students' integration of lecture podcasts, learning materials, and lecture attendance in a psychology course". Education and Information Technologies. 23 (1): 165–178.*
4. *Sharma, Neel, Lau, C.S, Doherty, Iain, Harbutt, Darren (April 2015).* "How we flipped the medical classroom". *Medical Teacher. 37: 327–330 – via EBSCO*
5. *Chen, Fei; Lui, Angela M.; Martinelli, Susan M. (June 2017). "A systematic review of the effectiveness of flipped classrooms in medical education". Medical Education. 51 (6): 585–597.*
6. *Sahin, Muhammed, Fell Kurban, Caroline (2016). The Flipped Approach to Higher Education: Designing Universities for Today's Knowledge Economies and Societies. UK: Emerald.*
7. *Kettle, Maria (2013). "Flipped Physics". Physics Education. 48 (5): 593–596.*
8. *Radcliffe, David, Knappenberger, Thorsten, Daigh, Aaron L. M., David (Oct 2016). "Using Khan Academy Videos in Flipped Classroom Mode to Bolster Calculus Skills in Soil Physics Courses". Natural Sciences Education.*
9. Clive Thompson (15 Jul 2011), "How Khan Academy is Changing the Rules of Education", Wired
10. Sarah D. Sparks (28 Sep 2011), Lectures Are Homework in Schools Following Khan Academy Lead

Different Dimensions of Teaching – Learning

Niranjan S. Deshmukh[1], Rajendra R. Utturkar[2]

[1]Mechanical Engineering Department, Bharati Vidyapeeth's Jawaharlal Nehru Institute of Technology, Pune 411 043
[2]Bharati Vidyapeeth's Jawaharlal Nehru Institute of Technology, Pune 411 043
[1]niru_jan@hotmail.com
[2]utturkar.rajendra@gmail.com
Track No. : 1
Track Name : Different dimensions of Teaching-Learning

Abstract
Purpose — The intention of this paper is to acknowledge the impact of Outcome Based Education and briefly mention experimentation in the fields of Digital Education, Flipped Classroom, 4G enabled learning with passing remarks on Choice Based Credit System.

Scope — Scope of this paper is finite in the sense of introduction and elementary outset in the field of experimentation in some of the techniques mentioned in Purpose.

Approach — The paper is descriptive documentation of some of the techniques used in the OBE vocabulary along with experimentation details of Digital Education and 4G enabled learning,

Observations — Main aim was to note changes in learner's (student's) attitude towards a particular course and improvising the ambit of reforms to be brought into practice.

Limitations — The paper is limited in the view of ongoing experimentation, as a result of improvement of experimentation parameters over the period of years.

Keywords — OBE, Digital Education, 4G Enabled Education, Flipped Classroom, CBCS

I OUTCOME BASED EDUCATION

A very effective tool, based on learning outcomes, for accurately measuring student performance is teaching / instruction model which focuses on "student" is the gist of Outcome based Education.

Various knowledge outcomes of competent education system are related to 'descriptive', 'procedural', 'applicability' and 'utility' [01]. The focus of OBE is to evaluate outcomes of the program with the help of predetermined levels of the knowledge outcomes, skills and attitude a student is expected to attain after completing a program and in immediate future in the way of work / occupation.

India received permanent signatory status of The National Board of Accreditation (NBA) in 2014, enabling induction in the Washington Accord. This proved to be upsurge for higher education in India, particularly in the field of engineering. A condition put in the accord calls for following OBE in engineering education in India. This is a significant reason why the engineering education model in India must follow OBE model.

To begin with OBE model of education, a systematic approach is required. A generalized flow chart for developing OBE model can be of following nature.

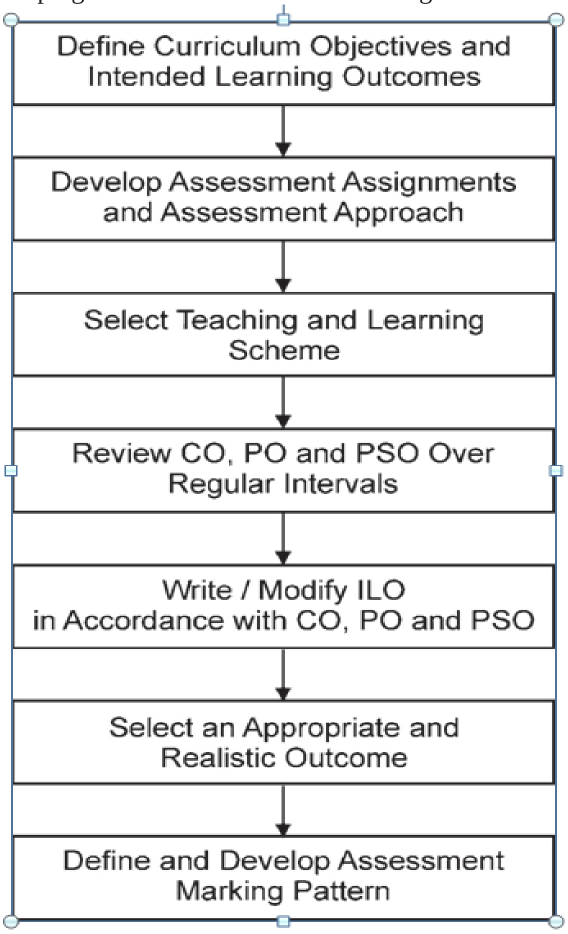


Fig. 1 Generalized Flow Chart for Developing OBE Model

In most of the cases, bodies like Technical Boards and Universities across India are active in undertaking development of OBE Model. Since these bodies cater to mass, the systems within their purview are definite. However each of the institutions following respective board or university has flexibility in implementing teaching and learning scheme.

In this paper the authors wish to describe some of the techniques used at the parent institution level and observed changes in the degree of Outcome Achievements.

II DIGITAL EDUCATION

Digital Education is to facilitate the students with learning activity which can be partially controlled by the students. The control provided is usually in the form of place of study, time of the day, participation time at a stretch, options available for mode of learning and pace of learning.

The Digital Education has certain advantages and also some disadvantages. The most agreeable amongst the advantages are: being interactive, detailed and pace controlled. However the serious drawbacks are the cost, lack of schedule and discipline.

Smart class rooms, mobile phone apps, online group formation, e-books are a few modes of digital learning.

Smart class rooms are expensive and fall under guided digital learning. Audio-video sessions also are a form of guided digital learning but are comparatively cheaper. Use of mobile phones (smart phones) is the cheapest form of digital learning, as mobile phones have become necessity and majority of the students carry mobile phones.

The Second Year Mechanical Engineering Class, in the authors' institute in the year 2018-19, had 79 students. Including 9 staff members there are 82 participants on the "SYME-I Official" group on Whats App, which accounts for 92+% of the students carrying smart mobile phones.

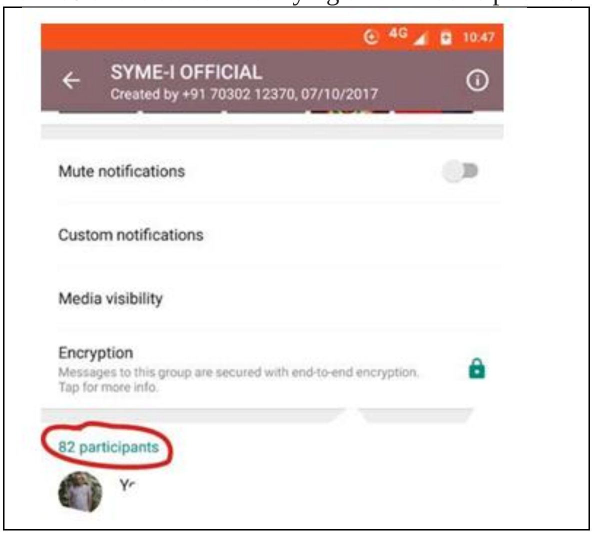


Fig. 2 Participants on "SYME-I Official" group

III 4G ENABLED EDUCATION

4G LTE (Long Term Evolution) is completely changing the way the OBE education model is evolving. Users of 4G LTE technology experience improved and faster streaming, downloads and uploads. It is safely assumed that average LTE download speed worldwide is about 13.5 Mbps.

The same technology can be put to use in institutes by establishing WAN. A great feature of 4G LTE, namely Priority and Preemption can ensure controlled data release to the users (students). This feature can be useful in online tests and assessment process.

Another feature of LTE — SON (Self Organizing Network) is also useful, when there is a surge of users (students) during a particular occurrence, like release of time table for examinations, assignment issue notice flash and so on.

Yet another feature of LTE technology, albeit new, is Voice-over-LTE (VoLTE). With this innovation the user, in this case the "Teacher" can place phone calls* over LTE network in the form of data packets called as packet voice. The packet voice can be shared along a network of several phone conversations. Packet voice can also grant the user the facility to check availability of assignee and alter the strategies.

A 4G Enabled education - experimentation

At rudimentary level, the author issues time

controlled assignments for the courses delivered by him (Fig. 3).

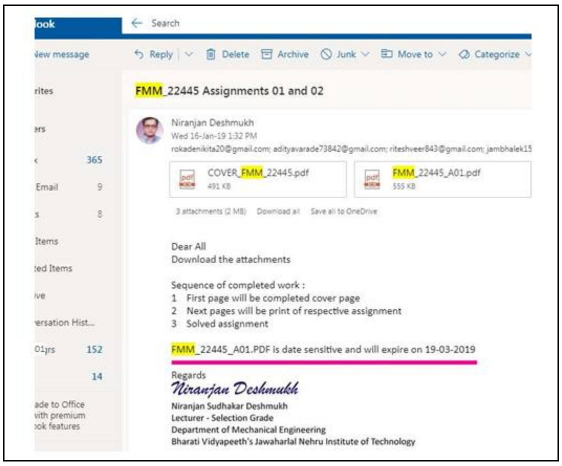


Fig. 3 Issued time controlled assignment

The assignment has 'issued on date' and 'complete by date' mentioned in the assignment. The assignment does not open for the users (students) after the complete by date is over (Fig. 4).

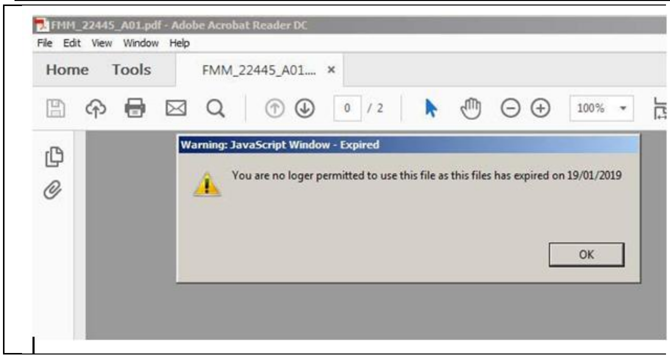


Fig. 4 Time expired assignment

* Instructions / Explainations etc.

The assignment is usually mailed to the students in PDF. For this purpose a 'Contact List' is prepared on mailing system (Fig. 5). As the students access the assignment on mobile devices, it is important to check what PDF features are accessible on mobile phones.

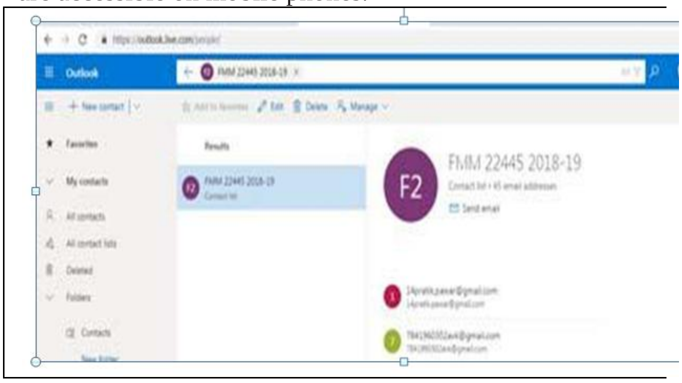


Fig. 5 Contact list for posting assignments / instructions

It is noticed that some structural information in the form of tables loose formatting. Some navigation controls are also not available. It is therefore necessary to design the material to be sent to the users (students) with care and check the contents and layout of the material to assure that the essence is preserved.

B 4G Enabled education and MOOC

Massive Open On-line Courses (MOOC) are assisted and are finding new dimensions owing to 4G Technology. MOOC is about learning, working and collaborating — locally as well as globally. MOOC is intended for anyone and everyone who wishes to participate (with certain pre-requisites). There are great possibilities to use MOOC for education, work and for personal enrichment.

Lifelong learning is an essential PO of OBE. MOOC connects workplace and higher education making lifelong learning possible.

4G technology offers high data transfer rate. With high definition mobile device capabilities and higher resolution digital cameras, this technology is proving useful in video blogs. Video blogs (Vlogs) are interactive and descriptive. Video blogs enhance persuasion ability and are more effective as teaching tools. NPTEL and www.edx.org offer many courses where vlogs are effective used.

The technique is also quite useful in conventional system of OBE. A GOOGLE search result is presented below (Fig. 6) as an example.

Fig. 6 MEEM Vlog: Video Blog Archive of Mechanical Engineering at Michigan Tech

IV FLIPPED CLASSROOM

To put the concept in simple words, a Flipped Class-room can be described as where the students will :

- learn the new content outside the conventional class-room,
- note down the difficulties they have during understanding the content,
- work out on the set goals prescribed by the teacher,
- complete the assignment / practical work / home work during next conventional classroom session.

The teacher helps the students during actual classroom session to apply the learned content and put it into practice. The concept of Flipped Classroom promotes several favor-able options which are not available in conventional class-rooms.

- the students can go back and review the contents till they are satisfied / understand the content,
- feedback is immediate (not at the end of course),
- more time is available to the students to digest the contents,
- 1 : 1 interaction is possible.

While planning a Flipped Classroom session it is necessary to decide the part of the course where this technique can be used. After selecting the content part, it is imperative to choose the technology to be adopted.

For Flipped Classroom to be successful, in-class activities are needed. These activities can be performed in a group (not more than 4 students) or individually. It is observed that group activity benefits effective learning through push - pull reaction.

It is also important to take feedback from students before advancing and completing the content part in a series of flipped classes. Sometimes the students feel more comfortable in conventional classrooms.

A Flipped Classroom is a big responsibility. The teacher has to assume the students participating in the session need to work out from root level. This calls for extending the curriculum beyond prescribed content with a few supporting additions.

A Flipped Class - experimentation

One of the laboratory exercises in the course of Fluid Mechanics and Machinery (FMM 22445) is “Dismantle and assemble a reciprocating pump”.

Because of complexity of the exercise and considering the dexterity required for undertaking the task, the author decided to use Flipped Class technique.

Professional videographers were hired to shoot entire dismantling and assembly process. Competent technicians from the pump servicing company were invited to perform the exercise.

Small snippets of videos were recorded without voice over. These videos were indexed and numbered in order. The videos were shown to the students during a video lecture session. The author gave running account of every step taken by the technicians (Fig. 7).

Fig. 7 Video lecture session - part of Flipped Classroom

These videos were made available to the students after the video lecture and a period of one week was given to the students to learn the contents.

During the next conventional classroom session the students were asked to perform the exercise in group of four students each.

It was observed that, barring a few exceptions all the students performed the exercise with alacrity.

V ASSESSMENT

Although various techniques are used to follow OBE in engineering, the aim of entire task at hand is to produce competent engineers.

The level of competency of the students at the end of the course decides success rate. The data available at the end of course is mostly of attribute nature than of variable nature. This is due to the case that the course outcomes are described as : “The student will be able to ......”, without any mention of proficiency.

To make the students aware of what exactly is expected of them and at what level of proficiency, the author uses a cover page, designed so as to make the students alert about the expectations (Fig. 8). The innocuous information on the cover page : Total number of pages helps students to decide whether they have taken shortcuts or spent unnecessary extra efforts on a particular assignment / experiment.

BHARATI VIDYAPEETH'S
JAWAHARLAL NEHRU INSTITUTE OF TECHNOLOGY
Katraj, Dhankawadi, Pune 411 043.

Department of Mechanical Engineering

Fluid Mechanics & Machinery - FMM_22445

Name :
Class : SY ME A
Roll Number : Enrollment Number :
Experiment / Assignment Number :
Experiment / Assignment Name :

Total number of pages :

Scope of experiment / assignment :

List of Diagrams / Tables :

Diagrams		Tables	
01		01	
02		02	
03		03	
04		04	
05		05	
06		06	
07		07	
08		08	
09		09	
10		10	

Marks : C P A / 10 Total   / /2019 Date   Sign

Fig. 8 Cover page for assignments and experiments

The marking scheme C,P and A (Cognitive, Psycho-motor and Affective domain marks) helps to reduce attribute part from the assessment.

As one other method of ensuring the effective content transfer to the students, the author maintains course content coverage record. This record addresses to CO as well as UO for individual units (Fig. 9).

Class : SYME A Subject : Fluid Mechanicsw and Machinery (FMM 22445)

Lecture No.	Date	Topic Covered	Present Students	Unit (L)	CO Number	UO Number
Unit - I Properties of Fluid and Fluid Pressure						
01	11-12-2018	Introduction to subject (PO/PSO/CO/UO/ADO explained) Briefed about microproject.	31	U 1 (12)	C4 22445.01	-
02	11-12-2018	Properties of Fluids: Density, Specific gravity, Specific volume, Specific Weight, Dynamic viscosity, Kinematic viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility	23			U 22445.1a
03	13-12-2018	Concept of fluid pressure, Pressure Head or Intensity of Pressure or Simply Pressure. Atmospheric pressure, Absolute pressure, Gage Pressure	37			-
04	15-12-2018	Vacuum Pressure, Representation of pressure on chart, Pascal's Law, Pitot Tube, Simple Manometer (S)	22			U 22445.1b
05	17-12-2018	Simple manometer & problems	28			U 22445.1b
06	18-12-2018	Problems on pressure unit conversion and simple manometer	33			U 22445.1a, U 22445.1b
07	18-12-2018	Differntial Manometer & problems	29			U 22445.1b
08	19-12-2018	Problems on differential manometer	35			U 22445.1b
09	20-12-2018	Bourdon Pressure Gage, Total pressure and center of pressure	34			U 22445.1c, U 22445.1d
10	24-12-2018	*NAD Procedure Explained*	38			-
11	27-12-2018	Total pressure - Horizontal. Inclined and Vertical; Concept of center of pressure	35			U 22445.1d
12	29-12-2018	Center of pressure - vertically immersed surfaces, problems	23			U 22445.1d
13	29-12-2018	Center of pressure - inclined immersed surfaces, problems	31			U 22445.1d
Unit - II Fluid Flow						
14	03-01-2019	Introduction, Hydrokinematics	40			-
15	05-01-2019	Fluid Flow - Terminology (Flow Lines, Path Lins, Stream Lines, Equipotential Lines)	24			U22445.2a
16	07-01-2019	Types of flows - Steady, Unsteady, Uniform, Non uniform, Laminar, Turbulent, Rotaional, Irrotational, Compressible, Incompressible, One-Two-Three Dimensional	42			-
		Law of continuity, Stream Function, Energy				

Fig. 9 Course content coverage record

VI CHOICE BASED CREDIT SYSTEM

To bring uniformity in assessment policies across all central as well as state universities in India the UGC proposed Choice Based Credit System.

The system has four types of courses that a student can select. These are Core, Elective, Foundation and Non Credit courses.

The Credit Count and Grading is in compliance with global grading system.

The CBCS has numerous advantages, namely —

- Cafeteria approach
- Preferred learning
- Pace matching
- Possibility of acquiring additional credits
- University migration is easier
- Skill enhancement scope is higher
- Improved job opportunities
- Grades have same cognizance

However, the CBCS has some drawbacks also, like need of strong and proper infrastructure; uncertainty in utility of acquired credits and unavailability of proper teacher for a particular credit course.

VII LEARNING - UNLEARNING - RELEARNING

Learning is defined as acquisition of knowledge or skills through study, experience, or being taught. Learning takes place mainly because of one or all of the following three reasons:

1. Survival
2. Fear
3. Rituals

Over a period of time all the factors (reasons) mentioned above either get dulled or change in perspective.

This is the phase where unlearning is essential. It is a process of discarding what is learned, by posing several questions about the acquired knowledge or skills. The thrust may come as a result of modification of assigned duties, or irrelevance of fear factor or being skeptical about rituals.

In the field of engineering studies, unlearning is similar to search for different avenues to look / find a solution to existing problems. It can also be due to variations in the assumptions.

Relearning on the other hand is refreshing of previous knowledge in new light. It is a measure of how fast and to what extent the new dimensions to a specific case can be understood and how the newly amassed knowledge can be put into practice.

References

Book (e-print) :

[1] Biggs, J. 2007. ‘Designing intended learning outcomes’ [Ch. 5, # 72]. Teaching for Quality Learning at University, (Ed. 3). Society for Research into Higher Education. Open University Press, McGraw-Hill Education, McGraw-Hill House, Shoppenhangers Road, Maidenhead, Berkshire, En-gland SL6 2QL

Web reference :

https://www.myklassroom.com/blog/4-things-to-know-about-outcome-based-education/

http://www.ascd.org/publications/curriculum_handbook/ 4 1 3 / c h a p t e r s / A n _ O v e r v i e w _ o f _ O u t c o m e - Based_Education.aspx

http://cei.ust.hk/teaching-resources/outcome-based-educa-tion/institutional-resources/obe-principles-and-process

https://thejournal.com/Articles/2014/02/03/10-Major-Tech-nology-Trends-in-Education.aspx?Page=1

https://www.mapsofindia.com/my-india/india/digital-educa-tion-in-india-and-class-room-teaching-advantages-and-dis-advantages

https://edtechnology.co.uk/Blog/five-ways-4g-lte-technol-ogy-is-driving-change-in-education/

https://searchmobilecomputing.techtarget.com/definition/Long-Term-Evolution-LTE

http://www.me.mtu.edu/videos.html

https://www.youtube.com/watch?v=wJOESS9VSzw

https://er.educause.edu/articles/2018/9/a-rubric-for-evaluat-ing-e-learning-tools-in-higher-education

Implementation of Project Based Learning (PBL) as a Tool for Delivering Kinematics of Machines

Shirish Subhash Mane[1]

[1]Automobile Engineering Department, Rajarambapu Institute of Technology, Sakharale
[1]shirish.mane@ritindia.edu

Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract:
Kinematics of Machines is one of the core courses offered to Mechanical and Automobile engineering students in their curriculum at most of the Indian universities. Earlier this course was delivered using traditional classroom delivery method with exam based approach to evaluate students. This paper aims to study the use of Project Based Learning (PBL) as a tool to engage students actively in the teaching learning process and also evaluate them throughout the semester for in-semester evaluation. The students are asked to work in groups and create a working prototype of a mechanism of their choice along with problems based on the chosen mechanism. Finally, students are to submit the working prototype of the mechanism along with a report on the mechanism.
An evaluation rubric is also developed to grade the students. It is designed in such a way that it takes into account all the components of the learning which the students are expected to learn as an outcome of the course. Also, the activities to be performed are designed considering the learning outcomes specified by ABET and graduate attributes specified by NBA.

Keywords: Project Based Learning, working prototype, mechanism, learning outcomes.

1.Introduction

There is a huge requirement of skilled engineers across the world. Internationally there is a trend moving towards outcome based engineering education. New accreditation models focus on outcome based learning. The national academies and many governments call for change in engineering education (Litzinger et al, 2011). In India, engineering education is under pressure as professional engineering bodies and Indian industries call for additional set of skills and competencies such as professional, soft and personal skills (Blom and Saeki, 2009, Goel, 2006). To meet the demand of skilled engineers, the capacity of engineering educational institutions in India were increased by increasing the capacity of existing colleges and by establishing new colleges. It has resulted in an increase in the volume, but the quality of the graduate engineer is still uncertain (Rao, 2006). Also, various government reports indicated the genuine concern about the quality of an engineering education pointing towards the need for radical changes in the curriculum and the teaching-learning practices in India.

Given this situation, Project Based Learning (PBL) is considered as relevant (Shinde, 2011b) and suitable alternative as the past results shown that if properly designed and implemented PBL leads to the development of industry relevant skills and prepare students for lifelong learning (Du and Kolmos, 2006, Shinde and Kolmos, 2011a). Problem Based Learning has its origin in McMaster University Canada in 1968. Later in Denmark at Aalborg, 1972 and Roskilde, 1974 two PBL models emerged. These models are designed from scratch (Graaff and Kolmos, 2003). Also, culture in these countries is different from India. Indian education systems are built for traditional teaching i.e. instruction based pedagogy. Hence, it is necessary to develop PBL model suitable for Indian conditions. Also, challenge is to achieve learning outcomes and skills demanded by the industries and prescribed by NBA and ABET (Shinde V., 2013). The objective of this paper is to discuss the development process of a mini project and its evaluation process at course level to evaluate the students as a part of In Semester Evaluation (ISE).

2. Methodology

A. Learning outcomes specified by National Board of Accreditation (NBA)

In response to the recent developments in Higher education in India and across the world; the Ministry of Higher Education in India has decided to change the accreditation criteria to become outcome based. India, being a member of the Washington Accord, applies Accreditation Board for Engineering and Technology, [ABET] criteria 2019-20 to assess the quality of education in educational institutes. Table 1 shows a summary of the ABET criteria. Since, NBA is the apex body which ensures quality education is imparted in India, these criteria along with the survey results are critically considered for the project based learning design.

Table 1: Summary of ABET Criteria

Learning Outcome (LO)	Statement of Learning Outcome
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	an ability to communicate effectively with a range of audiences
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

B. Course Level Requirements

Rajarambapu Institute of Technology is an autonomous institute affiliated to Shivaji University, Kolhapur. Being an autonomous institute, it has the authority to modify the curriculum as per need of industry. The evaluation of the students is divided into three parts. In Semester Evaluation, Unit Tests and End Semester Evaluation, Table 2 shows the distribution of marks for these three parts.

Table 2. Evaluation Scheme and weightage

Mode	Marks
ISE	20
Unit Tests	30
ESE	50

The faculty has the freedom to design the ISE for students as per the course.

C. Activities to be performed in PBL

ISE evaluation of all the students was done using Project Based Learning (PBL) assignment. Following activities were planned for the same.

1. **Formation of team and identification of Mechanism:**
   Students will be asked to form a team of 4-5 members each. Then they will be given a deadline to submit the mechanism whose working prototype they should submit at the end of the assignment.
2. **Identification of types of Links, Pairs and Joints used in the Mechanism:**
   In this activity, the students will be asked to identify the type of links, pairs and joints used in the mechanism.
3. **Finding DOF of the mechanism:**
   In this activity, students will be asked to find out the degrees of freedom of the mechanism using Kutzbach criterion.
4. **Velocity and Acceleration of each link in the mechanism:**
   In this activity all the group members will be asked to find out velocity and acceleration using relative velocity method.
5. **Design of the mechanism in CATIA:**
   In this activity, students will be asked to design the mechanism in CATIA using 3D modeling and also extra weight-age will be given to students who animate the mechanism in CATIA.
6. **Technical report on the working of the mechanism and the overall tasks carried out during the project:**
   In this activity, students will be asked to make a small 4-5 page report on all the activities carried out during the entire course of the assignment.
7. **Presentation of the whole project to an audience:**
   In this activity, students will be asked to present their experience and also display the working of the prototype mechanism manufactured by the group members.

All the activates carried out in the project have been mapped to learning outcomes provided by ABET.

Table 3: Mapping of project based learning activities to learning outcomes

Project Based Learning Activity	Learning Outcome
Formation of team and identification of Mechanism	1.An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
Identification of types of Links, Pairs and Joints used in the Mechanism	1.An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Finding DOF of the mechanism	1.An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Velocity and Acceleration of each link in the mechanism	1.An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Design of the mechanism in CATIA	1.An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering,

	science, and mathematics 7.An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
Technical report on the working of the mechanism and the overall tasks carried out during the project	3.An ability to communicate effectively with a range of audiences
Presentation of the whole project to an audience	3.An ability to communicate effectively with a range of audiences

D. Assessment and evaluation

All these activities were assessed using a rubric. Rubric is divided into 10 activities which are marked for 10 marks each. In all, the students got a final score out of 100 marks which was then scaled back to 20 marks.

Rubric used for evaluation has been shown on the next page.

3. Experiences during implementation

The overall participation of students was found to be excellent. It being an activity based evaluation; students have enthusiastically prepared the working prototypes of the mechanism and also presented it to the whole class.

Fig. 1 Students presenting mechanism to class

Fig. 2 Students presenting mechanism to Head of Department, Dr. S. R. Desai

It was found that the overall CO attainment as compared to previous year was improved.

4. Conclusion

Project Based Learning is a very useful tool to encourage effective participation of students in the teaching learning process. It is a better option as compared to traditional evaluation methods like tests and assignments. PBL improves the involvement of students and also is suitable for all types of students.

References:

ABET 2019, Accreditation Board for Engineering and Technology, *https://www.abet.org/wp-content/uploads/2018/11/E001-19-20-EAC-Criteria-11-24-18.pdf,* Accessed 2nd May, 2019

Blom A, and H. Saeki (2009), Employability and Skill Set of Newly Graduated Engineers in India, *Bank Policy Research Working Paper Series, Volume 11.*

Du X. Y., and Kolmos A. (2006), Process Competencies in a Problem and Project Based Learning Environment, *35th SEFI Annual Conference: Engineering Education and Active Students*, Uppsala, Sweden, 2006.

Goel, S (2006), *Investigations on required core competencies for engineering graduates with reference to the Indian IT industry*, European Journal of Engineering Education, 31:5, 607-617.

Graaff E. D., and Kolmos A (2003)., Characteristics of Problem-Based Learning, *Int. J. Eng. Ed*. Vol. **19**, No. 5, pp. 657–662.

Litzinger, T.A., Lattuca, L.R., Hadgraft, R.G. and Newstetter, W.C. (2011).*Engineering Education And The Development Of Expertise - Journal Of Engineering Education* (pp. 123-150).100 (1).

Rao (2006), Rao Committee Report, Faculty Development in India, July2006.

Shinde V., and A. Kolmos (2011a), Students Experiences in Aalborg PBL Model: A Case Study, *SEFI Annual Conference, Lisbon*, 27–30September 2011.

Shinde V. (2011b), Relevance of the Problem and Project Based Learning (PBL) to the Indian Engineering Education, *across the disciplines: research into best practice, 3rd International Research Symposium on PBL, Coventry University, U.K*, 28–29 November2011, 489–501.

Shinde,V. (2013) Designing "Theory of Machines and Mechanisms" course on Project Based Learning approach. In K. Mohd-Yusof, M. Arsat, M. T. Borhan, E. de Graaff, A. Kolmos, and F. A. Phang (Eds.), PBL Across Cultures (pp. 163-172). Aalborg: Aalborg University.

Rubrics for evaluation of PBL (Project Based Learning) Assignment

S. Y. B. Tech. Automobile Engineering

Course Name: Kinematics of Machines *Course Code: AE2041*

	Level 1 (0-4)	Level 2 (5-7)	Level 3 (8-10)
Formation of Team & Identification of Mechanism	Team formed one week after the deadline. Mechanisms identified one week after the deadline.	Team formed within one week after the deadline. Mechanism identified within one week after deadline.	Team formed before deadline. Mechanism identified before deadline.
Types of Links, Pairs and Joints used in the Mechanism	Able to identify more than 40 % and upto 60% of links, pairs and joints in any given mechanism.	Able to identify more than 60 % and upto 80% of links, pairs and joints in any given mechanism.	Able to identify more than 80 % of links, pairs and joints in any given mechanism.
DOF of the mechanism	Knowledge about application of Kutzbach and Grubler's criterion for finding out the DOF of planar mechanisms.	Correct application of the Kutzbach criterion to identify the DOF of the mechanism as a whole.	Correct application of the Kutzbach criterion to identify the DOF of the mechanism as a whole. Able to identify the DOF of each link in the mechanism.
Velocity and Acceleration of each link in the mechanism	Knowledge of the formulae and process to be used to calulate velocity and acceleration of any given link in a mechanism.	Able to calculate the velocity and acceleration of all the links in the mechanism.	Able to calculate the velocity and acceleration of all the links in the mechanism. Solution of the kinematic diagram in AUTOCAD.
Design of the mechanism in CATIA	3D modelling in vague and proper constraints have not been given to each link.	3D modelling of the mechanism in CATIA is fairly accurate with incopletely constrained links in the mechanism.	Complete 3D modelling of the mechanism in CATIA with proper constraints according to motion of each link. Animation of the working of the mechanism.
Technical report on the working of the mechanism and the overall tasks carried out during the project	Report is vague and content is incomplete. Report is illogically organised and has gramatical and formatting errors.	Report is somewhat accurate and content is fairly complete. Report is somewhat logically organised and has marginal gramatical and formatting errors.	Report is complete with all relevant data/content. Report has mention of all the tasks carried out during the entire duration of the assignemnt. Report is gramatically sound and formatted properly.
Quality of the Working Prototype of the Mechanism	All the links in the prototype of the mechanism are not moving effectivel relative to each other with a given input motion. No thought has been given to effective utilisation of the resources.	All the links in the prototype of the mechanism are fairly moving relative to each other with a given input motion. Some thought has been given to effective utilisation of the resources.	All the links in the prototype of the mechanism are perfectly moving relative to each other with a given input motion. Thought has been given for optimised use of resources.
Presentation of the whole project to an audience	No thought given to flow of presentation and inclusion of very few activities carried out during the assignment in the presentation. Only one group member is aware of whole presentation and other members are contributing vaguely in the presentation.	Hapazard flow of presentation and inclusion of more than half the activities carried out during the assignment in the presentation. All the group members are aware of whole presentation and contribute equally in the delivery of presentation.	Effective flow of presentation and inclusion of all the activities carried out during the assignment in the presentation. All the group members are aware of whole presentation and contribute equally in the delivery of presentation.
Question and Answer	Less than 50% of questions posed by the audience answered effectively by the group members.	Between 50 - 80 % of questions posed by the audience answered effectively by the group members.	More than 80% of questions posed by the audience answered effectively by the group members.
Innovation and Creativity	Textbook mechanism has been chosen by the group. No creativity has been applied by the group members.	Mechanism with practical real life application has been chosen which is already in use. Some creativity has been applied by the group members.	Mechanism with practical real life application has been chosen which is innovative in nature. Creative thought process has been applied during the design process of the workking prototype.

Fig. 3 Rubric used for evaluation

Implementation of Project Based Learning (PBL) as a Tool for Delivering Metrology and Quality Control

Shashikant B. Dhokate[1], Dr. L. M. Jugulkar[2]

[1]Automobile Engineering Department, Rajarambapu Institute of Technology, Sakharale
[1]shashikant.dhokate@ritindia.edu
[2]lalitkumar.jugulkar@ritindia.edu
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: The reputation and success of any industry depend upon the quality of products which they are offering/ So, in modern industries, the whole plant has to contribute towards building quality to the product. As such, the concept of quality and its control has become one of the stringent requirements of modern industries. Hence, it is required to have a thorough understanding of the principle of accurate and precise measurement techniques, the concept of variability in measurement. The subject Metrology and Quality control aims at equipping the students with a strong foundation in measurement concepts and skills so that they can perform the job of a quality inspector and help the industries to produce quality products. Earlier this course was delivered using traditional classroom delivery method with an exam based approach to evaluate students. This paper aims to study the use of Project Based Learning (PBL) as a tool to engage students actively in the teaching-learning process and also evaluate them throughout the semester for in-semester evaluation. The students are asked to work in groups and manufacture the GO and NO-GO gauge for a given problem. Finally, students are to submit the gauge along with its report.
An evaluation rubric is also developed to grade the students. It is designed in such a way that it takes into account all the components of the learning which the students are expected to learn as an outcome of the course. Also, the activities to be performed are designed considering the learning outcomes specified by ABET and graduate attributes specified by the NBA.

Keywords: Project Based Learning, working prototype, mechanism, learning outcomes.

1.Introduction

It is agreed that engineering education should include a set of learning experiences that allow students to build deep conceptual knowledge, develop the ability to apply technical and professional skills fluently, and engage in authentic engineering projects (T Pinto et al, 2018). There is a huge requirement for skilled engineers across the world. Internationally there is a trend moving towards outcome-based engineering education. New accreditation models focus on outcome-based learning. The national academies and many governments call for change in engineering education (Litzinger et al, 2011). In India, engineering education is under pressure as professional engineering bodies and Indian industries call for an additional set of skills and competencies such as professional, soft and personal skills (Blom and Saeki, 2009, Goel, 2006). To meet the demand of skilled engineers, the capacity of engineering educational institutions in India were increased by increasing the capacity of existing colleges and by establishing new colleges. It has resulted in an increase in the volume, but the quality of the graduate engineer is still uncertain (Rao, 2006). Also, various government reports indicated genuine concern about the quality of an engineering education pointing towards the need for radical changes in the curriculum and the teaching-learning practices in India.
Given this situation, Project Based Learning (PBL) is considered as relevant (Shinde, 2011b) and suitable alternative as the past results shown that if properly designed and implemented PBL leads to the development of industry-relevant skills and prepare students for lifelong learning (Du and Kolmos, 2006, Shinde and Kolmos, 2011a). Problem Based Learning has its origin in McMaster University Canada in 1968. Later in Denmark at Aalborg, 1972 and Roskilde, 1974 two PBL models emerged. These models are designed from scratch (Graaff and Kolmos, 2003). Also, culture in these countries is different from India. Indian education systems are built for traditional teaching i.e. instruction based pedagogy. Hence, it is necessary to develop a PBL model suitable for Indian conditions. Also, the challenge is to achieve learning outcomes and skills demanded by the industries and prescribed by the NBA and ABET (Shinde V., 2013). The objective of this paper is to discuss the development process of a mini project and its evaluation process at the course level to evaluate the students as a part of In Semester Evaluation (ISE).

2. Methodology

A. Learning outcomes specified by National Board of Accreditation (NBA)

In response to the recent developments in Higher education in India and across the world; the Ministry of Higher Education in India has decided to change the accreditation criteria to become outcome based. India, being a member of the Washington Accord, applies

Accreditation Board for Engineering and Technology, [ABET] criteria 2019-20 to assess the quality of education in educational institutes. Table 1 shows a summary of the ABET criteria. Since, NBA is the apex body which ensures quality education is imparted in India, these criteria along with the survey results are critically considered for the project-based learning design.

Table 1. Summary of ABET Criteria

Learning Outcome (LO)	Statement of Learning Outcome
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	an ability to communicate effectively with a range of audiences
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

B. Course Level Requirements

Rajarambapu Institute of Technology is an autonomous institute affiliated to Shivaji University, Kolhapur. Being an autonomous institute, it has the authority to modify the curriculum as per the need of the industry. The evaluation of the students is divided into three parts. In Semester Evaluation, Unit Tests and End Semester Evaluation, Table 2 shows the distribution of marks for these three parts.

Table 2. Evaluation Scheme and weightage

Mode	Marks
ISE	20
Unit Tests	30
ESE	50

The faculty has the freedom to design the ISE for students as per the course.

C. Activities to be performed in PBL

ISE evaluation of all the students was done using Project Based Learning (PBL) assignment. Following activities were planned for the same.

8. **Formation of team and allocation of the problem:**
   A team of 4-5 members each were formed. Total 14 teams formed. Then the problem was given on gauge design.
9. **Finding the dimensions of shaft/hole with tolerance band :**
   In this activity, the students will be asked to find the dimensions of Shaft/Hole by referring tolerance chart.
10. **Finding dimensions of GO and NO-GO Gauge:**
    In this activity, students will be asked to find out the dimensions of GO, NO-GO Plug/ring/snap gauge (with tolerance) depending upon the given problem.
11. **Material selection:**
    In this activity, all the group members will be asked to select the appropriate shape and size of metal for gauge.
12. **Manufacturing gauge on lathe/milling machine:**
    In this activity, students will be asked to manufacture the given gauge according to dimensions.
13. **Inspection of manufactured gauge:**
    In this activity, students will be asked to inspect the gauges according to design dimensions.
14. **Report and Presentation of the whole project to an audience:**
    In this activity, students will be asked to present their experience and also display the gauge manufactured by the group members.

All the activates carried out in the project have been mapped to learning outcomes provided by ABET.

Table 3. Mapping of project-based learning activities to learning outcomes

Project Based Learning Activity	Learning Outcome
Formation of team and allocation of problem	1.An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
Finding the dimensions of shaft/hole with a tolerance band	1.An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Finding dimensions of GO and NO-GO Gauge	1.An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Material selection	1.An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Manufacturing gauge on lathe/milling	1.An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering,

machine	science, and mathematics 7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
Inspection of manufactured gauge	7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
Report and Presentation of the whole project to an audience	3.An ability to communicate effectively with a range of audiences

D. Assessment and evaluation

All these activities were assessed using a rubric. A rubric is divided into 07 activities which are marked for 10 marks each. In all, the students got a final score out of 70 marks which were then scaled back to 20 marks.

The rubric used for evaluation has been shown on the next page.

3. Experiences during implementation

The overall participation of students was found to be excellent. It is an activity-based evaluation; students have enthusiastically manufactured gauges and also presented it to the whole class.

Fig. 1 Students Manufacturing Gauge

Fig. 2 Students presenting gauge design to the class

It was found that the overall CO attainment as compared to the previous year was improved.

4. Conclusion

Project Based Learning is a very useful tool to encourage effective participation of students in the teaching-learning process. It is a better option as compared to traditional evaluation methods like tests and assignments. PBL improves the involvement of students and also is suitable for all types of students.

References:

1. ABET 2019, Accreditation Board for Engineering and Technology, *https://www.abet.org/wp-content/uploads/2018/11/E001-19-20-EAC-Criteria-11-24-18.pdf*, Accessed 2nd May, 2019
2. Blom A, and H. Saeki (2009), Employability and Skill Set of Newly Graduated Engineers in India, *Bank Policy Research Working Paper Series, Volume 11.*
3. Du X. Y., and Kolmos A. (2006), Process Competencies in a Problem and Project Based Learning Environment, *35th SEFI Annual Conference: Engineering Education and Active Students*, Uppsala, Sweden, 2006.
4. Goel, S (2006), *Investigations on required core competencies for engineering graduates with reference to the Indian IT industry*, European Journal of Engineering Education, 31:5, 607-617.
5. Graaff E. D., and Kolmos A (2003)., Characteristics of Problem-Based Learning, *Int. J. Eng. Ed*. Vol. **19**, No. 5, pp. 657–662.
6. Litzinger, T.A., Lattuca, L.R., Hadgraft, R.G.and Newstetter, W.C. (2011).*Engineering Education And The Development Of Expertise - Journal Of Engineering Education* (pp. 123-150).100 (1).
7. Rao (2006), Rao Committee Report, Faculty Development in India, July2006. Shinde V., and A. Kolmos (2011a), Students Experiences in Aalborg PBL Model: A Case Study, *SEFI Annual Conference, Lisbon*, 27–30September 2011.
8. Shinde V. (2011b), Relevance of the Problem and Project Based Learning (PBL) to the Indian Engineering Education, *across the disciplines: research into best practice, 3rd International Research Symposium on PBL, Coventry University, U.K*, 28–29 November2011, 489–501.
9. Shinde,V. (2013) Designing “Theory of Machines and Mechanisms” course on Project Based Learning approach. In K. Mohd-Yusof, M. Arsat, M. T. Borhan, E. de Graaff, A. Kolmos, and F. A. Phang (Eds.), PBL Across Cultures (pp. 163-172). Aalborg: Aalborg Universitetsforlag.

Rubrics for evaluation of PBL (Project Based Learning) Assignment

T. Y. B. Tech. Automobile Engineering (2018-19) SEM-1

Course Name: Metrology & Quality Control *Course Code: AE3111*

	Level 1 (0-4)	Level 2 (5-7)	Level 3 (8-10)
Finding dimensions of Shaft and Hole	Incorrect dimensions of Hole & Shaft	Correct dimensions of shaft & Hole	Correct dimensions of shaft & Hole with tolerance
Design Calculations of Gauge	Wrong gauge dimensions	Correct application of the Taylors Principle to identify the Go & NO-GO gauge dimensions as a whole.	Correct application of the Taylors Principle to identify the Gauge dimensions and its tolerance
Selection of Material	Improper selection of material and its thickness	Able to select appropriate material	Able to select appropriate material and its thickness.
Manufacturing of Gauge	Gauge manufactured with with wrong dimensions and with poor surface finish	Gauge Manufactured with proper dimensions	Accurate dimensions and surface of gauge is smooth
Technical report on the gauge and the overall tasks carried out during the project	Report is vague and content is incomplete.	Report is somewhat accurate and content is fairly complete.	Report is complete with all relevant data/content.
Presentation of the whole project	No thought given to flow of presentation and inclusion of very few activities carried out during the assignment in the presentation.	Hapazard flow of presentation and inclusion of more than half the activities carried out during the assignment in the presentation.	Effective flow of presentation and inclusion of all the activities carried out during the assignment in the presentation.
	Only one group member is aware of whole presentation and other members are contributing vaguely in the presentation.	All the group members are aware of whole presentation and contribute equally in the delivery of presentation.	All the group members are aware of whole presentation and contribute equally in the delivery of presentation.
Question and Answer	Less than 50% of questions posed by the audience answered effectively by the group members.	Between 50 - 80 % of questions posed by the audience answered effectively by the group members.	More than 80% of questions posed by the audience answered effectively by the group members.

Fig. 3 The rubric used for evaluation

Integrated Project Development using Database and Java through Process Oriented Guided Inquiry Learning (POGIL)

Sadanand S. Howal[1], Tejaskumar S. Kamble[2], Durgesh P. Kshirsagar[3]

[1,2]Computer Science and Engg. Department, Rajarambapu Institute of Technology, Sakharale
[1]sadanand.howal@ritindia.edu
[2]tejaskumar.kamble@ritindia.edu
[3]durgesh.kshirsagar@ritindia.edu
Track No:1
Track Name: Different dimensions of Teaching-Learning

Abstract: This paper shows the combined approach to learn Java and Database Management System (DMS) for Integrated Project Development (IPD). This approach is very effective and gives experiential learning through IPD. Software project development requires knowledge of back end and front end. For the back end database knowledge is necessary while developing front end requires good knowledge about any programming language. In this paper, we are describing the enquiry based learning technique POGIL to learn Java programing language. Using combined approach students developed their IPD , which helped them to learn overall software application development process. The result collected from this activity were so satisfied; student gained good understating of Java, Database and Integrated Project Development.

Keywords: POGIL, Java, Database, Project Based Learning, SQL.

I. INTRODUCTION

Prerequisite for developing any software application is to have good hands-on programming language and database management system concepts. Computer Engineering students are getting difficulty in understanding programming concepts. In students perception they are not able to apply the concept in real life projects. Also with faculty perception to teach programming concepts as per student understanding level is difficult task [3]. Most of the time we faces the problem of large classroom. To improve the student understanding in programming courses, POGIL is the best effective pedagogical tool. POGIL is an acronym for Process Oriented Guided Inquiry Learning. The POGIL is one of the best active learning tool. It is student centric instructional base learning[6]. This active learning tool engages student. As this is inquiry based tool, it increases self-learning ability of student. It constructs student’s concept seamlessly. To promote deep content understanding, inquiry approach to science teaching has been widely recommended. POGIL helps us to overcome above mentioned problem to teach programming courses. We have applied this technique to teach Java and database concept and subsequently it is used to develop Integrated Project Development using both courses. It has shown good result in learning cycle [2]. Because of IPD student understand the overall programming concept as well as Software Development Life Cycle (SDLC) in easier way. As per feedback taken from student it shows satisfactory result. The paper is divided into six parts. First part explains what POGIL is, then second is database and java course description. After that paper explains about how POGILis used to teach Java. At the end of paper, observations and conclusion is discussed.

II. POGIL Methodology

Initially POGIL was applied in chemistry field [1][5] for study of formulation of various chemicals. Now it is widely used across range of fields.
Figure 1 shows POGIL learning cycle phases.

1. Exploration Phase: Student browses basic terms from instructional material.
2. Concept Invention Phase: Student start solving the problem and slowly constructs the whole concept.
3. Application Phase: Student Applies learnt concept to IPD.

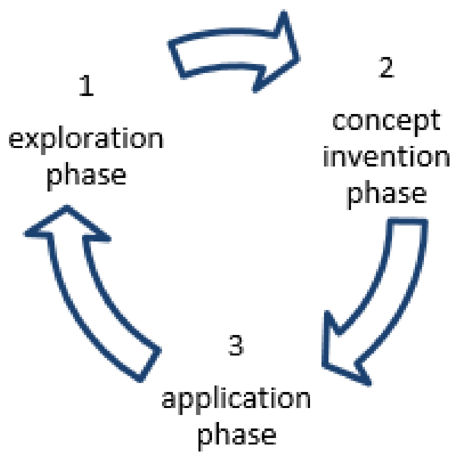


Fig. 1 POGIL Learning Cycle

A group of student works on this activity. A different role is assigned to a group of students. The students work in a team of 3 to 4 members. A facilitator i.e. faculty will provides the instructional material. It consists problems, questionsand definitions of basic terms. The questions and problems are designed in a way that the answer of previous question is required to solve the next question or problem and that leads students to valid own conclusion. So that students will slowly get understood about concept and finally learntthe whole concept. A group will start working on the problem and questions by referring books, internet, journals etc. as per their need. Each member of a group perform their own role.

This pedagogical techniques helps student build their self-learning ability, able to divide problem into pieces and slowly acquire the concepts with application.

Following are the skills of student can be developed using POGIL:

- Critical Thinking
- Self-Learning
- Analytical skill
- Working within Team
- Communication
- Problem Solving
- Team Management

III. Course Description

We have applied POGIL for Java programming language to teach Java IO and thread concept and to teach SQL database concepts for third year students. Java and Database courses having three credit and four credits respectively in curriculum.

Table 1. Course Assessment Strategy

Course Name	ISE1 10%	ISE2 10%	ISE3 30%	ESE 50%
Java	Online MCQ	Programm-ing Test	Integrated Project Develop ment (IPD)	POE
Database System Laboratory	Online MCQ	Database Design		POE

As shown in Table No.1, these courses having In-Sem Exam of 50% and End Sem Exam of 50% weightage.

Student have done IPD for ISE3 of 30 Marks weightage. It is combine evaluated by both course teacher.

IV Implementation of POGIL

We have applied POGIL for Java programming language to teach Java IO and thread concept and to teach SQL database concepts for third year students. Java and Database courses having three credit and four credits respectively in curriculum.

A team of 4 members formed. Following roles were created within a team:

- **Recorder:** Records all answers and questions, and provides copies to team and facilitator
- **Speaker:** Talks to facilitator and other teams if any problem.
- **Manager:** Keeps track of time and makes sure everyone contributes appropriately.
- **Reflector:** Considers how the team could work and learn more effectively.

We have created an instructional material separately for Java IO and Thread respectively. For java IO, have created four module`s as described below and allotted two hours to complete the single activity:

Table 2. Java IO POGIL Modules

Module No.	Description	Time (in Min)
1.	Java IO and stream introduction	10
2.	Stream classes structure	60
3.	File Reader and writer classes	20
4.	Reading data from keyboard	20

The module of topic is designed in a way that student should go in detail to each term of topic. Before starting actual solving of activity an introduction of each term is already given in instructional material which was already shared with students through Moodle. Also, it consists of some sample program source code with output, syntax for few class constructors, class hierarchy and accessibility of classes etc. We have asked students carry laptop in a group. So that they can test their program and easily get which concept works for what purpose.

Below are the sample questions asked in instructional material for Java course:

1. Write description in front of each piece of code in Table 2.

Table 3. Sample Questions

Sr. No.	Piece of code	Description
1	FileInputStream fin1=new FileInputStream("e:\\simple1.txt "); FileInputStream fin2=new FileInputStream("e:\\simple.txt ");	
2	SequenceInputStream sis=new SequenceInputStream(fin1,fin2);	
3	int i1=0; while((i1=sis.read())!=-1){ System.out.println((char)i1);	
4	sis.close(); fin1.close(); fin2.close()	

2. Replace highlighted part by alternate method to get output “line by line” instead of character.

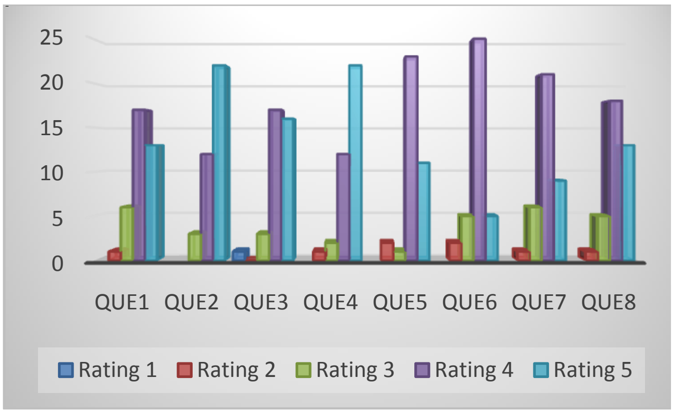
```
import java.io.*;
class SimpleRead{
public static void main(String args[]){
  try{
    FileInputStream fin=new FileInputStream("abc.txt");
    int i=0;
    while((i=fin.read())!=-1){    //read() return -1 when
reaches to end of file
     System.out.println((char)i);
    }
    fin.close();
  }catch(Exception e){system.out.println(e);}   }  }
```

3. Write program reading data from keyboard by Input Stream Reader and Bufferd Reader class until the user writes stop
4. Implement a program to create a file which consists data from two files?

V Activity Feedback

After activity we have conducted feedback from student. Below are the questionnaire of feedback:

1. Do you think resource material provided were sufficient?
2. During activity, were instructor guiding properly to Speaker of your team?
3. Do you think, is speaker passing correct information from Instructor?
4. Do you think Questions were such that they are improving concepts relationships?
5. By answering questions in Model do you think you have been learned the concept?
6. By learning concepts, are you able to apply concept to problem statement?
7. Rate overall group performance after activity
8. Rate overall activity



Graph No.1: Feedback Analysis

After analysing feedback we come to know following points:

1. Resource material provided was sufficient
2. Student has done their respective role honestly and correctly.
3. Constructs Relationship of concepts by answering questions asked in material.
4. They have enough confidence to apply concept in real life example.
5. Student require few more minutes to complete activity
6. Most important they demanded such activity in future also.

VI Integrated Project Development (IPD)

Once the student learn the complex concept of programming using POGIL, they started IPD with their selected topic. Steps they followed to develop project are as below:

1. A team of 3- 4 members formed
2. Topic selection
3. Topic Approval from course In-charge
4. Database Design
   a. Database Normalization
   b. E-R Diagram
5. Database Implementation Using SQL
6. Development of Functional and non-functional components using Java
7. Validation of sub programs/Modules
8. Integration of sub programs/Modules

IPD helped students to apply Java and Database concepts in real time problem solving.

VII Observations

At the end of overall activity we made observations mentioned in following Table No.4:

Table 4. Activity Observations

Sr. No.	Traditional Classroom	POGIL Classroom
1	Student role is passive learner	It is changed to active learner.
2	Writes and try to memorize concepts during lecture.	Constructs concepts and applies it during activity. No need to memorize.
3	No team work	Works in team with a role.
4	No passion develops for self-learning	Creates interest to learn thing at own.

CO Attainment:

As shown in Table No. 5, the CO attainment of Java course indicates that CO1 and CO5 which are focusing onreal worldproblem/application development has increased.

Table 5. Java CO attainment

CO No.	CO Statement	2017-18	2018-19
CO1	Formulate real world problem using Object oriented Principles	70.00%	77.00 %
CO2	Create class hierarchy using Java inheritance and interface for given requirement.	71.00%	72.00 %
CO3	Implement programs on Exception Handling, Applet, Networking, File Handling using IDE's	69.00%	72.00 %
CO4	Design GUI based applications by using AWT and Swing package for given problem	74.00%	83.00 %
CO5	Develop java application to address particular software needs	62.00%	72.00 %

As shown in Table No. 6, the CO attainment of Database Lab course indicates that CO4 and CO5 which are focusing on database design and implementation for real world problem.

Table 6. Database System Lab CO attainment

CO No.	CO Statement	2017-18	2018-19
CO1	Express terms related to database design and management.	63.48%	66.30%
CO2	Learn and apply the Relational Algebra structured Query Language (SQL) for database definition and manipulation.	41.09%	45.67%
CO3	Able to use of concept of Functional Dependency and decompose schema by applying certain normal forms.	51.07%	60.89%
CO4	Apply ethical computing concepts and practices to design database and implementation (security, concurrency control , recovery, deadlock handling)	60.20%	67.78%
CO5	An ability to design and create database to solve real world problem.	55.55%	68.65%

VIII Conclusion

POGIL activity helped student to learn complex concept by breaking them into small modules. Also, this helped them to apply learnt concept to develop integrated application using database and Java. This activity creates learning interest into student where they work in a team. Course in-charges of both courses need to be in synchronize while performing this activity. It creates collaborative learning environment not only for student but also for faculties too.

References

[1] Perry D, Wight RD. Using an ACS general chemistry exam to compare traditional and POGIL instruction. ACS symposium series, 994, 240–247, 2008.

[2] Abraham, M. R. 2005. Inquiry and the learning cycle approach. In: Pienta N. J., Cooper, M. M., reenbowe, T. J., eds. Chemists’ Guide to Effective Teaching. Upper Saddle River, NJ: Prentice Hall; 41–52

[3] Treko, N., The big challenge: Teaching large multi-level classes. Academic journal of interdisciplinary studies 2, 243-251, 2013.

[4] McCombs, B. and Whistler, J., The learner-centered classroom and school: Strategies for in-creasing student motivation and achievement. San Francisco: Jossey-Bass Publishers, 1997.

[5] J. J. Farrell, R. S. Moog, J. N. Spencer, "A Guided Inquiry Chemistry Course." J. Chem. Educ., 1999, 76, 570-574.

[6] Anderson, R., Anderson, R., Davis, K. M., Linnell, N., Prince, C., and Razmov, V., Supporting active learning and example based instruction with classroom technology. Proceedings of the 38th IGCSE Technical Symposium on Computer Science Education. ACM, New York, NY, 69–73, 2007

Outcome Based Question Paper Setting: A Teachers' Guide

Dr. Lenina SVB[1], Pavan Nandram Kokate[2], Sonali Badrinath Pathade[3]

[1]Assistant Professor, lvbirgale@sggs.ac.in
[2]Student BTech Final Year, 2015bec065@sggs.ac.in
[3]Student BTech Final Year, 2015bec045@sggs.ac.in
Department of Electronics and Telecommunication Engineering,
SGGSIE and T, Vishnupuri, Nanded, Maharashtra State, India
Track No:1.
Track Name : Different dimensions of Teaching-Learning

Abstract: Outcome based education is the demand of the day. It requires the measurable outcomes. A teacher's survival in the field of teaching completely depends upon the adaptability to new and changing teaching learning demands. Accreditation and outcome based education (OBE) has become the buzz word in today's world. Outcomes are measured in terms of compliance with the levels of Blooms Taxonomy. Every teacher has to prove the level of competency of the students through this Blooms' Taxonomy. Therefore, the need of the day is that, a teacher should be able to classify the questions as per Blooms Taxonomy and be able to prove that the level of the paper is leading towards OBE. This paper is an attempt to help the teachers in classifying every question of the paper right at the time of question paper design and meet the needs of OBE. There is huge peer and organizational pressure on every teacher for meeting this OBE. All the committees demand such classification and measurement for OBE. This paper has made an attempt to analyse the Blooms keywords used in setting the question paper and help the teacher in rating the level of the question.

Keywords: Question, paper, Bloom's Taxonomy, verbs, education, teacher, guide, OBE

1. Introduction

Education is defined as the processes by which the societies deliberately transmit their understanding, attitudes, values, skills, competencies accumulated information, knowledge and behaviours from generation to generation, Dr. Lenina SVB, (2017). It involves communication designed to bring out learning. Psychologist Dr Benjamin Bloom, proposed a taxonomy called as Bloom's Taxonomy in the year 1956. Main objective of this taxonomy was promotion higher forms of thinking in education. By this idea the analysis and evaluation of concepts, procedures, processes, and principles became possible instead of memorizing facts. In designing educational, learning processes, and training this is most widely used. And obviously, it is used or expected to be used by the teachers in preparing question papers and mapping the outcome achievement.

Main objective of the present paper is to organize the verbs used in question paper preparation, another objective is to relate these verbs to Bloom's taxonomy and one more objective is to identify verbs common to more than one level of the Bloom's Taxonomy, all making the job of a teacher and manager easy. This organization helps a teacher and the organizations to classify the question paper depending on the keywords (verbs) used in the framed question paper and measure the level of attainment of the objectives, which are designed by these leaders both at the individual and group levels. One of the motivations behind this paper is the feedback given by the committee that visited for review on extension of autonomy for Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, Maharashtra State, India, the author's affiliation institute.

This paper is organised as, Section II includes, a brief information about related work. Section III, discusses the Bloom's taxonomy, Section IV, lime lights the proposed method for teachers and organizations, Section V, describes the future scope of the method and finally, the paper is concluded by conclusion and discussion on future scope.

2. Related work

Most of the work in the literature is related to various classifiers for classifying the questions. Prominent among them are as follows :

Jayakodi et al, (2015) focused on using a learning taxonomy that fits well for computer science and engineering to classify and assign marks to exam questions according to the taxonomy levels. Existing Natural Language Processing (NLP) techniques, Wordnet similarity algorithms with NLTK and Wordnet package were used and a new were developed to classify and the marks for each exam question according to Bloom's taxonomy.

Alhazmi et al, (2015), proposed and described a method to integrate outcome-based assessment into learning management system (LMS).

Teo et al, (2014) described a method of auto generating set exam questions in which the examination questions are based on the Cognitive Level of Blooms Taxonomy. Using Genetic Algorithm they develop a method of auto-generating examination questions and analyse performance of the system.

Yahya and Osman, (2014), used the technique of Particle Swarm Classification. The classification problem in data mining field they tried to tackle it and known as Educational Data Mining. They applied this technique to classify the database of questions into the various cognitive levels.

Doshi and Christian, (2014), considered learning approaches of a learner by which they reduced the randomness in practical paper preparation and evaluation for programming languages. Rubrics were implemented, designed and used for practical question set. Using this templates training were given to faculty members for evaluation. For External university examination of post graduate students these paper sets were used. Their observation results in improving the students' skill levels notably.

Sterbini and Temperini (2013), proposed a method to open answers evaluation. It is based on peer-assessment: which is implemented by the Open Answer web system in a social-cooperative e-learning setting.

Goyal et al, (2012) proposed an e-test classify based on Bloom's classification, also known as taxonomy of learning objective for different type of learner model like rote learner, analytical learner. They classified learners as analogy, deductive and base learner and common-sense based learner. To solve student test in e-learning environment they approach to fuzzy logic.

Xu et al, (2009), proposed a new classification scheme which can provide a guidelines for pupil in choosing a useful visualization system based on Bloom's cognitive taxonomy.

Afonin and Bokov, (2007), considered the questions and opportunities of navigators training at Sevastopol national technical university using Transas Marine simulators. The analysis was made using Gardner's theory of intelligence sets and Bloom's taxonomy regarding objects being trained.

The work above covers the Bloom's taxonomy in their proposed methods, and the questions are not classified based on the semantics of the verbs. All approaches use different classifies with complex algorithms. Proposed approach simply uses an Microsoft excel sheet as a grid to classify the questions.

3. Bloom's taxonomy

In 1956 Bloom's Taxonomy was introduced. A group of professors, who in 1948 classify education objectives and goals. Motive was to design a classification system in following areas:

i. Cognitive,
ii. Affective, and
iii. Psychomotor.

In 1950s, the work in cognitive area was completed, which commonly known as Bloom's Taxonomy of the Cognitive Domain (Bloom, Englehart, Furst, Hill and Krathwohl, 1956). The affective and psychomotor domains Taxonomies were developed by others.

Teachers want students to know education (surrounded by educational goals) which can organize in pyramid form in lower to higher level. This is the major idea of the taxonomy. The levels are successive, that is lower level is essential for the higher level, so that first level is totally understand before reaching the next level.

According to Bloom et al. (1956) the old levels were arranged as follows:

Knowledge (BT 1), Comprehension (BT 2), Application (BT 3), Analysis (BT 4), Synthesis (BT 5), and Evaluation (BT 6).

Bloom taxonomy is given by many analyst with verbs and a behaviour of examples for each level. The original taxonomy uses the noun forms in the nomenclature of the levels.

To fit and comply with outcome-focused modern education objectives, Anderson and Krathwohl (2001) revised Bloom's taxonomy. Knowledge, the first level changes to remembering, in which student recall and retrieve previous learned information. Comprehension the meaning, translation, interpretation, and interpolation of instructions and problems. In which students describe a problem in their own language. Application was mapped as applying, in which student applies what they learned in classroom in their work place. Analysis became Analysing, in which student distinguish between facts and inferences, illustrate the ability to contrast and compare. The four levels are as it is as Bloom et al.'s (1956) as in old hierarchy. In this processing levels used are conceptual, meta cognition, factual and procedural. Comparison of levels in original Bloom's taxonomy and modified taxonomy is as shown in Table 1.

Sr. No.	**Level Name**	
	Old (original Bloom's) (1956)	**New (Lorin Anderson) (2001)**
1	Knowledge	Remembering
2	Comprehension	Understanding
3	Applications	Applying
4	Analysis	Analysing
5	Synthesis	Evaluating
6	Evaluation	Creating

4. Corresponding Author

Dr. Lenina SVB, Assistant Professor, Department of Electronics and Telecommunication Engineering, SGGSIEandT, Vishnupuri, Nanded, Maharashtra State, India lvbirgale@sggs.ac.in

5. Proposed method for teachers and organizations

It is a job of every teacher in professional institutions like engineering to identify the level of paper he or she is setting. Examination departments find it difficult to do so due to lack of subject expertise. The proposed method tries to provide keyword matrix which can easily classify the given question paper. Given the keyword matrix of table 2, a teacher can refer the table 2 to classify the questions in the question paper right from the question design itself.

But the exam department can equally well classify the given question paper at given instant of time by mapping the keywords into the proposed matrix. Steps involved in identifying the key verbs and classification of the question paper into Bloom's Taxonomical levels is shown in Fig. 1. It is exemplified with an example for the subject paper as Data Communication and engineering (DCN), midterm question paper designed for fourth year engineering students at the author's institute, shown in Fig 2. There are three levels of the taxonomy. one hundred and thirty six keywords or verbs in total. Out of these twenty three keywords or verbs (choose, compare, compose, construct, create, decide, describe, design, determine, devise, distinguish, examine, explain, identify, imagine, interpret, invent, judge, justify, plan, predict, prioritise, rate) belong to more than one level. Only two keywords (choose and construct) belong to more than two but maximum

Table 2. Keyword Matrix

Bloom's Taxonomy Level	**Remembering (BT-1)**	**Understanding (BT-2)**	**Applying (BT-3)**	**Analysing (BT-4)**	**Evaluating (BT-5)**	**Creating (BT-6)**
Remembering (BT-1)	Describe, Draw, Define, Find, Identify, List, Label, Memorise, Locate, Match', Name, Recognise, Recite, Relate, Reproduce, RecallState,, Select, Write, Tell	Describe		Identify		
Understanding (BT-2)	Describe	Compare, Convert, Demonstrate, Describe, Discuss, Distinguish, Explain, Find out more information about, Generalise, Interpret, Outline, Paraphrase, Predict, Put into your own words, Relate, Restate, Summarise, Translate, Visualise		Compare, Distinguish, Explain, Interpret		
Applying (BT-3)			Apply, Calculate, Change, Choose, Classify, Complete, Construct, Examine, Illustrate,	Examine	Choose, Construct	Choose, Construct

			Interpret, Make, Manipulate, Modify, Produce, put into practice, Put together, Show, Solve, Translate, Use			
Analysing (BT-4)	Identify	Compare, Distinguish, Explain, Interpret	Examine	Advertise, Analyse, Categorise, Compare, Contrast, deduce, Differentiate, Distinguish, Examine, Explain, Identify, Investigate, Separate, Subdivide, Take apart		
Evaluating (BT-5)			Choose, Construct		Argue, Assess, Choose, Compose, Construct, Create, Criticise, Critique, Debate, Decide, defend, Design, Determine, Devise, Discuss, estimate, Evaluate, Formulate, Imagine, Invent, Judge, Justify, Plan, Predict, Prioritise, Propose, Rate, Recommend, Select, Value, Verify, Weigh	Choose, Compose, Construct, Create, Decide, Design, Determine, Devise, Imagine, Invent, Judge, Justify, Plan, Predict, Prioritise, Rate

Creating (BT-6)			Choose, Construct		Choose, Compose, Construct, Create, Decide, Design, Determine, Devise, Imagine, Invent, Judge, Justify, Plan, Predict, Prioritise, Rate	Add to, Argue, Assess, Choose, Combine, Compose, Construct, Create, Debate, Decide, Design, Determine, Devise, Discuss, Forecast, Formulate, Hypothesize, Imagine, Invent, Judge, Justify, Originate, Plan, Predict, Prioritise, Propose, Rate, Recommend, Select, Verify

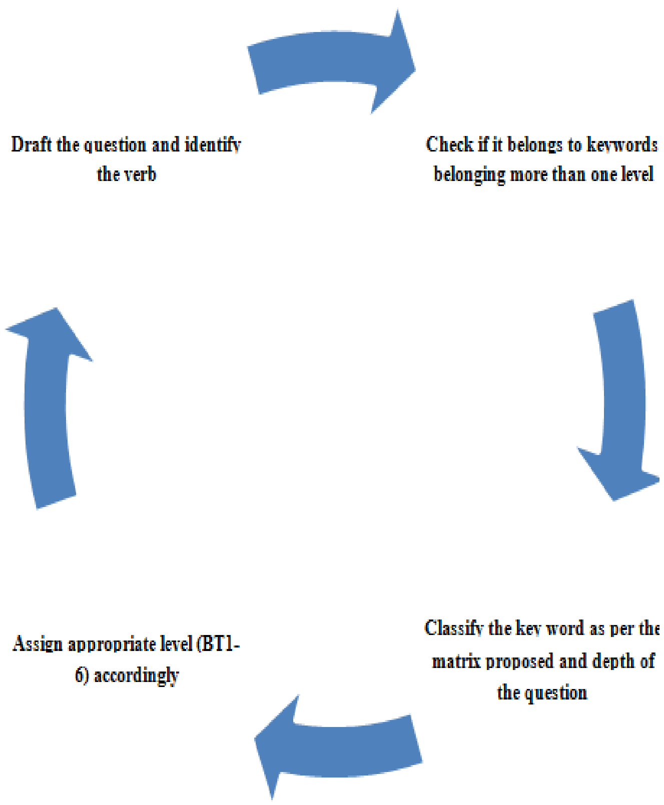
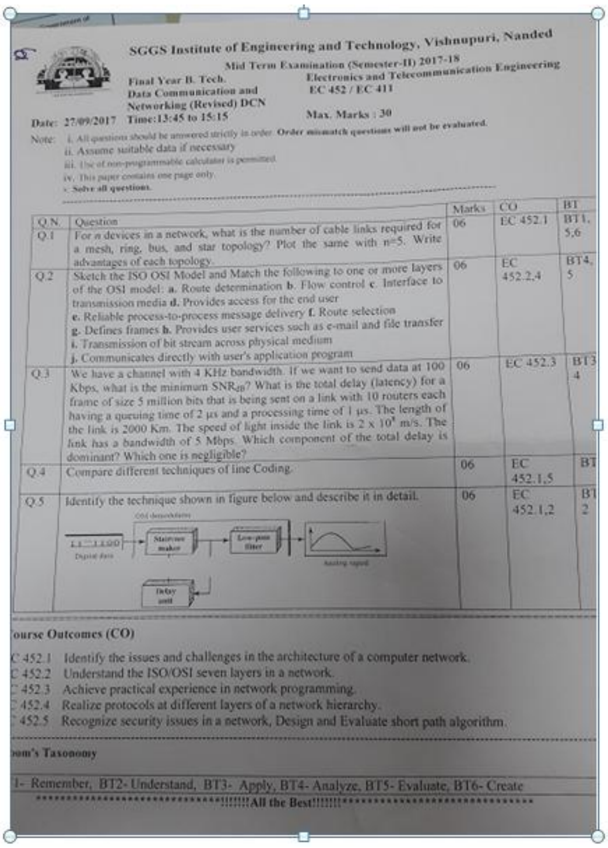


Fig. 1 Process of classifying the question in the question paper



SGGS Institute of Engineering and Technology, Vishnupuri, Nanded
Mid Term Examination (Semester-II) 2017-18
Final Year B. Tech. Electronics and Telecommunication Engineering
Data Communication and Networking (Revised) DCN EC 452 / EC 411
Date: 27/09/2017 Time:13:45 to 15:15 Max. Marks : 30
Note: i. All questions should be answered strictly in order. Order mismatch questions will not be evaluated.
ii. Assume suitable data if necessary
iii. Use of non-programmable calculator is permitted.
iv. This paper contains one page only.
v. Solve all questions.

Q.N.	Question	Marks	CO	BT
Q.1	For *n* devices in a network, what is the number of cable links required for a mesh, ring, bus, and star topology? Plot the same with n=5. Write advantages of each topology.	06	EC 452.1	BT1, 5,6
Q.2	Sketch the ISO OSI Model and Match the following to one or more layers of the OSI model: **a.** Route determination **b.** Flow control **c.** Interface to transmission media **d.** Provides access for the end user **e.** Reliable process-to-process message delivery **f.** Route selection **g.** Defines frames **h.** Provides user services such as e-mail and file transfer **i.** Transmission of bit stream across physical medium **j.** Communicates directly with user's application program	06	EC 452.2,4	BT4, 5
Q.3	We have a channel with 4 KHz bandwidth. If we want to send data at 100 Kbps, what is the minimum SNR_{dB}? What is the total delay (latency) for a frame of size 5 million bits that is being sent on a link with 10 routers each having a queuing time of 2 μs and a processing time of 1 μs. The length of the link is 2000 Km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 5 Mbps. Which component of the total delay is dominant? Which one is negligible?	06	EC 452.3	BT3 4
Q.4	Compare different techniques of line Coding.	06	EC 452.1,5	BT
Q.5	Identify the technique shown in figure below and describe it in detail.	06	EC 452.1,2	BT 2

Course Outcomes (CO)
EC 452.1 Identify the issues and challenges in the architecture of a computer network.
EC 452.2 Understand the ISO/OSI seven layers in a network.
EC 452.3 Achieve practical experience in network programming.
EC 452.4 Realize protocols at different layers of a network hierarchy.
EC 452.5 Recognize security issues in a network, Design and Evaluate short path algorithm.

Bloom's Taxonomy
BT1- Remember, BT2- Understand, BT3- Apply, BT4- Analyze, BT5- Evaluate, BT6- Create
******************************!!!!!!!All the Best!!!!!!!******************************

Fig. 2 Classified question paper according to Bloom's Taxonomy

6. Conclusions and future direction

Proposed arrangement of matrix and identified verbs or words are used and the classification is by human intervention. However, it is easy for a teacher or the exam coordinators to have the matrix as reference and classify the given question paper as per the appearance of key words. Present work can be extended for smart classifier. The future scope of this paper would be smart classifier.

7. References

Dr Lenina SVB (2017) Outcome Based Education and Blooms Taxonomy for Future Education, International Conference Proceedings, Future work organizations: Perspectives Issues and Challenges held on 28th to 30th December 2017, first International conference organized by Sona School of Management, pp. 72-76, Goa, India, 2017.

A. A. Yahya and A. Osman, (2014) Classification of high dimensional Educational Data using Particle Swarm Classification, 2014 IEEE/ACS 11th International Conference on Computer Systems and Applications (AICCSA), Doha, 2014, pp. 34-41.

Anderson, L. W., and Krathwohl, D. R. (2001) A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives (Complete ed.). New York: Longman.

A. K. Alhazmi, H. Zafar and F. Al-Hammadi (2015) Framework for integrating outcome-based assessment in online assessment: Research in progress, 2015 Science and Information Conference (SAI), London, 2015, pp. 217-221.

A. Sterbini and M. Temperini, (2013) Open Answer, a framework to support teacher's management of open answers through peer assessment, 2013 IEEE Frontiers in Education Conference (FIE), Oklahoma City, OK, 2013, pp. 164-170.

Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain. New York: David McKay Company.

J. C. Doshi and M. Christian, (2014) Effect of Conceptual Cue Based (CCB) Practical Exam Evaluation of Learning and Evaluation Approaches: A Case for Use in Process-Based Pedagogy, 2014 IEEE Sixth International Conference on Technology for Education, Clappana, 2014, pp. 90-94.

K. Jayakodi, M. Bandara and I. Perera, (2015) An automatic classifier for exam questions in Engineering: A process for Bloom's taxonomy, 2015 IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE), Zhuhai, 2015, pp. 195-202.

N. H. Ibrahim Teo, N. Abu Bakar and M. R. Abd Rashid, (2014) Representing examination question knowledge into Genetic Algorithm, 2014 IEEE Global Engineering Education Conference (EDUCON), Istanbul, 2014, pp. 900-904.

S. Xu, Xuhui Chen and Dapeng Liu (2009) Classifying software visualization tools using the Bloom's taxonomy of cognitive domain, 2009 Canadian Conference on Electrical and Computer Engineering, St. John's, NL, 2009, pp. 13-18.

Fretschner, M. Ajzen’s (2014), Theory of planned behavior in entrepreneurship education research, In Becoming an entrepreneur (pp. 249-277). Sense Publishers, 2014.

Shane, Harold G. (1981), significant writings that have influenced the curriculum: 1906-1981. Phi Delta Kappan 62 (5): 311–314.
http://www.nbaind.org/accreditation.aspx
http://mhrd.gov.in/sites/upload_files/mhrd/files/statistics/InSCED2014_1.pdf

M. Goyal, D. Yadav and A. Choubey (2012), Fuzzy logic approach for adaptive test sheet generation in e-learning, 2012, IEEE International Conference on Technology Enhanced Education (ICTEE), Kerala, 2012, pp. 1-4.

I. L. Afonin and G. V. Bokov (2007) Navigators Training Software, 2007 17th International Crimean Conference - Microwave and Telecommunication Technology, Crimea, 2007, pp. 945-946.

8. Acknowledgements

We would like to extend our special thanks to SGGSIEandT Nanded, Maharashtra State, India, for giving us an opportunity and cordial environment to work on this paper. We would also like to thank all faculty and staff members who have directly or indirectly contributed to this work. Special thanks to the HOD of Electronics and Telecommunication, TEQIP III coordinator and The Director of the institute SGGSIEandT, for providing the funding through TEQIP-III program.

A Need of Serious and Professional Approach towards the Site Visits for Civil Engineering Learners for an Effective Teaching-Learning Process in its True Sense

Dada S. Patil

Civil Engineering Department, Anjuman-I-Islam's Kalsekar Technical Campus, School of Engineering and Technology, Panvel, Navi Mumbai, 410206, dadpatt@rediffmail.com

Track No: 1

Track Name: Different Dimensions of Teaching-Learning

Abstract: Site visits facilitate to render the real life experiences to the aspiring Civil Engineering learners. The learners develop their understanding of how theoretical practice is applied in a working environment. Taking learners to the site forms a very vital and essential part of the Civil Engineering courses. Visiting a live construction site helps in imparting them a valuable insight into the civil engineering industry and in turn, enhances their understanding of how taught theoretical principles are applied in practice. The Bloom's Taxonomy, which is practically close to the Cognitive (Knowledge) domain of learning, comprises of the increasing orders of learning as Remembering, Understanding, Applying, Analyzing, Evaluating and Creating. Many times, the learners end up in acquiring only the lower learning levels through the theoretical inputs in a regular class room teaching. They could seldom reach to the higher learning levels. However, a site visit can act as one of the effective tools to enhance their learning levels owing to the fact that they can practically witness the way in which the theoretical concepts learnt are put in to practice. However, many times it is observed that learners fail to realize the seriousness of site visits. It is intended that they should be in a position to relate the class room theory to the real life experience witnessed on the site. Instead of a highly professional approach expected from them, they inadvertently adopt a causal approach on the site. They prepare a substandard site visit report, crowding it with plenty of irrelevant photographs. Moreover, they miserably fail to write a technically sound and precise report. Thus, the intended purpose of visit and subsequent report preparation gets badly hampered. This ultimately gives rise to a vital question that, did the academic purpose of ensuring an effective Teaching-Leaning process by enhancing the learning levels through an exercise of site visits really serve its intended purpose? Unfortunately the answer is discouraging. The Final Year learners of Undergraduate Civil Engineering Program learn "Analysis and Design of Reinforced Concrete Retaining Walls" in Design and Drawing of Reinforced Concrete Structures course in their 8th semester. The reinforced concrete retaining walls are mainly seen in the highway or railway projects. They are constructed to retain the earth (soil) on one side or both the sides. The learners were taken to a construction site of cantilever retaining walls, being built by Ashoka Buildcon Limited on Panvel-Uran Highway, in the vicinity of the institute. In this paper, an attempt has been made to briefly share the pedagogical experience in connection with how effectively the task of site visit was carried out. It is briefly discussed here about how the learners were given required theoretical inputs by engaging a special class, as a prerequisite to the site visit. The paper discusses about the importance of systematic and disciplined site visit. More importantly, the paper intends to stress upon a vital fact that, immediately after returning from the visit, the learners were given a questionnaire consisting of the questions requiring critical and logical thinking regarding the theoretical and pragmatic aspects of cantilever retaining wall. An attempt is made in this paper to bring it to the light that majority of the learners could answer very precisely and logically. This showed that there was an improvement in their learning levels. The learners were instructed to write a brief and precise report of the visit. They made a satisfactory report as per the guidelines. This proves that serious and professional approach towards the site visits enhances the learning levels of the learners, thereby resulting in to an effective Teaching-Learning process, in its real sense.

Key Words: Site visit, Bloom' Taxonomy, effective Teaching-Learning process, cantilever retaining wall, site visit report, casual approach, professional approach, etc.

1. Introduction

Construction site visit leads to an interactive experience which facilitates in enhancing the learners' understanding of real construction practices. It creates an interactive learning environment for learners and provides a much needed exposure to a real-world spatiotemporal experience of a construction project [1]. Formal class room teaching and small group tutorial work continue to be the mainstay for majority of the Civil Engineering courses. However, a blended approach to teaching and learning including guest lectures, learners' mentoring and construction site visits helps to enrich the learning experience. For undergraduate learners, construction site visit represents the transformation of theory into practice [2]. According to Wankat and Oreowicz [3], site visits are visually and kinesthetically rewarding. Learners get an opportunity to question on design and construction aspects. This brief social exchange contributes to the notion of 'legitimate peripheral participation' as espoused by Lave and Wenger [4]. This paper makes an attempt of briefly discussing the ill-effects of casual approach of learners

towards the site visit exercise, necessity of engaging the learners in a special class as a prerequisite to the site visit, need of sincere and professional attitude on the site, importance of checking the improvement in learning levels of the learners by conducting a test comprising of questions catering to the theoretical as well as practical aspects of the site visit, significance of preparing a good quality site visit report.
participation' as espoused by Lave and Wenger (1991)

2. Casual Approach of the Learners

According to Wankat and Oreovicz (2015, p.174) site
It is expected from the learners that they would relate the concepts, equations, analysis and design learnt in the class room to the live construction site structures. Unfortunately, many times it is seen that they don't get involved in the site visits seriously and sincerely. This is probably due to their ignorance of the fact that getting acquainted with the real world construction practices facilitate to enhance the learning levels. Out of compulsion, many learners tend to be merely a part of the visiting team. They don't listen carefully to the technical discussions done on site by the faculty and the site engineer. They ultimately end up in clicking plenty of photographs of themselves and structures. When asked to prepare a report, they tend to include abundant numbers of photographs of structures visited, without understanding their practical significance. Due to lack of seriousness, they find it very difficult to write a technically sound and logically adequate report, thus failing to relate the concepts and the practice. This results in to a poor quality site visit report. This severely affects the sole purpose of improving the outcome based Teaching-Learning process, to a large extent. As a matter of fact, the objective of achieving an effective Teaching-Learning process through enhanced learning levels by means of site visits is not attained in a real sense. The whole exercise culminates in to becoming just a formality and a mere paper work.

3. Necessity of a Special Class as a Prerequisite to the Site Visit

The theory in connection with analysis and design of reinforced concrete cantilever retaining wall was already taught to the learners in the regular class room hours as per the prescribed University curriculum. However, in order to stress upon the relevant theory and practical significance of the site visit, a special class was engaged for about an hour on the day of visit. Detailed discussion was done through an interactive session, using power point presentation. The session comprised of critically dealing with the technical concepts in a detailed manner with respect to each of the following figures [5]. The learners were conveyed a clear message that the site visit would be followed by a test, on the same day, consisting of the typical questions requiring critical and logical thinking and the marks obtained would be considered while finalizing the term work marks. This was to make them serious about the whole task.

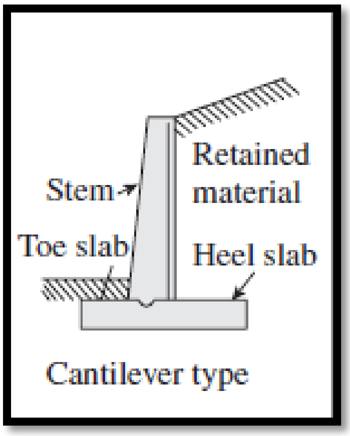


Fig. 1. Parts of a Typical Cantilever Retaining Wall, [5]

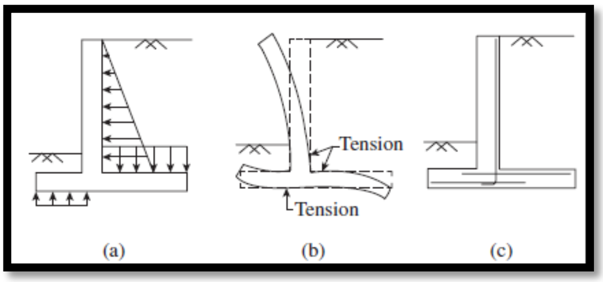


Fig. 2. Behaviour of Cantilever Retaining Wall: (a) Loads on stem, toe and heel slabs (b) deflected shape (c) Location of main reinforcement, [5]

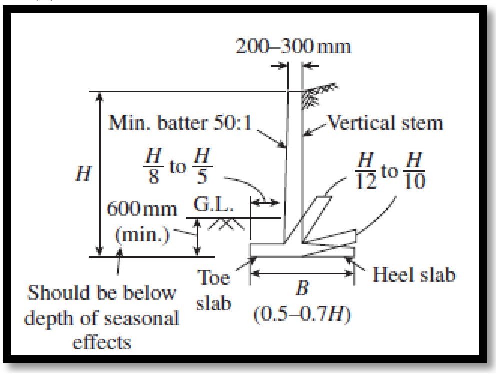


Fig. 3. Common Proportions of Cantilever Retaining Wall, [5]

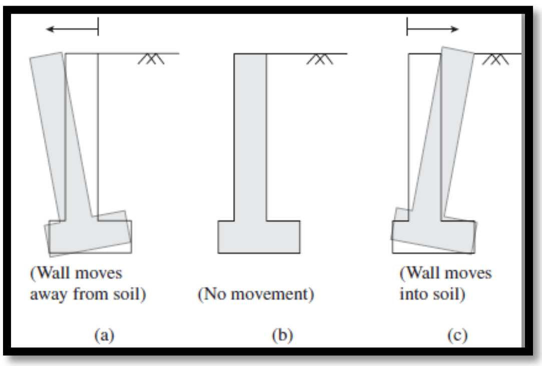


Fig. 4. Three Types of Earth (Soil) Pressures (a) Active (b) At Rest and (c) Passive, [5]

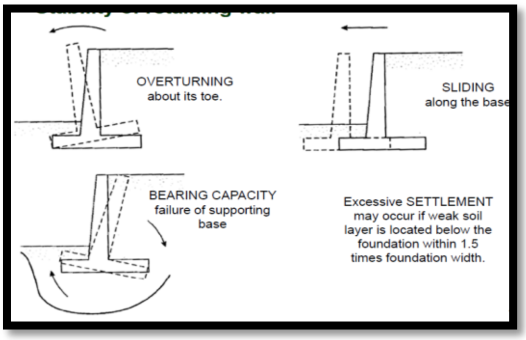


Fig. 5. Stability of Retaining Wall, [5]

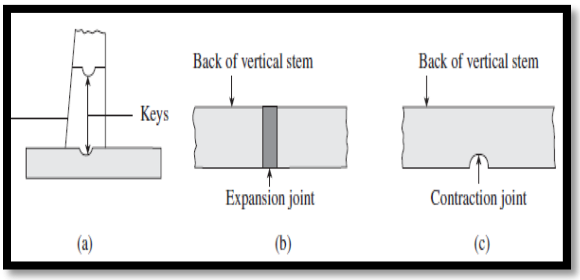


Fig. 6. Joints in Retaining Walls: (a) Construction (b) Expansion (c) Contraction, [5]

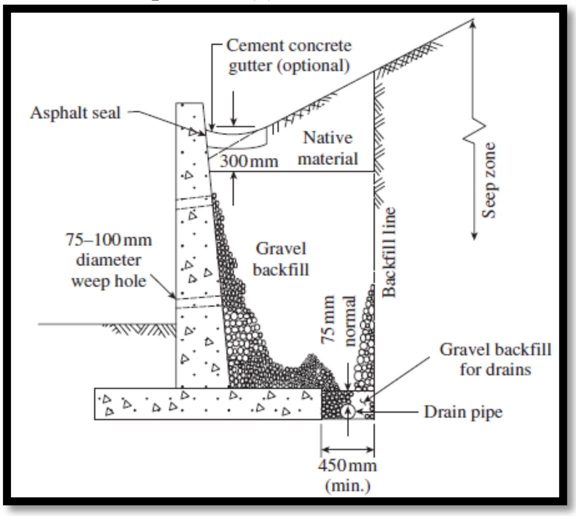


Fig. 7. Drainage of Backfill Soil, [5]

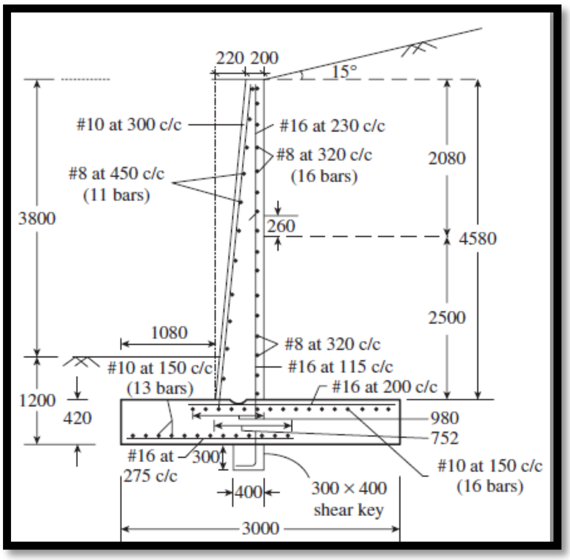


Fig. 8. Typical Steel Reinforcement Details in a Cantilever Retaining Wall, [5]

4. A Need of Serious and Professional Approach on Site

As a mandatory requirement, the learners were briefed about the discipline and safety norms to be followed on the site. They were divided in to two batches, so that individual attention was possible for an effective outcome based exercise. The learners were again made aware of all the theoretical considerations in connection with the analysis and design requirements. Practical aspects were discussed at depth by the site engineer. Figures 9, 10, 11 and 12 show the photographs clicked on the site. There were two cantilever retaining walls at different stages of construction.

Fig. 9. Concerting Done up to Full Height for a Part of the Retaining Wall Length

Fig. 10. Reinforcing Steel Details before Concreting Operation

Fig. 11. A Complete Detailing of Reinforcing Steel

Fig. 12. A View of Outer Face (Non-Soil Face) Showing the Number of Weep Holes for an Effective Drainage

5. Importance of a Test after the Site Visit to Check the Learners' Understanding Level

As soon as the site visit culminated, the learners were instructed to write a quick test. Each question was coined very carefully in order to make sure that answering it would need critical and logical thinking with regards to theoretical concepts and practical aspects as well. The typical questions asked were as below.

- What is the minimum depth of foundation, from ground level, to be provided for the cantilever retaining wall?
- Why the width of the base slab (b) is approximately taken as 0.5 to 0.7 times of total height (H) of the cantilever retaining wall?
- What is the reason of providing toe projection less than the heel projection?
- What is the purpose of providing 200 mm to 300 mm as a minimum dimension for the top width of vertical stem?
- Why vertical stem is normally tapered towards top, instead of providing the same width throughout?
- For height of about 3.6 m approximately, why stems of cantilever retaining wall are normally provided with the same width, instead of tapering?
- Why the sloping (tapering) face of the vertical stem on the front face (outside face) is preferred, over that on the back face (soil face)?
- Is it mandatory that the thickness of heel slab and toe slab be same? If yes, why? If no, then why engineers normally provide the same thickness for both?
- Why passive pressure on the toe side is normally neglected in the analysis and design? If we are erring on safer side by doing so, explain how?
- If weep holes are not provided in the stem, what would happen? Does it affect the dimensions of the stem, toe and heel to be provided?
- Why is it necessary that the maximum compressive stress at the toe end be less than SBC of soil? If its greater than SBC, what would happen? In case, SBC > max. compressive stress, what would you do?

The way in which the questions were framed clearly depicts that answering them, inadvertently, enhances the learning levels. It was heartening to see that majority of the learners could write the answers precisely. This showed that the detailed technical discussions, during a prerequisite class and on the site, facilitated the learners to gain higher levels of learning, thereby resulting in to an effective Teaching-Learning process.

6. Preparation of a Good Quality Site Visit Report

The learners were instructed to prepare a site visit report catering to the quality and not only to the quantity in terms of number of pages. They prepared a technically sound and brief report, with limited and required number of photographs. The various aspects highlighted in the report were a typical sketch of cantilever retaining wall, length of the wall, dimensions of its different parts, the concrete grade used, the steel grade used, the engineering properties of backfill soil, a sketch showing drainage arrangements, the quantities of concrete, steel and formwork used. More significantly, the learners were asked to include in the report, the detailed solution of a problem in which the actual soil properties encountered on the said site, actual height of the wall, grades of concrete and reinforcing steel used were the input parameters. With the help of the problem solving skills gained during the regular classes of analysis and design of cantilever retaining wall, they were able to provide an adequate solution. The results obtained were showing the close proximity with the actual concrete dimensions and steel areas provided on the site. This unknowingly boosted the confidence of the learners through connecting the theoretical concepts with the actual practice.

7. Conclusion

- Site visit forms an essential part the various courses in Civil Engineering program.
- In the University prescribed content, a mandatory site visit is included in many Civil Engineering courses. If such a compulsory activity is not mentioned for few courses, then also it is highly advisable to take the learners to the site visit in connection with the theory learnt in a particular course. It would definitely lead to a better understanding of the analysis, equations, design concepts and constructional aspects learnt during the classroom discussion.
- The casual approach of the learners towards the site visit should be highly discouraged. Otherwise, it would end up in a mere formality to cope up with the requirement of University prescribed syllabus. Pragmatically speaking, an expected outcome in terms of higher levels of learning would not be accomplished in such as case in its true sense. It would end up in completing a formality of paper work indicating the attainment of higher levels of learning as per Bloom's Taxonomy. Neither it would improve the quality of education nor would it contribute to the short term and long term goals of the learners and the program.
- A serious and professional approach towards the site visit for Civil Engineering learners would definitely result in to improved learning levels, thereby leading to an effective Teaching-Learning process in its real sense.

References

[1] Ricardo Eiris Pereira and Masoud Gheisari, "Site Visit Application in Construction Education: A Descriptive Study of Faculty Members", International Journal of Construction Education and Research, Taylor and Francis Online, pp. 83-99, 21 Nov. 2017.

[2] Mike Murray and Stuart Tennant, "Off-Piste Pedagogy: Construction Site Visits for Undergraduate Civil Engineers" 6th International Symposium for Engineering Education, 2016, the University of Sheffield, July 2016, UK.

[3] Wankat, P. C and Oreovicz, F.S, 2015 "Teaching Engineering". 2nd edition, Prude University Press, West Lafayette, Indiana, USA.

[4] Lave, J. and Wenger, E., 1991, "Situated Learning: Legitimate Peripheral Participation", Cambridge: Cambridge University Press.

[5] Subramanian. N., "Design of Reinforced Concrete Structures", Oxford University Press, published in 2013.

Acknowledgement

The author wishes to express a heartfelt gratitude to Er. Arun Patil, Ashoka Buildcon Limited for granting permission for the site visit. Thanks are also extended to the site engineer for giving invaluable guidance to the learners.

Gallery Walk: An Alternative Learning Strategy in Improving Students' Academic Performance

Popat D. Kumbhar
Department of Civil Engineering,
K. E. Society's, Rajarambapu Institute of Technology, Rajaramnagar (Islampur), Dist. Sangli (MS, India), 415414
popat.kumbhar@ritindia.edu
Track No: 1
Track Name: Different Dimensions of Teaching-Learning

Abstract:
This paper investigates the effect of gallery walk technique on academic performance of Third Year Civil Engineering students' in 'Concrete Technology' course in comparison with the jigsaw technique implemented previously. Both, gallery walk and jigsaw techniques are cooperative learning strategies in which students get actively engaged in classroom activities and assignments. The gallery walk was implemented with little modifications in the original methodology for the entire class of 72 students by assigning them with various subtopics from major topics of the course. Students' performance in Unit Test examinations was evaluated by analyzing results. Results showed 33% increase in the improvement of attainment level of students after implementing gallery walk compared to the results of tradition teaching. Further, the results of gallery walk and jigsaw technique, previously implemented are found to be approximately same. However, implementation of gallery walk technique showed effective engagement of students in the learning process, increased confidence level of students and improvement in lifelong learning skills compared to jigsaw method.

Keywords: Gallery walk, jigsaw technique, students' performance, attainment level, lifelong learning skills.

1. Introduction:

Research in engineering education is fast gaining importance due to the challenges being faced in rapidly changing dynamic environment. In order to keep updated with the changing technologies the engineering education in India is always compared with the education systems adopted globally. Hence in India, switching from conventional teaching to modern teaching methods is given more importance **(Sreekanth et al, 2015).** Outcome Based Education (OBE), is one among the modern educational systems, recently implemented in engineering education in India, has shown improvements in the higher education system to a larger extent in view of reforming the youth potential into human resources **(Ravindran and Lenin, 2016).**

Traditional teaching lacks in providing focused learning, interactivity, and doesn't encourage critical thinking skills and hence, OBE is favoured to traditional or conventional teaching **(Wadhwa et al, 2015).**

Active learning is an integral part of OBE, as successful completion of the task by student indicates system's effectiveness and curriculum. Several active learning approaches are used for effective learning experiences.

Gallery walk is one of the collaborative learning techniques that promote use of higher order thinking skills like analysis, evaluation, synthesis etc. It is a presentation method in which students or their groups display their work products, normally on posters, and then move around the classroom observing each other's work. They may provide the comments on the work products prepared by groups **(Farrah, 2015).** Gallery walk allows students to get actively engaged as they walk throughout the classroom and share ideas, and respond to important questions, images, and problem-solving situations in a stress-free way **(Namaziandost et al, 2018).** The work products in gallery walk consists anything from an open ended questions about the content being taught, to photographs, images, posters related to the content, or even to finished projects **(Edel-Malizia, 2015).**

2. Cooperative Learning Methods:

Cooperative learning is a kind of learning that involves organizing the classes in small groups of students that work together so that each group member's success depends on the group's success. A large number of techniques are available for providing cooperative learning. Among the easiest methods to implement include, think-pair-share, think-pair-write, reciprocal teaching, jigsaw technique, gallery walk etc.
Gallery walk allows students to get out of their seats and set into a mode of active engagement whereas; in jigsaw technique the entire class is divided into small diverse groups which serve as students' 'home group'. Each member of 'home group' is assigned to an 'expert group' to study a part of the content. After the students join in their 'expert group' and gain expertise in their specified content, they return to their 'home groups' to share what they have learnt with the other group members **(Francis, 2013)**. Jigsaw technique allows everyone in the class to learn all the content relevant to the subject or course, as

against to just the piece they were accountable for Fig.1 and Fig.2 shows the diagrammatic representation of both, gallery walk and jigsaw techniques.

For implementing OBE, innovative teaching methodologies need to be explored. Cooperative learning activity is one of these teaching methodologies and helps in promoting the higher order thinking skills. At present, many active learning tools such as brainstorming, Jigsaw, Think-Pair-Share (TPS), Gallery Walk, etc. are being used **(Sreekanth et al, 2015).** However, no any research is done yet to find out which learning strategy facilitates students learning effectively **(Muhammad, 2016).**

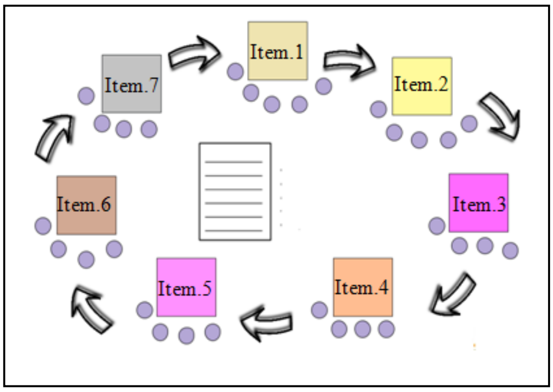


Fig.1: Mechanism of Gallery Walk
https://www.google.com/search)

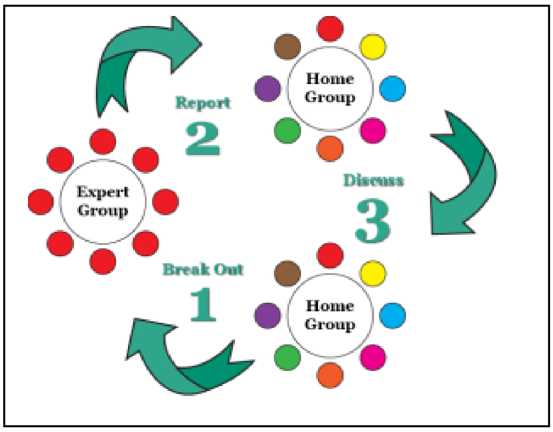


Fig.2: Mechanism of Jigsaw
(Source: https://www.google.com/search)

Therefore, in the present paper, an attempt has been made to study the effect of gallery walk technique on academic performance of students over traditional teaching method and also to know its effectiveness compared to the similar type of cooperative learning techniques known as 'jigsaw' method.

3. Procedure of Gallery walk Technique:

While using gallery walk, the students have to explore the texts or images that are displayed on walls of the classroom and physically move around the classroom to share their works with peers **(Harton, n.d.).**

The various steps involved in using Gallery Walk Technique are as given below **(Farrah, 2015).**

1. **Generation of Questions**
   The teacher thinks of five to six questions (generally six or even more as per size of class) to use around a central class concept.
2. **Writing of Questions:**
   Before class time, the questions for Gallery Walk are written on large sheets of self adhering chart, post-it paper, self supporting flip charts, whiteboards, or simply on pieces of normal paper (preferably, A3 size). One question should be written on one sheet of paper.
3. **Posting the Questions:**
   The questions are posted on the walls of classroom, giving sufficient separation space between sheets. Alternatively, questions can be placed on desks or tables in the classroom.
4. **Preparation of Students**:
   All the instructions are given to students before carrying out the 'Gallery Walk' technique. If the Gallery Walk has formal oral and written evaluation, the important components of that evaluation should be declared in the beginning.
5. **Grouping of Students and Assigning Roles**:
   Students are arranged into groups of three to five. Few students shall be identified and assigned with roles like leader, reporter, monitor, and recorder for smooth conduct of Gallery Walk.
6. **Beginning of the Gallery Walk**:
   The groups of students are directed to visit different charts or "stations." Upon arriving at the station, each team have to write comments on the question posed at the station. To avoid chart chaos and lengthy comments, recorder is encouraged to write the comments in a brief bulleted format at the top of chart.
7. **Rotating groups to new station and adding content:** After a short period of time, generally 5 to 7 minutes, the instructions to students should be given for rotating their groups. The group then rotates, clockwise, to the next station. At the new station the group adds new comments and also responds to comments written by the previous group.
8. **Monitoring the Progress**:
   As groups rotate, the teacher looks after student discussion and involves all group members. The teacher has to rephrase questions or provide hints if students either don't understand or misinterpret questions.
9. **Returning to Starting Point**:
   Groups continue to review the answers already contributed by previous groups, adding their own comments. This procedure continues until groups have visited all stations and returned to the station

at which they started. Students are then instructed to record their original (starting) question and to sit down in their groups to begin the next stage (i.e. report out).

10. **Report Out**:
In this stage, the group synthesize what has been written about their original discussion question. The students are allowed for about ten minutes for synthesizing comments. The "reporter" selected earlier will be asked to summarize the group's comments with the help of other group members and gives an oral presentation to the class.

11. **Measuring Understanding of Students:**
In Report Out stage, the teacher emphasizes correctly expressed concepts and also corrects for misconceptions and errors, if any.

4. Methodology adopted in using Gallery Walk:

Gallery Walk Technique was implemented for teaching the topic ‘Special Concretes’ (Unit No.4) of the course ‘Concrete Technology’ of Third Year B. Tech. Civil Engineering class (Sem. VI).

The existing gallery walk technique was slightly modified and implemented for the entire class of 72 students’ to suit the requirements of class. Thus, in the present work, instead of writing the questions and posting them on posters as is done in original Gallery Walk, teacher allotted different topics to students in groups for implementing the Gallery Walk method.

A. Criteria for Evaluation:

The criterion for evaluating student was decided based on 1- 5 scales considering following points:

- Quality of poster prepared for displaying required technical information of the topic (information, images, graphs, bar charts, pie charts, etc.)
- Organization of the information on the poster
- Communication skills with body language
- Homogeneity of group and effective team work
- Ability of the group members to answer the technical questions (related to the topics of respective groups as well as other groups)

B. Evaluation grades:

Following grades were fixed corresponding to the 1 to 5 scales:

1- Poor
2- Scope for betterment
3- Satisfactory
4- Good
5- Excellent

C. Steps Adopted in Implementing Gallery Walk:

- Formation of diverse groups
- Distribution of sub-topics to groups
- Allowing students for downloading of topic related literature / articles from MOODLE server, internet and other sources
- Allowing students for discussion, study and preparation of posters
- Presentations of Groups on their selected topic
- Preparation of Posters size drawing sheet (A2 or A3)
- Arrangement for group wise display of posters
- Evaluation of students by Evaluation Team
- Visits of individual groups (rotation) to the groups displaying posters
- Finalizing student groups securing higher grades / ranks based on evaluators grading
- Prize distribution

The tasks performed in each step of gallery walk are briefly discussed below:

1) *Formation of diverse groups for gallery walk:* In all, 9 diverse groups of students were formed from the entire class of 72 students.

2) *Distribution of sub-topics or articles to groups of students for study:* Each group was assigned with a particular topic from Unit 4 (i.e. Special Concrete) for which the students were expected to prepare on the topic and present their learning in the form of a poster.

3) *Downloading of topic related articles from MOODLE server, internet and other sources:* The literature (notes, power point presentations, book chapters, internet information etc.) available was uploaded on MOODLE for preparation of students and the students were asked to get the resource material downloaded and study it by discussions in the group. The students were also informed to gather the necessary information pertaining to their topics.

4) *Allowing students for discussion/study and preparation of posters:* Students were allowed to study, prepare for the presentations by referring to the literature in 3 class hours (periods) and were informed to think on preparation of posters so that the required information can be presented on it in an organized manner.

5) *Presentations of Groups of students on their selected topic:* Each group was given opportunity to present on their topic and answer the queries of other group students.

6) *Preparation of Posters (A2/A3 size) on drawing sheet:* All the groups were asked to prepare the posters giving the required information of their topics preferably on A2 or A3 size drawing sheets.

7) *Arrangement of group wise display of posters for gallery walk (exhibition):* The students were informed about the layout of passage or corridor where they should display their posters (Fig.3).

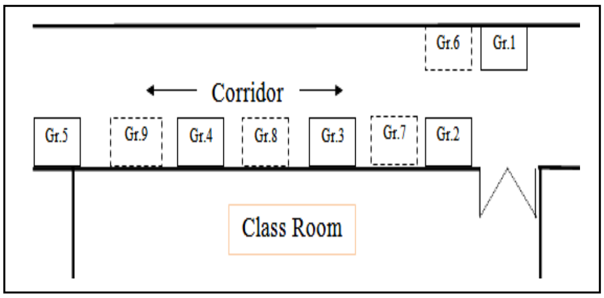


Fig. 3: Layout for arrangement of Gallery Walk

8) ***Evaluation of students by Evaluation Team:***
The students were informed well in advance about the evaluation criteria and about announcement of prizes based on the evaluators' grades. The evaluators' team comprised of two senior faculty members **(Dr. P. S. Patil and Dr. Y. M. Patil)** from department of civil engineering. The evaluators were also informed about the tasks of evaluating students well in advance and also about evaluation criteria.
Initially only 5 groups (Gr.1 to5) were allowed to display their posters and after one or two groups get evaluated, remaining 4 groups (Gr.6 to9) were asked to display their posters nearer to earlier groups as indicated in Fig.3 (dotted boxes), to avoid chaos. The evaluators started evaluating students by visiting the stations sequentially following the guidelines.

9) ***Visits of individual groups (rotation) to the groups displaying posters:***
After the evaluation of a particular group was done by evaluators, remaining groups (Gr.6 to 9) were allowed to visit the stations (where posters of other groups were displayed) and listen to the presenters of the groups and get resolved their queries. This way the groups were rotated for getting the information on the topics chosen by other groups.
Two students, **Ms. Revati Tanavade and Mr. Sangram Patil** voluntarily worked for reporting and monitoring this Gallery Walk Activity and both these students contributed in completing this activity successfully.

10) ***Selection of groups securing higher grades / ranks based on evaluators grading:***
The evaluators were informed to evaluate all the groups and also individual members of every group following the evaluation guidelines rigorously.

11) ***Prize distribution:***
After rigorous evaluation, three groups securing maximum grades were selected and prizes were distributed to these groups by evaluators. The evaluators expressed their views about the 'Gallery Walk Technique' and its advantages for better learning of students.

D. Evaluation of students in Unit Test Examinations:

The performance of students, after implementation of Gallery Walk, was evaluated through Unit Test examination (2018-19) by calculating the average attainment of course outcomes (CO) achieved by students. The Unit Test examination (2018-19) was conducted for 25 marks. Of the two total questions of the Unit Test examination, question no.2 was set on the topic (Special Concretes) taught by using **'Gallery Walk'** method.
Similarly, the performance of students in the Unit Test examination in the previous year 2017-18 was also evaluated. The Unit Test examination conducted in the year 2017-18 consisted questions on the same topic (Special Concretes) but the topic was taught by using another cooperative learning method namely **'Jigsaw'** Method.

Further, the performance of students in the academic year 2016-17 in the Unit Test examination was evaluated for the sake of comparison. Question no.1 of Unit Test was set on the topic (special concretes) which was taught by using traditional teaching method (lecturing, chalk and talk method).The questions set in Question Paper of Unit Test examinations of current and previous years were approximately for same marks.

The questions were mapped with CO4 of the course 'concrete technology'. The statement of CO4 is stated as 'Describe the properties of special types of concretes based on their material composition and method of manufacture'.

The comparison of marks obtained by students and the average attainment levels of the course outcomes in the Unit Test examinations conducted for the current year (2018-19) and previous years (2016-17 and 2017-18) are presented in the Table 1.

Table1. Performance of Students in Unit Test-2

Sr. No.	Unit Test-2 (Concrete Technology)				
	2016-17	2017-18		2018-19	
	Q.1a (12 M*)	Q.2a (7M)	Q.2b (4M)	Q 2a (6M)	Q 2b (4M)
1	5.5	5.5	2.5	0	2
2	5.5	6	2	0	3
3	6	5.5	3.5	4	4
4	3.5	6	0	0	3
5	8.5	5.5	3.5	2	3
6	6	6	3	3	4
7	6.5	6	3	3	0
8	9.5	6	3	5	3
9	8	6	3	2	4
10	7.5	6.5	3.5	2	2
11	8.5	4	2	5	4
12	6	5	3	2	4
13	8	6.5	3.5	4	4

14	7.5	6	3	5	4
15	8.5	7	3	6	4
16	9	6	3	5	3
17	7.5	5	2	3	4
18	6.5	6	3	3	4
19	8.5	6	3	0	2
20	7.5	6	3	3	3
21	8	7	3	2	4
22	8	7	3	4	4
23	8	7	3	2	4
24	8	7	4	5	4
25	8.5	7	4	5	4
26	5	7	3	0	0
27	5.5	7	3	3	4
28	3.5	7	3	6	4
29	8.5	6	3	4	3
30	6.5	7	3	4	4
31	7	7	1	2	2
32	8.5	6	3	3	4
33	7	7	3	5	4
34	7.5	7	3	4	3
35	7.5	6	2	5	3
36	12	7	3	5	3
37	8	6	3	5	4
38	8	6	3	5	4
39	7	6	3	4	4
40	7	6	3	3	4
41	9	6.5	2.5	5	3
42	6.5	6	3	5	3
43	8	7	3	5	3
44	5.5	6	3	0	0
45	8	7	3	5	3
46	7.5	7	3	5	4
47	8	7	3	4	4
48	4.5	7	3	2	2
49	7.5	6.5	2.5	6	4
50	7.5	7	3	4	4
51	6	7	3	4	3
52	10	7	3	5	4
53	5.5	6	3	2	4
54	7.5	7	3	4	4
55	6.5	7	3	2	3
56	7.5	6.5	3.5	5	4
57	7.5	5	1	6	4
58	7.5	6	3	5	4
59	7.5	5	3	6	3
60	8	6	3	5	3
61	6	6	3	6	4
62	7.5	6	3	0	0
63	1	5	3	5	4
64	3.5	6	3	5	3
65	3	7	3	5	4
66	5.5	6	3	5	4
67	7.5	6	3	4	4
68	8	5	3	5	4
69	7.5	5.5	2.5	4	3
70	8.5	6	3	4	4
71	7	6	2	6	5
72	9.5	6	3	5	4
73	9.5	6	3	-	-
74	8	6	3	-	-
75	8	5	3	-	-
76	3	6	3	-	-
77	9.5	-	-	-	-
78	2.5	-	-	-	-
79	9	-	-	-	-
80	8	-	-	-	-
81	7.5	-	-	-	-
Total Marks (M)	**578**	**472.5**	**218.5**	**272**	**243**
Tot. Students attempting Que.	**81**	**76**	**75**	**65**	**68**
Avg. M= Tot M /Tot Students	**7.14**	**6.22**	**2.875**	**4.18**	**3.57**
Avg.Attainment,% = (Avg. M/ Max. M of Que)* 100	**59.5**	**88.8**	**72.8**	**69.7**	**89.3**
Avg. Attainment, %	**59.50** (Traditional Teaching)	**80.83** (Jigsaw)		**79.54** (Gallery Walk)	

***M: Marks**

5. Results and Discussions:

From the results, it is seen that the performance of students' (i.e. average attainment) gets improved by over 33% after implementing gallery walk compared to the results of tradition teaching. The percentage attainment of students is graphically illustrated in Fig.4.

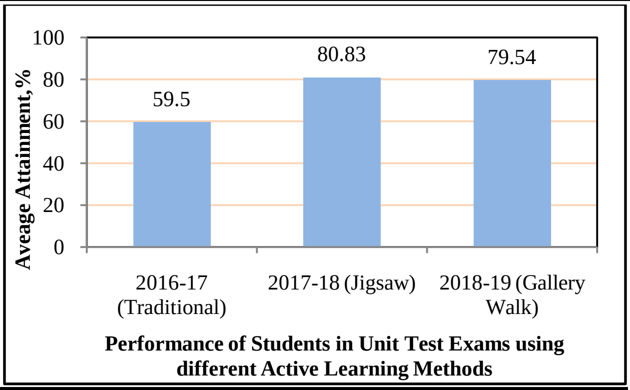


Fig. 4: Students Performance in Unit Test Exams using different Active Learning Methods

From the Fig.4, it is seen that the average attainment of students' outcomes is approximately remains same after implementation of both 'Gallery Walk' and 'Jigsaw' techniques, that is, the attainment levels did not change substantially by implementing both active learning methods. Hence, it can be stated that 'Gallery Walk' method can be considered as an alternative cooperative learning technique to 'Jigsaw Technique' which may result in the improvement in learning of students.

6. Conclusions:

From the study, following conclusions can be drawn:

- Implementation of 'Gallery Walk' technique resulted into 33% improvement of students' performance (average attainment) in the Unit Test examination over traditional teaching method. A little decrement in the attainment level is seen by implementing gallery walk compared to attainment of jigsaw technique. However, implementation of Gallery Walk method resulted in an increase in the confidence level of students, improvement in lifelong learning skills and joyful learning compared to the traditional and jigsaw method.
- As no substantial changes in the attainment levels of students are observed after implementing both, gallery walk and jigsaw techniques, 'gallery walk' method can be considered as an alternative to 'jigsaw technique' for providing active learning to students, which may result in the improvement of students' performance.

Acknowledgement:

Author would like to thank Dr. Mrs. S. S. Kulkarni, Director and Dr. S. K. Patil, Dean Academic, of K.E.Society's, Rajarambapu Institute of Technology, Rajaramnagar for motivating in carrying out the study. Author would also like to thank senior professors of Civil Engineering Department Dr. P. S. Patil and Dr. Y. M. Patil and department office attendant Mr. Sudhir Kale for active involvement in the implemented classroom activity.

The author appreciates the contribution of Third Year B.Tech. class students Ms. Revati Tanavade and Mr. Sangram Patil and for their active role during implementation of Gallery Walk activity.

References:

Edel-Malizia S. (2015) Pedagogical Practices—Gallery Walk Retrieved [7.5.2019] from https://scholarsphere.psu.edu/downloads/1jw827964s.

Farrah, A.Z.(2015) doi: http://dx.doi.org/10.18326/rgt.v8i2.226-237.

Francek, M. (n.d.) Starting Point: Teaching and Learning Economics-Step by Step Instructions. Retrieved [12.5.2019] from https://serc.carleton.edu/introgeo/gallerywalk/step.html.

Francis, H. A. (2013) Using Jigsaw Technique as an Effective Way of Promoting Cooperative Learning Among Primary Six Pupils in Fijai, International Journal of Education and Practice, 2013, 1(6), 64-74

Harton, E. (n.d). Teacher Toolkit –Gallery Walk Retrieved [12.5.2019] from http://www.theteachertoolkit.Com/index. php/tool/gallery-walk.

Muhammad, H. R.(2016) Gallery Walk; An Alternative Learning Strategy in Increasing Students' Active Learning. Retrieved [7.5.2019] from http://repository.unhas.ac.id/handle/123456789/18762.

Namaziandost E., Fariba R. E., Mehdi, N., and Rasool M.(2018) The Effect of Gallery Walk Technique on Pre-intermediate EFL Learners' Speaking Skill, Language Teaching Research Quarterly, (8), 1–15.

Ravindran, D. and Lenin, N. (2016) Adoption of Outcome Based Education in Engineering Education during Transition Stage. Retrieved [12.5.2019] from https://www.researchgate.net/publication/301228664.

Sreekanth,N.V., Arjun C C and Guruprasad, K. (2015) Outcome Based Education: Strategies and Tools for Indian Scenario, Journal of Engineering Education Transformations (JEET), Special Issue: Jan. 2015, eISSN 2394-1707, 348-352.

Wadhwa, S., Barlow, A. and Jadeja, S. (2015) Activity Based Learning: Overcoming problems in implementing OBE in Engineering Education during transition phase, 43rd Annual SEFI Conference, Orléans, France, 1-9.

Teaching Learning Related to Engineering Education – A Review

Pallavi A. Padalkar[1]

[1]Guru Gobind Singh College of Engineering and Research Centre, Nashik.
[1]padalkar.pallavi@gmail.com

Track No: 1
Track Name: Different Dimensions of Teaching Learning.

Abstract: In India Engineering education has been facing substantial challenges in regard to good quality teaching and knowledge deployment. This has given rise to the need of new teaching methods and learning techniques which must be developed in the field. Teaching being considered as a complex activity. The present review and study showcases on the concept of good teaching practices and methodologies affecting performance pattern of students in higher education with specifically related to engineering stream. The field of engineering being a continuously evolving stream, demands an innovation in the teaching and learning methodology, therefore, the review is anticipated to distinguish the factors which can be used for the evaluation of the students and the good teaching practices. The present study focuses on the latest innovative teaching methods in engineering education and recognizes the important factors influencing the same**.** Today's generation being the Google generation needs to be tackled very carefully. To provide engineering education to such students is the challenge in front of the tutors, which can only be dealt using new techniques and teaching methods.

Keywords: evaluation, Google generation, innovative, learning techniques, teaching methodology

5. Introduction

The undergraduate (UG) engineering students graduate from academic institutes with knowledge and information that associates their computational proficiency to engineering and technology principles, processes and practice. However, there appears to be a scarcity of evidence to suggest that UG students receive sufficient instructions throughout their curriculum and studies. This results in a need of different approaches of educating the undergraduate engineers. When it comes to training methods and a change in teaching methods, it's important to know the different ways in which people learn and retain information. Teaching methods should be adjusted to the different types of learners to ensure they have the best experience. According to Tech News, the different learning styles varies, a typical classroom will contain 20% Visual Learners, 25% auditory learners, 15% kinaesthetic learner and the remaining 30% consisting of students with mixed learning styles. This is an interesting statistic that supports that learning methods should cater to all types of learners. [5]

A. TYPES OF LEARNERS

Visual learners – These learners prefer to see information and to visualize the relation between the ideas. Such learners like referring to diagrams, charts, or graphs. These learners generally like to colour code information and translate information to visual data for better understanding and memorization. [ ]

Fig. 1 Visual Learners

Auditory learners – They choose to hear information rather than reading it or seeing it displayed visually. They tend to be linear thinking and may repeat information several times to remember what they had just learned. [6,7]

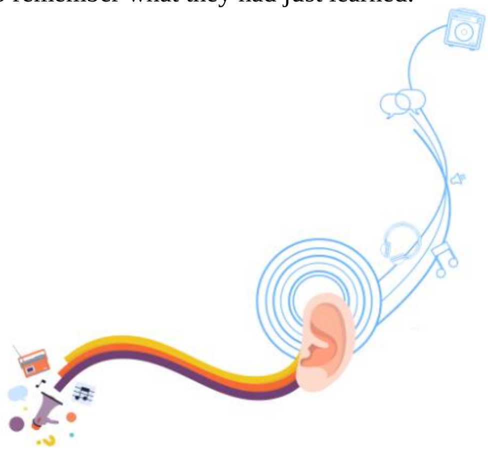


Fig. 2 Auditory Learners

Reading / Writing learners – Reading and writing being one of the ancient methods of learning, is the best method of interacting with text is more powerful than that of hearing or seeing images. [6]

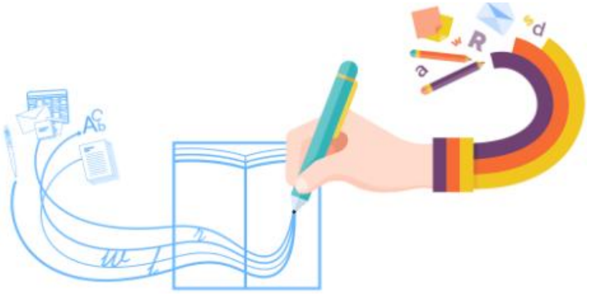


Fig. 3 Reading and writing Learners

Kinaesthetic learners - This type of learner is also known as the 'hands on' learner, they learn best by practising and doing. A kinaesthetic learner usually will enjoy building, making or creating as it gives them the opportunity to solve problems. [7]

Fig. 4 Kinaesthetic Learners

Intrapersonal learners - This type of learner prefers to have written directions and loves to make lists. The best way for this learner to retain information is to rewrite ideas in their own words and use a printout of presentations to help guide them and lastly review class notes. [6]

B. Active learning

Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing. While this definition could include traditional activities such as homework, in practice active learning refers to activities that are introduced into the classroom. The core elements of active learning are student activity and engagement in the learning process. Active learning is often contrasted to the traditional lecture where students passively receive information from the instructor. [2]

C. Collaborative learning

Collaborative learning can refer to any instructional method in which students work together in small groups toward a common goal. As such, collaborative learning can be viewed as encompassing all group-based instructional methods, including cooperative learning. [2]

D. Cooperative learning

Cooperative learning can be defined as a structured form of group work where students pursue common goals while being assessed individually. The most common model of cooperative learning found in the engineering literature is that of Johnson, Johnson and Smith. [,] This model incorporates five specific tenets, which are individual accountability, mutual interdependence, face to-face promotive interaction, appropriate practice of interpersonal skills, and regular self-assessment of team functioning. [2]

E. Problem-based learning (PBL)

Problem-based learning (PBL) is an instructional method where relevant problems are introduced at the beginning of the instruction cycle and used to provide the context and motivation for the learning that follows. PBL typically involves significant amounts of self-directed learning on the part of the students. [2]

6. Teaching Style

Teaching style can be defined in terms of answers to five questions: [3]

a. What type of information is emphasized by the instructor: concrete-factual, or abstract—conceptual, theoretical?

b. What mode of presentation is stressed: visual—pictures, diagrams, films, demonstrations, or verbal—lectures, readings, discussions?

c. How is the presentation organized: inductively—phenomena leading to principles, or deductively—principles leading to phenomena?

d. What mode of student participation is facilitated by the presentation: active—students talk, move, reflect, or passive—students watch and listen?

e. What type of perspective is provided on the information presented: sequential—step-by-step progression (the trees), or global—context and

Preferred Learning Style		*Corresponding Teaching Style*	
sensory intuitive	perception	concrete abstract	content
visual auditory	input	visual verbal	presentation
inductive deductive	organization	inductive deductive	organization
active reflective	processing	active passive	student participation
sequential global	understanding	sequential global	perspective

Fig. 5 Dimensions of Teaching and Learning Styles

7. Literature Review

The literature review and study of the effectiveness of each approach is necessary, and the same is discussed in table 1:

Table 1. Literature review

S. No.	Authors	Description of study
1	Aabha Chaubey et.al (02) (2018) [4]	This review draws an attention towards the debate over good teaching needs to be considered in a comprehensive manner where we must see the presence and impact of different aspects related to student and teachers like assortment in the infrastructure of the educational institutions, sociocultural, political and economic factors and the most important is the composition of the class room (gender, social background, ethnicity, etc).
2	H. Kipper and T. Rüütmann (2013) [9]	At least four different kinds of knowledge are essential for expert teaching: knowledge of content; pedagogical content knowledge; general pedagogical knowledge; and knowledge of learners and learning. The goal of the article is to help engineering teachers acquire knowledge in each of these areas.
3	Michael Prince (2004) [2]	Defined the common forms of active learning most relevant for engineering faculty and critically examines the core element of each method.
4	Richard M. Felder (2002) [1]	During the study following aspects were explored: 1) Which aspects of learning style are particularly significant in engineering education? 2) Which learning styles are preferred by most students and which are favored by the teaching styles of most professors? 3) What can be done to reach students whose learning styles are not addressed by standard methods of engineering education?
5	Detlef R Prozesky (2000) [3]	Assessment must be carefully planned so that it supports the learning we want to see - we know that students learn what they believe they need to pass the exams, and leave out the rest .

Summary

Readers must clarify what is being studied and how the authors measure and interpret what "works."

8. Methodology

We understand things in the light of our past experience. This is also true of 'learning' we get our ideas of what 'learning' means from what happened to us in the past. Learning can be formal or informal. People learn in different ways and learning continues throughout life. Teaching is helping other people to learn. Teaching is a process in which a teacher cultivates an open and trusting relationship with their students. [3]

Table 2. Terms used in teaching

Terms Used	Definition
Aims	A general statement of what is intended in a particular lesson or course of study.
Assessment	A means of comparing students' actual achievement with desired standard of achievement as outlined in the syllabus.
Brainstorming	A collection of ideas shared in a group encouraging free expressions.
Buzz group	Discussion in groups of 2-4 people.
Case study	Test description to facilitate imagination and discussion of a possible situation.
Curriculum planning	A plan worked out in advance fixing the order or the timetable of a group of educational activities for a particular course - aims, content, methods, and evaluation.
Demonstration	Teacher activity - e.g. to teach a practical skills or why certain outcomes occur.
Learning objectives outcomes	Specific statements of behavior by a student after a period of learning - proving they have learned.
Lecture	Subject introduced and delivered by the teacher in a specific time which transmits information.
Practical	Student activity - e.g., learning a skill or group work.
Project	A task based on investigation with a specific time table. The teacher will advise the student on resource and materials. The student reports back with findings, usually in written format.

Seminar	A group of 4-5 students following up something that has already been introduced on the course. Involves reading of an essay or paper by one group member followed by discussion.
Tutorial	One-to-one teaching (student and teacher) usually for counseling purposes based on the students' work.
Role Play	A situation is acted out to create insight into students own behavior.

*The glossary compiled by Sue Stevens

Table 2 shows the terms involved in teaching and learning process. Effective teachers are those who practice various teaching methodologies and tools of teaching for the betterment of the students.

Through these different approaches to teaching, educators can gain a better understanding of how best to govern their classrooms, implement instruction, and connect with their students. Within each category of teacher and student centeredness and tech usage, there are specific teaching roles or "methods" of instructor behaviour that feature their own unique mix of learning and assessment practices. Learn more about each one to find the best fit for your classroom. [5]

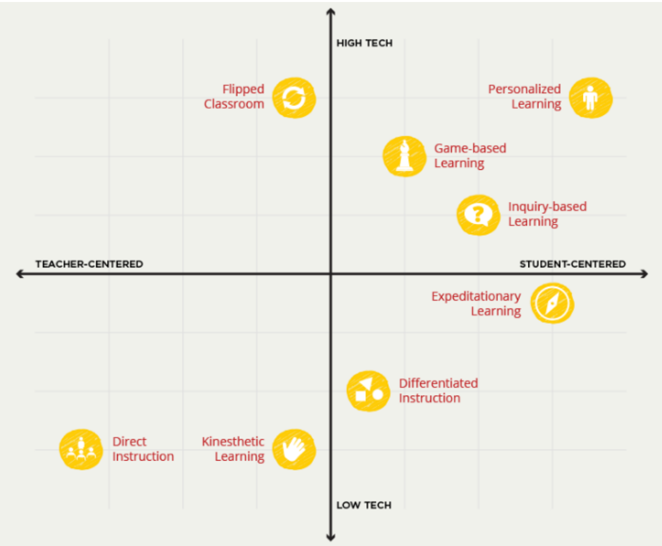


Fig. 6 Tech. VS Teacher / Student Centeredness

In 1984 a computer-assisted "Write To Read" (WTR) program was designed and tested in a number of US schools over the following decade. Results were mixed; some schools achieved good results, others not. One reason for the limited success was that WTR programs were not completely implemented in all schools so the evaluation rests on incomplete data (Slavin, 1991). Comparison over time is also difficult as technology has changed, as has skills in computer use. This WTR after the rise of internet brought a revolution in the teaching learning process.

The 21st century gave rise to the Google generation students, who need to be tackled very carefully.

Technology can be a powerful tool for transforming learning. It can help affirm and advance relationships between educators and students, reinvent our approaches to learning and collaboration, shrink long-standing equity and accessibility gaps, and adapt learning experiences to meet the needs of all learners. This introduced new terminologies like Equity and Accessibility in education

Equity in education means increasing all students' access to educational opportunities with a focus on closing achievement gaps and removing barriers that students face based on their race, ethnicity, or national origin; sex; sexual orientation or gender identity or expression; disability;

English language ability; religion; socioeconomic status; or geographical location.

Accessibility refers to the design of apps, devices, materials, and environments that support and enable access to content and educational activities for all learners. In addition to enabling students with disabilities to use content and participate in activities, the concepts also apply to accommodating the individual learning needs of students, such as English language learners, students in rural communities, or from economically disadvantaged homes. Technology can support accessibility through embedded assistance, for example, text-to-speech, audio and digital text formats of instructional materials, programs that differentiate instruction, adaptive testing, built-in accommodations, and assistive technology.[8]

9. Discussion and Concluding Remarks

In the review a discussion was carried out about the teaching learning related to engineering education. Teaching learning has progressed from the Traditional methods to modern methods of the 21st century. Technology has allowed us to reorganize the design of physical learning spaces to accommodate new and expanded relationships among learners, teachers, peers, and mentors to facilitate the Google age learners.

A *digital use divide* method of education is suggested by the researchers to exist between learners who are using technology in active, creative ways to support their learning and those who predominantly use technology for passive content consumption.

The focus on providing Internet access and devices for learners should not overshadow the importance of preparing teachers to teach effectively with technology and to select engaging and relevant digital learning content.

E. Equations should be edited in equation editor

F. Lengthy proofs / derivations should be avoided .If necessary, they should be appended to the manuscript

10. References

Journal Article

[1] Richard M. Felder (2002), "Learning and Teaching Styles in Engineering Education", *Engr. Education*, 78(7), 674–681.

[2] Michael Prince (2004), “Does Active Learning Work? A Review of the Research”, *J. Engr. Education*, 93(3), 223-231.

[3] Detlef R Prozesky (2000), “Teaching and Learning” *Community Eye Health* Vol 13 No. 34.

Article with DOI

[4] Sådhanå (2018) 43:188, https://doi.org/10.1007/s12046-018-0946-3

Web References

[5] https://blog.prezi.com/the-four-different-types-of-learners-and-what-they-mean-to-your-presentations-infographic/

[6] https://www.techquarters.com/what-are-the-different-types-of-learners/

[7]https://teach.com/what/teachers-know/teaching-methods/

References in special issue

[8] Reimagining the Role of Technology in Education: 2017 National Education Technology Plan Update, JANUARY 2017, U.S. DEPARTMENT OF EDUCATION http://tech.ed.gov.

[9] H. Kipper and T. Rüütmann (2013), Special Focus Paper, “Teaching For Understanding In Engineering Education”, http://dx.doi.org/10.3991/ijep.v3iS1.2402**Hands-On Learning through**

Hands-On Learning through Concept Map and Tool / Service Demonstration for Internetworking Protocol Course

Ashwini B. Patil

Assistant Professor, Department of Information Technology,
Rajarambapu Institute of Technology, Rajaramnagar,
Sakharale (Islampur) Dist. Sangli
Maharashtra, India - 415414.
ashwini.patil@ritindia.edu
Track No:1
Track Name: Different dimensions of Teaching-Learning

Abstract:
Networking related courses like data communication, computer networks and internetworking protocol are the core part of IT curriculum, such courses are hard to teach in class in theoretical aspect. There are various challenges while teaching such courses. As the data packets flowing in the network are not visual in network, students are not able to correlate the concept to scenario in the real network. Only theoretical knowledge of networking concepts is not sufficient. In this paper, author have discussed active learning techniques/methods like Concept Map, Software Tool demonstration, network service configuration and demonstration, which is used for Internetworking Protocol course. Graphical representation using concepts/ideas and practical implementation, these two approach are really useful for better understanding of networking related courses, which gives better result. Students will learn more effectively through hand-on, it will also help to increase the networking skill of IT professional.

Keywords: Networking, Protocols, Concept Map, Tool Demo, Installation / Configuration, Demonstration, Wireshark, tcpdump, pathping, pathtrace

1. Introduction

Internetworking Protocol, this course deals with different network services or protocols like IP, ICMP, IGMP, FTP, TFTP, TELNET, DNS, DHCP,WWW, SMTP, HTTP etc. The learning outcomes of this course are as follows,

- **a.** Describe in writing the terminology and concepts of client-server models with Berkeley socket programming.
- **b.** Explain the concepts of network protocols and services like ip, dhcp, dns, ftp, tftp, remote login and telnet, www, http, email along with their packet formats.
- **c.** Analyse the packet formats of network protocols and services like ip, dhcp, dns, ftp, tftp, remote login and telnet, www, http, email etc.
- **d.** Compare different network protocols, services and summarize in writing.
- **e.** Summarize the working of network protocol analyzing and simulation tools like Wireshark, tcpdump, ns2 etc.

At the end of course each students should able to explain how each of this network protocol work, what is the basic packet format, capture and analyse the real packets from the network, they also able to install, configure and demonstrate the network service.

Giving them theoretical knowledge in class is insufficient for better understanding of the networking concepts. Practical demonstration of different networking concepts along with packet analysis is essential for understanding of this course.

So along with the traditional teaching method, Concept Map, Tool demonstration, service configuration, packet analysis with modern tools should be used so as to achieve all above listed outcome.

2. Challenges faced while teaching the course

Different network protocols or services are having different

- ✓ Packet formats (Message format for Query and Response message from client to server)
- ✓ Installation and Configuration steps
- ✓ Working Mechanism

So just by theoretical teaching in the class, the student cannot able to

- ➢ Recall the concepts thought in class
- ➢ Relate the concepts from book with real scenario in network k series
- ➢ Install and configure the network services
- ➢ Demonstrate the working of installed and configured service
- ➢ Analyze the real packet in the network.

So traditional classroom teaching for networking courses is not suitable, practical implementation of differ concepts is important to better understand of this course.

3. Use of Teaching/Learning Techniques

For, Internetworking Protocol course, I have used following activity based learning technique,

- Concept Map preparation
- Installation-configuration-demo of network service
- Demonstration of networking concept using modern tools
- Poster Presentation
- Summary Writing
- Packet analysis using Wireshark, tcpdump etc.

These activities are really gives good result in teaching learning process.

After using this technique, I found the result of course is increased as compared to last year.

4. Purpose or Motivation of Techniques

- **Concept Map :**

Concept map is used to visualize the knowledge. It is used to organize and structure the knowledge on paper. Through concept map students can manage concepts into sub-concepts, which will enrich the students' understanding of a topic. Concept map help to re-call and remember the concepts, working of different network protocols, Packet (message) formats of all the protocols

The concept map is beneficial to both students and teachers for good understanding of the topic and improve the teaching methodology respectively [2]

Concept map is more effective learning tool, which is recommended in higher education, when it was combined with other suitable learning techniques as per the course to enhance the learning environment [3].

- **Use of modern networking tools /utilities**

- Utilities: ping, trace route, pathping
- Packet analyzers: Wireshark, tcpdump
- Network Simulator: NS2

Using the utilities like ping, trace route and pathping, it is possible to show the practical demo of ICMP (Internet Control Message Protocol).

The packet analyzer help to capture the live packet of different network services, so that students and co-relate the packet format from books with real captured packets and they can analyses the captured packet for troubleshooting in the network.

Through the network simulator like NS2, students can design and test their own network scenario, which will be helpful for them in research in new protocol design and testing.

- **Installation-configuration-demo of network service**

To learn networking related courses, Nurul I Sarkar [1] suggested to use practical demonstration along with classroom teaching.

6. Sample concept maps prepared by students

Student will get confidence that they can installing – configuring and testing the network service. This will increase the knowledge and networking skills of the students.

5. Procedure of implementation

Following procedure is used for implementation of this learning methodology,

Step 1: Group Formation of 3-4 students
Step 2: Topic allocation
Step3: Concept Map preparation of allocated topic
Step4: Installation-configuration of network service
Step5: Presentation/ Demonstration of concept map and configured service /Tool

Concept map preparation and presentation taken in two ways:

1) During lecture :
At the completion of every protocol in the lecture,

a) Groups of 2-3 students get formed
b) Each team have to prepare the concept map of topic taught in the class.
(during map reparation, teacher will act as mentor to the team)
c) Randomly few concept maps are discussed in the class.
d) After discussion, correction are told to teams

2) Work given outside the classroom:

a) Groups of 3-4 students get formed
b) Topics are assigned to them for preparation of concept map on poster.
c) Groups discussed to mentor and finalize the poster of concept map
d) Each group have installed, configured the network service (either on Windows or Ubuntu OS)
e) Each group has demonstrate how to make use of these network service.
f) They have used Wireshark tool for live capturing the data packet while demonstration and analysed that captured packet by correlating packet format from book and actual content of packet.
g) Report are prepared by students including

- Description about topic or network service
- How that network service works
- Installation and configuration steps.
- How to use the networks service.
- Comparison of packet format with live data packet capture through Wireshark and Content analysis.

This report was shared with other students through Moodle Server.

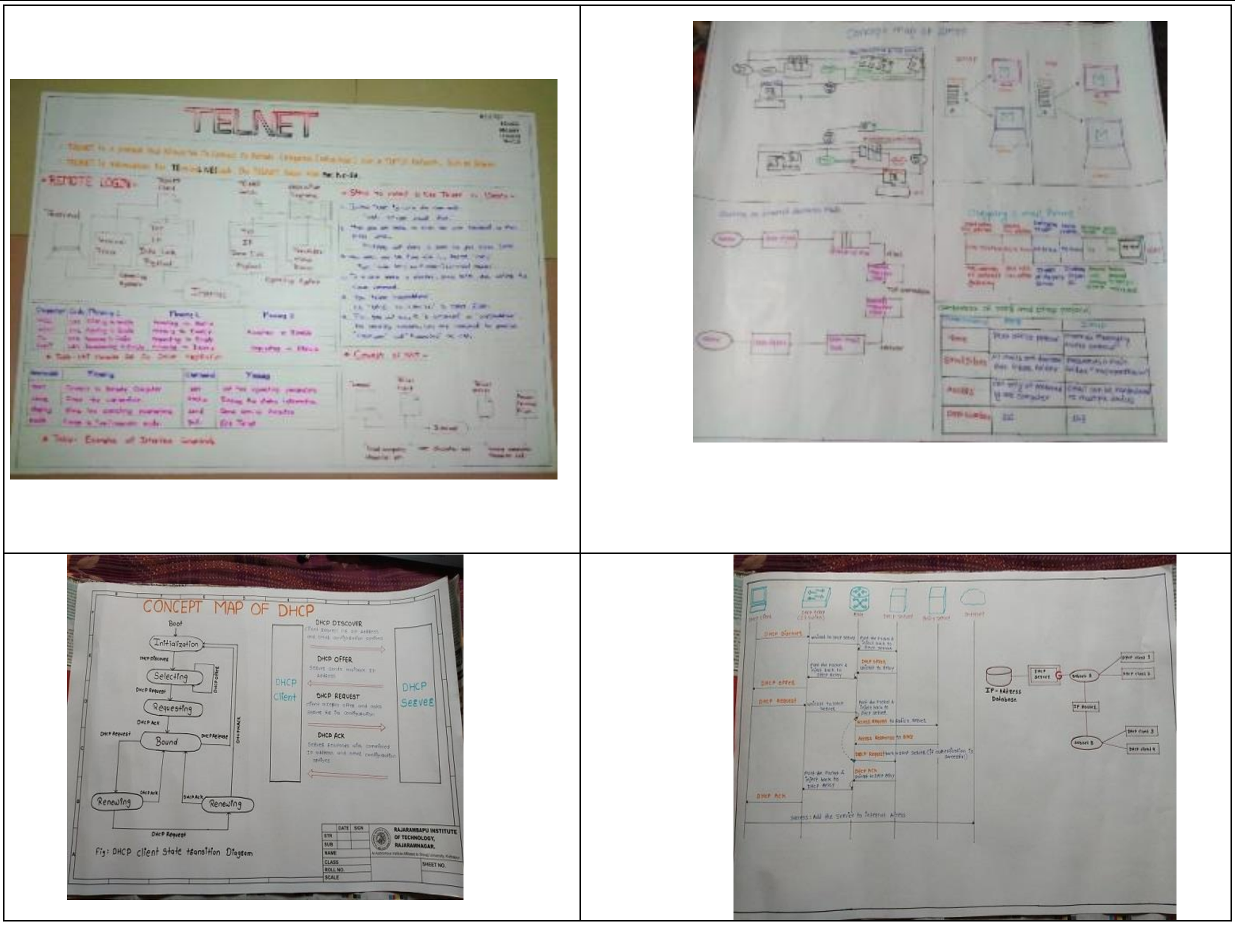


Fig. 1 Sample Concept Maps

7. Networking tools/ utilities used by students for demo

Students have used either utilities or tool for actual implementation and demonstration of concept.
Following are few examples,

- ✓ **Utilities:** Ping, traceroute, pathping
- ✓ **Packet analyzers:** Wireshark, tcpdump
- ✓ **Network Simulator**: NS2

8. Case Study: Packet analysis done by students

I have discussed one case study that, how students analysed the real packet captured in the network. e.gFigure2 shows, HTTP Request message/packet format

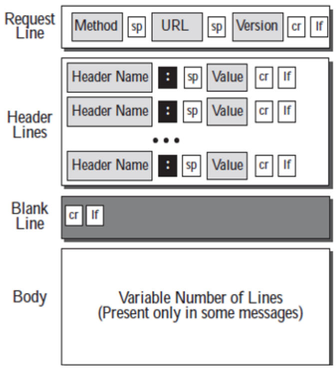


Fig. 2 HTTP Request Packet Format

(Reference from:TCP/IP Protocol Suite)
Using the Wireshark (packet capturing and analysis tool) students have captured the real packets in the network, by opening URL [http://172.22.4.64/moodlein browser.](http://172.22.4.64/moodle)

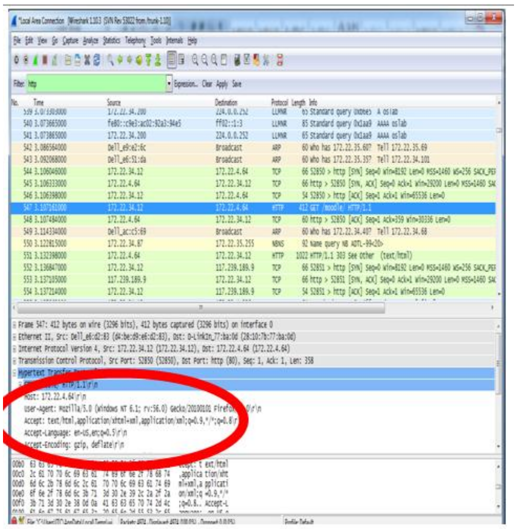


Fig. 3 Packet capturing and analysis using Wireshark

Student have analysed, packet format with real captured packet.
E.g

Real Content:

Method	sp	URL	sp	Version	cr	lf

Captured content: **GET /moodle/ HTTP/1.1 \r \n**
Here Different headers are

1) **User Agent:** Identify the cline program
   Example: User agent : Mozilla 4.0
2) **Accept:** Specify certain media types which are acceptable for the response.
   Example: Accept: text/plain; text/html
3) Accept-Language: The Accept-Language request-header field is similar to Accept, but restricts the set of natural languages that are preferred as a response to the request.
   Example: Accept-Language = en-us
4) Accept-Encoding: The Accept-Encoding request-header field is similar to Accept, but restricts the content-encoding that are acceptable in the response.
   Example: Accept-Encoding: compress, gzip

Etc…….
For every network protocol, students has done the installation, demo and real packet analysis.
This will give practical exploration of every concept or topic.

9. Suitability of Techniques to Course

Both this technique, I found more suitable for networking related courses, because it was help the students for better understanding of concepts, correlating theory with real approach.
Concept Map help the students to,

❖ Recall and remember the concepts ,working of different protocols
❖ Differentiate in the packet (message) formats of all the protocols.

Service Configuration/Tool demonstration help the students to,

❖ Install and configure the network service
E.g Install and configure the FTP server.
❖ Show the real demo of service in network
E.g Upload and download the files to and from configured FTP server.
❖ Analyze and interpret the given packet format
e.g Analyze the following header information,

GET/tutorials/other/top-20-mysql-best-practices/ HTTP/1.1
Host: net.tutsplus.com
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.1; en-US; rv:1.9.1.5) Gecko/20091102 Firefox/3.5.5 (.NET CLR 3.5.30729)
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-us,en;q=0.5
Accept-Encoding: gzip, deflate
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
Cookie: PHPSESSID=r2t5uvjq435r4q7ib3vtdjq120
Cache-Control: no-cache

❖ Draw the packet for (Query/Reply) based on given scenario.

e.g Suppose the DNS client is looking for IP address of computer having the domain name "ritindia.edu." Show the DNS query and response messages.

10. Rubrics designed for Evaluation

Activity based evaluation is done for this course. The evaluation carried in group through poster presentation and demo of the tool or network protocol.
Following is the sample rubrics sheet design to do the evaluation,

Criteria for evaluation/Level	Barely Acceptable (1)	Basic (2)	Good (3)	Very Good (4)	Grade Point as per Roll No.s			
Concept map preparation and understanding (4)	Concepts and Ideas are disconnected	Concepts and ideas are somehow linked together but reflect some inconsistency	Concepts and principles are presented in consistent fashion	Concepts and principles are presented in consistent fashion and well understood				
Demonstration(4)	Know the list of tools/services to demonstrate the concept.	Service / tool are just installed, but not able to configure it and demo the use of it.	Demonstrated the configuration of service / Tool, but not able show the application use.	Demonstrated the configuration of service / Tool along use or application.				
Q&A (4)	Answer at least one question correctly, need clarification	Answer most questions correctly, need clarification sometimes	Answer most question correctly and concisely	Handle difficult questions easily with confidence and illustrative explanation				
Total								

Fig. 4 Rubrics for evaluation

11. Outcomes of Technique

The techniques used found more suitable for the course. Following are some outcomes of using this technique for the course,
Students are able to,

❖ Correlate Theoretical concepts to real working of protocol.
❖ Understand the working principle of the protocol.
❖ Understand basic packet format
❖ Differentiate between the services
❖ Install, configure and use any network service.
❖ Analyze the packet formats and answer the analytical problem statement

12. Feedback from students

Feedback was taken from students based regarding the activity based learning,

Fig. 5 Student Feedback

The feedback given by students is positive sign of their learning of the course.

13. Results and Discussion

Curriculum: 15-19

Academic Year: 2017-18 (Third Year)

Table 1. % of attainment for AY 2017-18

COs	**Outcome statement**	**Threshold based Attainment %**
CO_IT3051_**1**	Describe in writing the terminology and concepts of Client-Server models and network protocols.	88
CO_IT3051_**2**	Explain the concepts of network protocols like IP, FTP, TFTP, Remote Login and TELNET services along with their packet formats and WWW.	77
CO_IT3051_**3**	Accurately calculate the values of protocol fields for the given requirements.	69
CO_IT3051_**4**	Compare different network protocols, services and summarize in writing.	87
CO_IT3051_**5**	Recommend computer programs for the given requirements to demonstrate the working knowledge of Berkeley socket programming.	96

The above table shows the learning outcomes for year 2017-18, that was modified, as this is networking course, focus is more on practical approach along with theoretical knowledge.

The Modified Cos are as follows,

Academic Year: 2018-19 (Third Year)

Table 2. % of attainment for AY 2018-19

COs	Outcome statement	**Threshold based Attainment %**
CO_IT3051_1	Describe in writing the terminology and concepts of Client-Server models with Berkeley socket programming.	53
CO_IT3051_2	Explain the concepts of network protocols and services like IP, DHCP, DNS, FTP, TFTP, Remote Login and TELNET, WWW, HTTP, Email along with their packet formats.	84
CO_IT3051_3	Analyze the packet formats of network protocols and services like IP, DHCP,DNS, FTP, TFTP, Remote Login and TELNET, WWW, HTTP, Email etc.	67
CO_IT3051_4	Compare different network protocols, services and summarize in writing.	82
CO_IT3051_5	Summarize the working of Network protocol analyzing and simulation tools like wireshark, tcpdump, NS2 etc	78

Following figure shows the CO attainment for the course for year 2018-19,

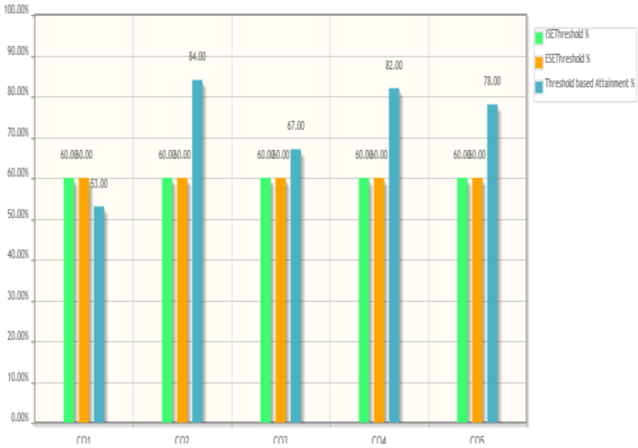


Fig. 6 Attainment for AY 2018-19

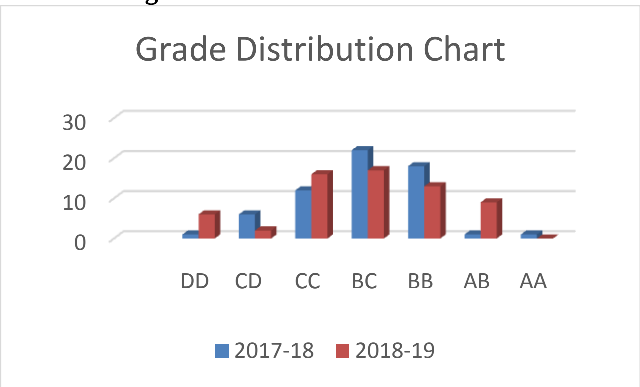


Fig. 7 Grade Distribution chart

Above figure shows that there is uniform distribution of the grade.

14. Conclusion:

Hands-on practice of different networking concept through the use of networking tools / service configuration along with demonstration are helpful for better learning of such courses. Concept map is useful enrich the understanding of the students. Use of such methodology is really applicable for networking related courses.

15. References

1) Nurul I Sarkar, "Teaching Computer Networking Fundamentals Using Practical Laboratory Exercises" IEEE TRANSACTIONS ON EDUCATION, VOL. 49, NO. 2, MAY 2006

2) Amruta Suresh Awati, Arti Dixit, "Automated Evaluation Framework for Student Learning using Concept Maps" , International journal of advanced research, Ideas and Innovations in technology" , *IJARIIT 2017*.

3) Ian M. Kinchin, "Concept Mapping as a Learning Tool in Higher Education: A Critical Analysis of Recent Reviews", The Journal of Continuing Higher Education, 2014

4) Behrouz A. Forouzen, "TCP/IP Protocol Suite", 4th edition, Tata Mag. Hill, 2010

5) https://www.wireshark.org/

Perspective of Emerging Model for Effective Teaching-Learning using ICT

Vikrant Shaga[1], Vinita Gaikwad[2], Sayyad Samee[3]

[1] Department of MCA, Thakur Institute of Management Studies, Career Development and Research, Kandivali(E), Mumbai
[2]Department of MCA, Thakur Institute of Management Studies, Career Development and Research, Kandivali(E), Mumbai
[3]School of Engineering Symbiosis Skills and Open University, Pune
[1]shagavik@gmail.com
[2]vinitagaikwad2@gmail.com
[3]samee.syd@gmail.com

Track No: 01
Track Name: Different dimensions of Teaching-Learning

Abstract: Many professional bodies in association with Government of India initiated many online workshops and webinars to promote e-learning for the students and faculties. Online videos, study contents, Blogs and other resources foster students to build innovative applications for the continuously changing society. Online contents, videos and other online resources are being created by teachers to facilitate students for better understanding of concepts and to gain knowledge. It is observed that traditional approach of conducting practical in the education domain does not impact the practical skills of the students.

The objective of this study is to enhance practical or experimental approach by introducing unique model in the Indian scenario. This model will promote teachers, students and other learners to use ICT tools in combination with open source tools and technologies. This will create an opportunity for the domain experts to explore their innovative ideas in the entire teaching fraternity. Positive outcomes can be observed through the proposed model however still results are expected in terms of student participation and their involvement in using this model.

Keywords: e-learning, ICT tools, open source

11. Introduction

In education domain, use of online tools and technologies has increased rapidly thus promoting e-learning. Teachers are using blended teaching learning to enhance better understanding of concepts to students.[1] Usage of ICT tools has various aspects in the area of education. Now days, it is possible to use ICT more effectively in urban and rural location where internet facility and infrastructure facilities are available.[2] Government of India initiated many competitive activities for student or online learners to come up with new innovative ideas and solutions. Once a problem has an appropriate solution, they will be allowed to proceed for implementation.

Vikrant Shaga
Department of MCA, TIMSCDR, Kandivali (E)
shagavik@gmail.com

This will not only enhance student's technical skill but also increase entrepreneurial skills. According to survey, it was found that 400 universities and 14,000 colleges have been benefited with high speed (1 GBPS) internet connectivity in India. [3] Researchers and practitioners defined ICT as a combination of software, hardware, internet and other network resources for the purpose of better perception of key concepts. ICT provided the means of converting physical classroom teaching to online teaching learning.

The conventional way to conduct the practical sessions was to provide the laboratory manual and some instructional material. Students would refer to those documents and try to perform their experiments. Teachers would check the results of the experiment; check the journal with printed outputs and marks were given accordingly. This was the evaluation process for individual student which was very time consuming and not really evolving the student-teacher interaction for solving subjected related problems.

12. Literature Review

As per pedagogical point of view, Higher Education Institutes (HEI's) and other institutes acknowledged that use of ICT in teaching learning enhances knowledge of students and helps in life-long learning [4].E-learning is not only the use of ICT tools and technologies but also concerns with pedagogical issues which focuses on the way of using digital resources, digital communication tools, promote interaction and facilitate pedagogical decision making. Participation in various e-learning courses and online competitions are now important acquisitions in the student's professional career. Even in case of teachers, lifelong learning is the base for professional development [5].

It was observed that teachers who are more towards professional development use ICT tools and latest technologies more efficiently in the class room[6]. One of the models called Training Acceptance Model (TAM) is suggested in Problem Based Learning (PBL) environment. The fact finding of TAM focuses on collaborative learning during lectures and students use ICT tools along with some instructional activities. In this study, authors have mentioned about external variables like peer influence through digital media for collaborative learning [7]. In present scenario, students are not taking interest in executing list of practical by referring detail lab manuals in labs for a specific practical subject. Executing practical without understanding key concepts and problem statement affects the student skills in the real time working environment[8].

13. Proposed Model

This model is designed especially for improving the conduct of practical sessions in education institutes. This model is more student-centric and their own teachers are the course owners or experts who incorporate entire contents into the online system. Teachers become online instructors, designing their own courses and more interestingly, they can use Digital Marketing to get benefits out of it. Benefits in terms of increase in number of users, number of views, monetization and so on. Online education resources created in Gnomio, videos created using Screencast-o-matic uploaded on YouTube and YouTube links embedded in Gnomio. For editing any video, moviemaker tool can be used. Entire model uses ICT and open source tools and technology for better outcome. Role of instructor is to use pedagogy, course management, student management, adding activities, evaluation on the basis of using designed activities, interaction and optimize solution given for the problem.

Role of learner/student is to go through the different activities in a single practical session. At the semester end once all practical experiments are completed, all students can fill the survey form designed in Gnomio. Based on the feedback provided by students, further enhancements can be done to get the better outcome. Expected outcomes from this model are gain in practical knowledge, problem solving mechanism in optimized way, cognitive abilities, reflective thinking, interaction of all students with tutors and peers on single platform with better interpretations. The set of activities mentioned in the Fig.1 is repeated depending on the count of experiments. This set of activities can be useful for theory sessions also.

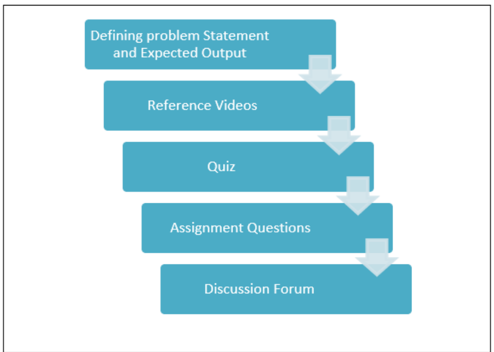


Fig. 1 Set of Activities

Empirical use of this model has been implemented using an open source tool Gnomio (Moodle) for e-learning. For pedagogic decisions, few in-classes and out-class segments have been designed. In-class segment consists of quizzes, assignments and discussion forum where-as out-class ment consists of problem statement with expected output and videos. All the documents and resources are licensed under creative commons.

Defining problem statement describes scope, structure and purpose for solving any problem. Analysis of problem statement is a critical element in structured problem solving, which has not been included in or explicated by traditional stage models of the process [9]. So, problem statement will help the students or learners to understand the scope and purpose of experiment. Expected output will provide the pictorial output or results which were already executed by the course coordinator. File resource in Gnomio helps to upload file which consists of instructional steps and expected output.

Lesson activities in Gnomio embed videos which are created by the instructor. Effective videos are the best tools for active learning if we incorporate it in our lessons. For active learning, important attributes include cognitive load, non-cognitive elements that impact engagement and features promoting active learning. The principle of cognitive theory in multimedia learning is given by Richard Mayer. Various aspects to be considered such as length of video, spoken text or captions, use of pictures with animations and identify the appropriate instructional materials. Few principles by Mayer include-

(a) Coherent Principle: keep the presentation simple and focused

(b) Contiguity Principle: text and graphics can be incorporated. Text should be placed below the graphics or at the top.

(c) Voice should be synchronized with video content.

(d) Segmenting Principle: Complicated parts can be break down to manageable segments or shorter sequence of videos. [10]

Videos can be created using open source tools (Cam studio or Screen Cast-O-Matic) and can be uploaded on YouTube as online resources. The Model proposed in this research paper has used above mentioned online free tools for video creation with audio, captions and live hands on demonstrations for programming subject practical.

Quizzes help learners to retain important information in mind. Incorrect solution to question motivates learners to go in depth for the specific topic. Correct solution to the question motivates them to proceed for the next stage of learning. In both cases, knowledge about the topic increases which leads to better perception of topic. In our model, we include five questions per quiz with assessment criteria as 2 marks for each correct answer.

The assignment questions grab the attention of reader. It helps the readers/instructors to understand what learners achieved after going through entire course content. It improves technical knowledge and increases the awareness about the topic. Assignment writing also increases the cognitive abilities of learners [11].

Discussion forum helps the learners to interact with instructors or course coordinators regarding general issues related to the topic. Not only instructors but members of the group can share their ideas and views about the topic. Groups of learners can discuss the issues and work for specific problem collaboratively to achieve goals. Sharing of resources in the form of images, text etc., can also be possible through discussion forums. Thus, even if instructor is not physically present but he/she can view the post shared by the learners. Solutions can be discussed from anywhere through online discussion forums.

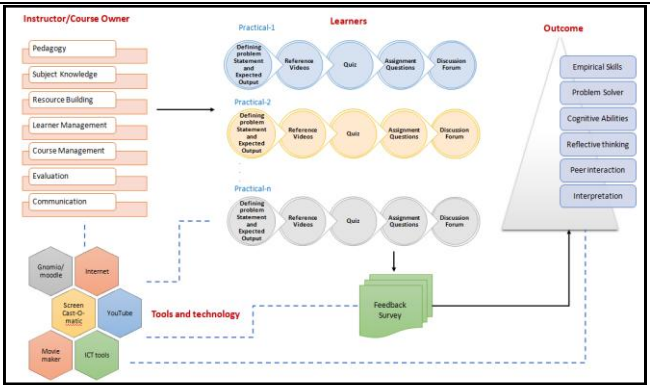


Fig 2. Proposed Model

Online discussion forums also facilitate help seeking by embedding social networks and involve experts to participate in problem solving [12].

Feedback survey involves predefined set of questions available with feedback facility in Gnomio. To collect the information about the model, course contents and instructor's interaction survey is divided into six sections. Questions in these sections are categorized based on relevance, reflective thinking, interactivity, tutor support, peer support and interpretation. Students or learners will choose the appropriate option based on understanding of concepts, perception of topic as well as efficiency in using model.

14. Recommendations

Teachers or course coordinators have to design, observe and build the team. This will enable the students to interact, demonstrate and participate in any problem-solving mechanism. The institution must have a provision of training individuals where not only student but the faculty members can also be a learner. Teachers should emphasis on how their contents can be digitized using open source technologies. Using ICT technologies enables information to be acquired, processed, stored and encourages the learner to solve new social challenges. Teachers training should be geared towards reflective thinking that can lead to successful projects. While digitising the contents, there is a need for environment that enables technological tools to be made readily available at any moment.

15. Conclusions

It is observed in traditional way of conducting practical session; students are unable to retain their instructors' instructions beyond a specific point of time and at the end are unable to gain empirical knowledge. They assume that they have understood all the concepts by executing practical problem and writing theoretical notes in their practical sessions. Few students who are high achievers/toppers interact with instructors in case of any issues in concept. For assignment questions, some students find it boring and some students find it challenging. Many students may copy the executed practical from other students to meet submission deadlines.

Effectiveness of the proposed model at the student level involves metrics related to student access of the resource and student learning. As we have started this process of teaching learning with practical approach, positive outcomes are observed however, the results expected in terms of frequency of student participants and their involvement in using online resources. Verbal feedback about the use of proposed ICT model in teaching learning is more useful and effective. In terms of reflective thinking, interpretation, relevance and tutor support, students find it very important and best way of teaching learning.

Acknowledgement

We would like to thank IIT Bombay for providing high quality training or orientation programmes for teachers. FDP's on use of online and blended learning helped to improve our teaching learning. Use of ICT tools and MOOCs helped us to create our own online educational resources.

References

[1] Tikadar, S., Bhattacharya, and S., Tamarapalli, V. (2018). A Blended Learning Platform to Improve Teaching-Learning Experience, IEEE 18th International Conference on Advanced Learning Technologies (ICALT), Mumbai, 87-89.

[2] Rajarapollu, P. R., and Bhagwatkar, S. A (2017).ICT - An Effective Way for Active and Collaborative Learning Teaching Process in Engineering Education - A Review, International Conference on Transforming Engineering Education (ICTEE), Pune,1-6.

[3] Park, Eunil., Kim, KiJoon., Kwon, Sang Jib., Ohm, Jay Y., del Pobil, Angel P., and Yoo, Kyeongsik (2016). Determinants for the success of regional ICT ventures: a close examination of South Korea, Springer Plus 2016.

[4] Gerick, J., Eickelmann, B. and Bos, W. Large-scale Assess Educ (2017). School‑ level predictors for the use of ICT in schools and students' CIL in international comparison, W. Large-scale Assess Educ (2017) 5: 5.

[5] Kong, S. C. (2019). Partnership among Schools in E-learning Implementation: Implications on Elements for Sustainable Development, Educational Technology and Society, 22(1), 28-43.

[6] Drossel, Kerstin., and Eickelmann, Birgit (2017). Teachers' participation in professional development concerning the implementation of new technologies in class: a latent class analysis of teachers and the relationship with the use of computers, ICT self-efficacy and emphasis on teaching ICT skills, Large-scale Assessments in Education An IEA-ETS Research Institute Journal 2017 5:19.

[7] Kwok, David., and Yang, Silin (2017).Evaluating the intention to use ICT collaborative tools in a social constructivist environment, Kwok and Yang International Journal of Educational Technology in Higher Education 14:32.

[8] Shaga, V. V., Samee, S. S., Arif, M.K., and Vengatesan (2018). Enhancing Empirical approach in teaching-learning using ICT, International Journal of Pure and Applied Mathematics, Volume 118 No. 20, 2727-2734.

[9] N. Annamalai et. al (2013), Importance of Problem Statement in Solving Industry Problems, Applied Mechanics and Materials, Vol. 421,857-863.

[10] Richard Mayer (2008), Applying the Science of Learning: Evidence Based Principles for the Design of Multimedia Instruction.

[11] Dr. Pascale Michelon (2006), What are Cognitive Abilities and Skills and How to Boost Them?

[12] Chao, P., Lai, K., Liu, C., and Lin, H. (2018). Strengthening Social Networks in Online Discussion Forums to Facilitate Help Seeking for Solving Problems. Journal of Educational Technology and Society, 21(4), 39-50.

Reciprocal Questioning (ReQuest) Procedure for Group Learning

Surajkumar G. Kumbhar[1], R. G. Desavale[2]

[1]Automobile Engineering Department, RIT, Rajaramnagar.
[2]Mechanical Engineering Department, RIT, Rajaramnagar
[1]surajkumar.kumbhar@ritindia.edu
[2]ramchandra.desavale@ritindia.edu
Track No: 01
Track Name: Different Dimensions of Teaching Learning

Abstract: The ability to ask relevant questions is an important skill for students. It builds students' ability to develop focused questions from the undergone reading. The objective of this work is to build skills among students which are required to develop a questioning ability from given engineering reading study material. Student development with the perspective of Reciprocal Questioning (ReQuest). The author used innovative teaching technique in the form of ReQuest for automotive chassis course of third year B. Tech. engineering. The final result of that semester showed that the technique improves motivation and learning capability in the students. The results indicate that students can be provided with such a simple structured instructional ReQuest procedure between groups to achieve outcome-based learning. While supplementary research is desirable, for the suggestion on the design of engineering courses so lectures can be utilized properly in the favor of learning of students.

Keywords: ReQuest, Questioning ability

1. Introduction

Today a skill set of instructional activities is required which allows students to apply on courses content, to take possession of self-learning, to use the technology meaningfully, and cooperate. Present education implicates either problem solving or preparation for the same. But teachers and academic institutions skip the problem-formulating stage. The system offers direct facts and procedures to leaner deprived of a chance to improve own questioning ability and investigation. They may remember the things but not gaining the full-fledged understanding to apply in real life.

Reciprocal Questioning (ReQuest) provides instructions which help students internalize learning and leads to greater comprehension. In the ReQuest procedure students work in groups to discover the purpose of reading as instructed by a facilitator. They find themselves in a cooperative learning situation. The author tried a new method in a theory course where many students reply strikingly to the new method, and most of them never tried such one.

This is not the first time where reciprocal questioning is applied. Many researchers had applied it to enhance the ability of the student to learn effectively. Manzo [1] verified ReQuest by evaluating the improvements done by remedial students of age from 07 to 26 years old in one-to-one remediation. Its usefulness with remedial students under medical conditions had led to an interest in its parallel potentialities in classroom settings. This reciprocal questioning is a sub-step of reciprocal teaching. Oczuks [2] explained this scaffolded technique which is purely based on teacher modeling, student participation, and four tactics of a learner used to know the reading material. This includes predicting, questioning, clarifying, and summarizing. Though this was formerly intended for slow and scuffling learners.

Additionally, Helfeldt [3] presented the ReQuest as an instructional technique to support at-risk readers. It can independently apply the valuable metacognitive approach of self-questioning. It united elements from dual time-proven question focused methods like Reciprocal Questioning (ReQuest) and Question-Answer Relationships (QARs) Hence, a scope to more informal investigations is available where someone should inspire to attempt ReQuest with a larger group.

This paper represents how a theory course can be taught in under education in effectively using students centered approach. The author applied the conventional question-answer method. This new concept of interaction within the group of students. The author wrote conclusions based on feedback obtained from the class on which this technique was applied.

2. Development of the technique

The ReQuest procedure is a teaching-learning method in which questions preparation out of given important reading material is used to endorse student learning to comprehend concepts and principles contrast to straightforward facts and concepts communication. In addition to course content, ReQuest encourages the improvement in the preparation of the focused questions, reading with a purpose, and communication. It can also provide opportunities for working in groups, assessing the reading stuff, and so-called life-long learning.

Any theory concept area can be easily adjusted to this. While some will vary between restraints, there are some features of good ReQuest stuff that excelaren as. The reading material must stimulate students to pursue an in-depth understanding of concepts. The reading stuff should push students to make logical decisions and to defend themselves. The material should incorporate the relevant purpose of reading which connects the student with course/knowledge. As used in groups, the material needs a level of difficulty to confirm that the students must work in a team to read and distribute as necessary.

3. Procedure of the technique

The construction of defined instructions is a key step for the ReQuest procedure. The key stage is the preparation of the questions and in-depth reading of the material for profound understanding. To implement this activity a plan of group activity is necessary and every student knows about what they have to be learned and what they have to do in it.

Step 01: Findings appropriate reading material- The first step is to search the relevant reading material related to the course syllabus. The facilitator or teacher plays a critical role to find out the significant stuff which challenges the logical ability of the readers as well as defendable for them.

Step 02: Group Formation- Secondly, the facilitator has to ask students to make groups in a heterogeneous manner. Heterogeneous in gender-wise, in leadership quality-wise, in communication skills-wise, in these sense students made groups of themselves.

Step 03: Material Distribution- In this step facilitator or teacher should distribute the same material between the groups with considering probable reading time.

Step 04: Reading - Facilitator should instruct students to read the same to know in depth.

Step 05: Preparation of Questions-Answers - Every individual has to discuss own reading with teammates. After a group discussion, students will know the concepts and their linkages with each other. They have to start work accordingly for the question and answer preparation. The facilitator must give suggestions to the groups.

Step 06: Question-Answer session – One group will ask questions to another group whereas another group tries to answer them in short. This will go on till all the question answers will be performed in a team.

It looks like a simple procedure but creates excitement between the groups like a debate.

4. Suitability of the technique

Automotive Chassis System course needs to relate to the students expectations, discipline and maintain their interest. The main objective of the course is to learn basic constructional features and operating principles of chassis systems. Also, a student should analyse the underlying mechanism of chassis systems and select the appropriate component or system for the typical vehicular application.

These objectives reflect the simplicity of the course as a theoretical conceptual course, so the main purpose of learning this is the introduction of a ReQuest procedure in the progressive assessment.

Fig. 1 Question Answer Session during ReQuest Procedure

5. Implementation of the technique

The author implemented this activity within02hours. The author made a plan of group activity and instructed students about every aspect of the technique. This leads the student to know about learning outcome and what they exactly will do.

The author already selected appropriate reading stuff from the course which is challenging to comprehend and maximum questions can be prepared from the same. Then students instructed to form the teams on their own choice which takes 05 minutes so far. Here, the material is distributed between the groups to start the reading session which was given a time limit of 45 minutes. As the reading stuff is more compared to single reader ability to read out in 45 minutes, groups distributed the stuff among themselves within 03 to 04 minutes. This is instructed already that they can do the so as the activity revised to be done in a group. Hence, it should go with the rule of proper distribution of the stuff. Groups read all the stuff and prepare the questions and answers. During the time, facilitator performed the role of expert for the groups to revise the nature of the questions so that students should learn the techniques to prepare focused questions. This helps a lot as this increase the ability of the student to think differently on the same stuff.

After all this, 15 minutes were given to discuss the group members among themselves. This coordinated the team and helpful for them to comprehend the overall concepts of the stuff. This is necessary as everyone was working on a different part of the stuff. This is the only chance to know the same. As students were discussing among themselves, they learn more as it is the magic of lesser generation gap. Students believe in their friends more than their parents and teachers as usual. Even they tried their regional language to teach things which are very helpful to know the concepts. After all, this is the main motto of any kind of education.

The real play was started when the questions answer session was undergone. Each group got a chance to ask questions to another group. Similarly, each group was pushed to answer the questions. This made a healthy debate between them. As the questions were simple, straightforward and well planned. The teams took interest while doing the same. At the same time facilitator plays the role of evaluator. Each team got marks for each right answer and loose marks for the wrong one. It takes at least 45 to 60 minutes i.e., maximum time out of the whole given time. This was the heart of the technique as this is 'wow' moment of the play. Lastly, the winning team got appreciation from the facilitator and other team members.

6. Difficulties faced in implementation

Refining techniques to change the experience of theoretical courses for an undergraduate at universities is still a topic of conversation and research across the globe. Many concerns that teacher needs to be conscious while handling theory course has been the results of these debates and investigations. These include:

- **a)** Students often find themselves bored while learning theory courses and detaching until they achieve and navigate own way into a challenging new learning environment posed by the facilitator.
- **b)** Students didn't know about learning practices which have to be followed for understanding theoretical concepts.
- **c)** The multiplicity of experiences and their range gain by students when entered into the learning environment.
- **d)** A struggle of expectations between teacher and students regarding knowledge conveyed.

7. Results and Discussion

Feedback of students revealed that the majority of students' agreed to "ReQuest" helped them create interest, better understanding and promotes self-directed subject learning. Students had given average grades in feedback is 8 out of 10. Significant feedback statements are stated as the questioning ability is improved and overall performance is uplifted.

The ReQuest procedure is simple, short, or they can be more involved and take one or two hours. It is possibly implemented as the group-oriented activity, so it is beneficial to set aside classroom time to prepare students to work in groups and to allow them to engage.

Assessment and evaluation were simple as facilitator assigned marks while groups were performing the question-answer session. This is because facilitator goes into the role of assessor and had time to do the so easily. This instructional technique does not require any rubrics as in regular active learning technique requires. For each correct answer, group member will get full marks and vice versa.

Feedback was taken from teams after the activity. In this, they gave exciting remarks over the technique. They agreed to have fun and learning through the exciting session. They requested to arrange more and more sessions on the same platform. This encourages them to perform the same in group study to check out the understanding of the member.

8. Conclusion

Substantial improvement in the learning level given in feedback clearly reveals the acceptance of ReQuest procedure over conventional learning. There is evidence that this is popular in students, associated with better reading-questioning skills, that it promotes lifelong learning skills and probably does not sacrifice important areas of knowledge. Also, it does not need any additional resources compared with modern active learning approaches. This paper uses the authors' experiences in implementing this technique. In particular, these activities developed in the Department of Automobile Engineering, Rajarambapu Institute of Technology, Rajaramnagar, Maharashtra (India) since 2018.

Acknowledgment

The authors would like to thank Dr. S. R. Kumbhar, Head, Automobile Engineering Department, RIT, Rajaramnagar for inspiration and guidance. The authors also would like to acknowledge the efforts of students and faculties of the Automobile Engineering Department at the RIT, Rajaramnagar.

References

[1] Manzo A. (1969)The ReQuest Procedure, Journal of Reading, 13, 123-127.

[2] Oczuks, L. (2003)Reciprocal teaching at work: Strategies for improving reading comprehension. Newark, DE: International Reading Association.

John P. Helfeldt and William A. HenkSource (1990) Answer Relationships: An Instructional Technique for At-Risk Readers, Journal of Reading, 33 (7), 509-514.

Effective use of Videos in Classroom Teaching for Internet Technology Laboratory Course

Varsha T.Lokare[1], Prakash M.Jadhav[2], Bharati K.Ugale[3]

[1,3]Computer Science and Engg. Department, Rajarambapu Institute of Technology, Sakharale
[2]Mechanical Department, Rajarambapu Institute of Technology, Sakharale
[1]varsha.lokare@ritindia.edu
[2]prakash.jadhav@ritindia.edu
[3]bharati.ugale@ritindia.edu

Track No:1
Track Name: Different dimensions of Teaching-Learning

Abstract: In today's era of internet technology, traditional teaching learning methodologies are not that much effective. Hence, the teaching learning with innovative approach is the demand of the current age band. In this paper, total three ways of using videos during classroom teaching has been proposed and applied namely combination of videos with Think Pair Share, videos with Objective Test and videos with discussion forum. These mentioned methodologies were applied to teach the course Internet Technology Laboratory for the third year B.Tech computer science and Engineering students at Rajarambapu Institute of Technology, Sakharale. The objectives of each activity has been defined along with detailed activity plan and finally the students feedback on each activity has been analysed to understand the students overall opinion.

Keywords: Videos with Think Pair Share, Videos with Objective Test, Videos with Discussion Forum, Internet Technology Laboratory.

II. INTRODUCTION

The main motive behind these activities is to provide the platform for the students to learn in best possible way. For example through short video clips students can better understand any difficult concept as animation, audio or video etc things are friendlier to the students than traditional chalk and board concept. To teach Internet Technology Laboratory (ITL) course, the video lectures has used along with three different activities to ensure the student involvement in watching and understanding the said concept through videos as mentioned in figure 1.

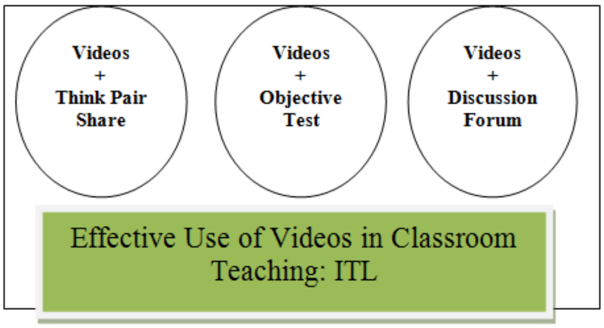


Fig 1. Activities along with Videos

The section II, III and IV describes each activity in detail namely videos+ Think Pair share, videos+ Objective Test and videos + Discussion Forum. Finally the concluding remarks are given in last section.

II. VIDEOS and THINK PAIR SHARE

Topic: File Transfer Protocols (FTP)

Objectives:

1. To understand the working of FTP protocol
2. To able to differentiate between FTP and SFTP
3. To able to state the applicability of TFTP

VideoLink:https://www.youtube.com/watch?v=tOj8MSEIbfA

Activity Plan:

Phase 1: Provide questions (prompts) that focus your students on what you believe are important in the video. Consider why you are having them watch the video, and what you hope they will learn from watching it. You can have students write down their answers. (5min)

List of Questions:
Q.1) What is FTP?
Q.2) What is SFTP?
Q.3) What is TFTP?
Q.4) Which communication protocol is used for FTP, SFTP and TFTP respectively?
Q.5) What are the differences between FTP, SFTP and TFTP?
Q.6) Which file transfer protocol is more secure?

Q.7) Which port number is used for FTP?
Q.8) Which port number is used for SFTP?

Phase2: Watch the video as a class. Don't be afraid to stop the video to point out something important if you think it will be useful to the students. Model the engagement with the video that you desire from your students. (8 min)
Phase3: Tell Students to answer the given questions individually. Make sure that they have achieved your goals for having them watch the video.(10 min)
Phase4: Allow students to discuss with their neighbour and finalize the answers.(5min)
Phase5: Share the answers with class members. (5min)

III. VIDEOS and MCQ

Topic: Email Transfer Protocols
Objectives:

1. To understand the working of SMTP and POP3 protocols
2. To differentiate between POP3 and IMAP
3. List out the advantages and disadvantages of POP3

Video Link:
1. https://www.youtube.com/watch?v=PJo5yOtu7o8
2. https://www.youtube.com/watch?v=SBaARws0hy4

Activity Plan:

1. Give brief idea of the layout of the activity planned (2min)
2. Play videos in the classroom (8 min)
3. Teacher will briefly summarize the video contents (5min)
4. Arrange discussion between faculty and students to clear doubts of students (5 min)
5. Tell students to appear for MCQ (already uploaded on MOODLE) (8 min)
6. Analyze the result to predict the overall percentage of understanding the concept. (2 min)

Figure2 is divided in two parts: Top portion shows the screenshot of MCQ's which were uploaded on MOODLE and bottom portion shows the result of objective test. It has been observed that around 75 % students has secured out of marks, 23% students secured 8 to 9 marks and only 2% students got 5 to 6 marks.

IV. VIDEOS and DISCUSSION FORUM

Topic: Proxy Server
Objectives:

1. To understand the need of proxy server in any organization
2. To able to list out the advantages and disadvantages of the proxy server.
3. To understand the working of proxy server through watching video

Video Link:
https://www.youtube.com/watch?v=fWuFEiChMKY
Activity Plan:

1. Explain the basic concepts in Proxy server (5min)
2. Play the video (8 min)
3. Tell students to create group of 4 students (2min)
4. Assign the role of questioner to half of the groups and ask them to post one question in a group on discussion forum (10min)
5. Tell remaining students to answer the posted questions. (10min)
6. Select the best question and best answer.

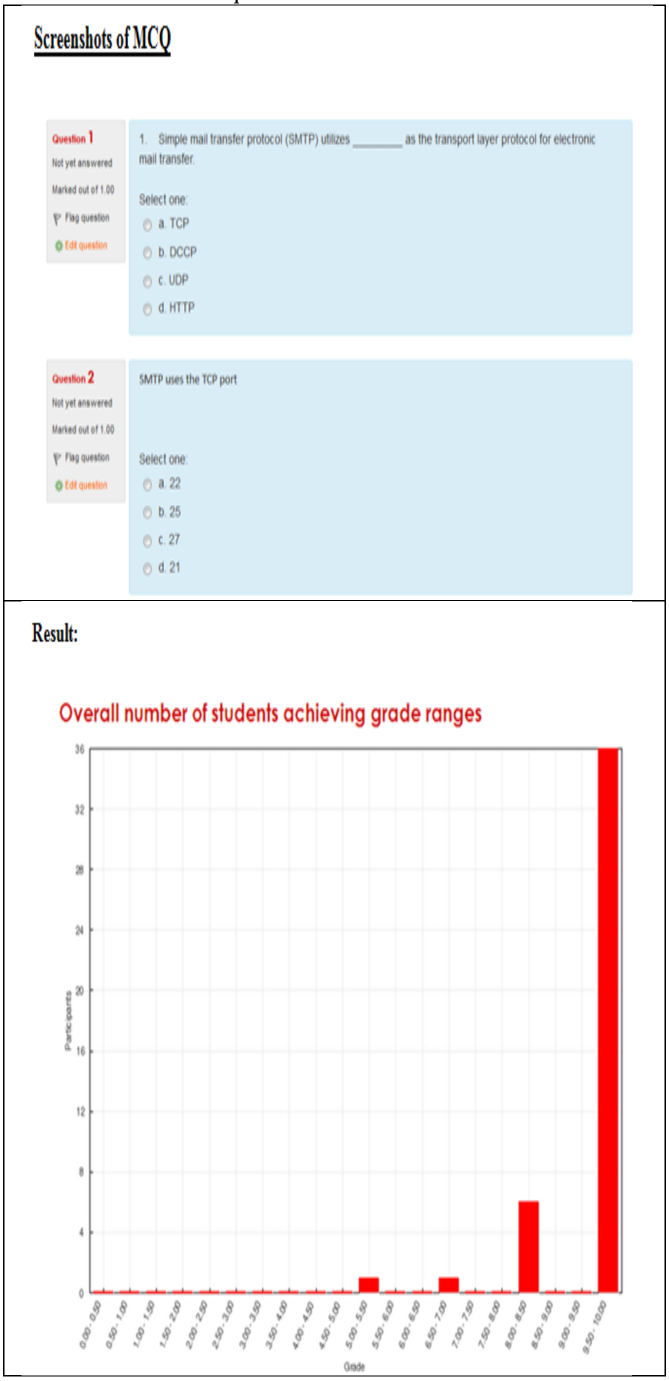
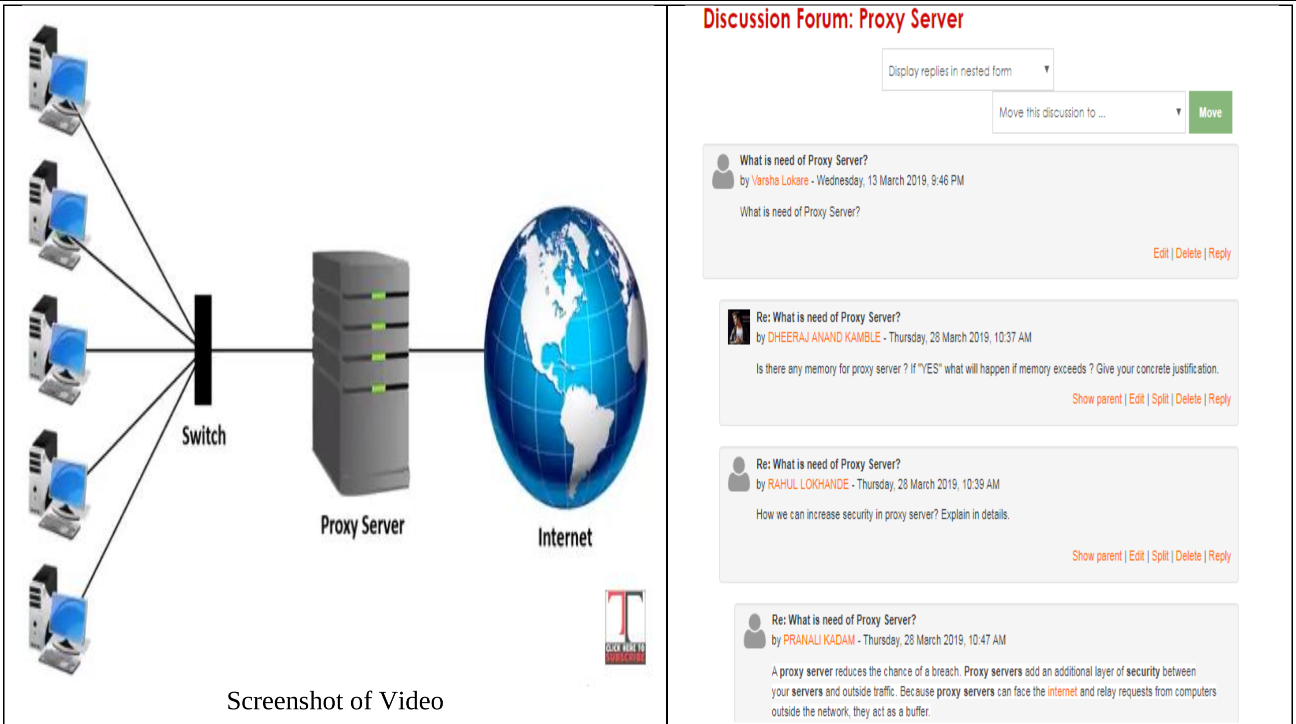


Fig 2. Videos + MCQ activity along with result



Screenshot of Video

Screenshot of Discussion Forum created on MOODLE

Fig .3 Videos + Discussion Forum Activity

Many authors[1,3] have published their work regarding different innovative teaching learning methodologies like Think Pair Share, Flipped classroom, Tools[2,4] etc. **RESULT ANALYSIS** It has been observed that the student's performance in the experiments associated with topics namely FTP, SMTP and POP and Proxy server (for which above mentioned teaching learning methodologies have applied) is improved. Also the student's feedback on each activity has taken into account for measuring the overall performance of the activity.

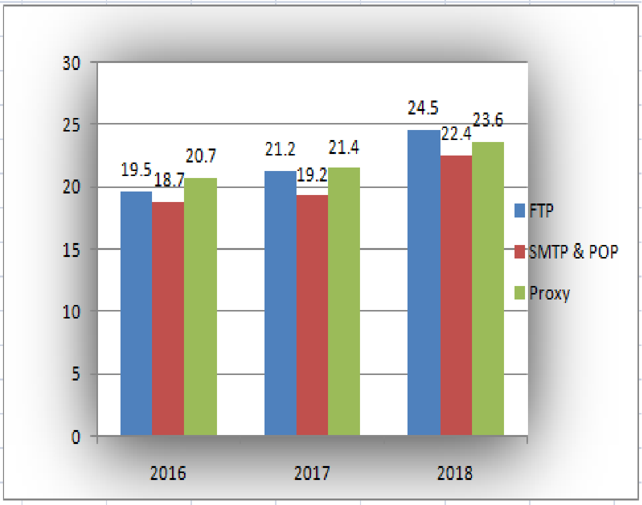


Figure4: Average Marks for 3 Experiments Vs Academic Years

activity as compared to videos with think pair share.

Table1 and Figure4 shows the average marks in the experiments associated with topics namely FTP, SMTP and POP and Proxy server as per three academic years 2016-2017, 2017-2018 and 2018-2019 respectively. It has been observed that there is increase in average marks in three above stated experiments, as the proposed activities along with videos has been applied in academic year 2018-2019. In academic year 2017-2018 only videos were shown in the classroom but there were challenges in ensuring students 100% involvement but that also shows around 2% percent increment in the average marks as compared to academic year 2016-2017. In academic year 2016-2017, no any video activity had applied to teach the course.

It has been observed that there is around 4 to 5 marks increase in average marks of three experiments in academic year 2018-2019 as compared to academic year 2016-2017, in which traditional methodology was applied. Also as compared to previous year academic year in which only videos were shown in the classroom, there is around 3 to 4 marks increase in average marks.

To analyse student understanding and to find out most accepted methodology by the students, feedback was taken of total 75 students. As shown in figure5, videos with discussion forum activity have highest weight age given by around more than 60 students. Videos with MCQ is least accepted

Table 1. Teaching Methodologies applied and result Analysis as per academic year

Expt. No	Title	Teaching Methodology Applied			Average Marks out of 30		
		2016-17	2017-18	2018-19	2016-17	2017-18	2018-19
1	FTP	Traditional	Videos	Videos+ Think Pair Share	19.5	21.2	24.5
2	SMTP and POP	Traditional	Videos	Videos+ Think Pair Share	18.7	19.2	22.4
3	Proxy Server	Traditional	Videos	Videos+ Discussion Forum	20.7	21.4	23.6

CONCLUSION

Effective use of videos in classroom teaching has been proposed and applied to teach the course Internet Technology Laboratory in the department of Computer Science and Engineering at Rajarambapu Institute of Technology, Sakharale. It has been observed that the three activities namely videos with Think Pair Share, videos with MCQ and videos with Discussion Forum, shows the more involvement of the students and better understanding of the concept. There is improvement in average marks of the respective experiments. Also the students opinion has taken in to account to analyse the overall impact of the activities and it shows that the videos with discussion forum activity has been most favourable activity among three activities applied.

REFFERENCES

[1] Prakash M. Jadhav and Varsha T. Lokare, “A Holistic Approach for Teaching Data Structure Course in the department of Information Technology”, Journal of Engineering Education Transformations, 2017.

[2] Gautami G Shingan, Bharati K Ugale,” A Holistic Approach for Teaching Design and Analysis of Algorithms Course in the Department of Computer Engineering”, Journal of Engineering Education Transformations, 2018.

[3] Varsha T Lokare, Prakash M Jadhav, Snehal S Patil,” An Integrated Approach for Teaching Object Oriented Programming (C++) Course”, Journal of Engineering Education Transformations, 2018.

[4] Bharati K Ugale, Gautami G Shingan,” A Novel Approach to Improve Logical and Critical Thinking through Collaborative Learning and Using Visualization Tools”, Journal of Engineering Education Transformations, 2018.

Domain Knowledge, Adequate Software Skills and Physical Model Making: A Dire Necessity for the Undergraduate Learners for an Outcome Based Teaching-Learning Process in Structural Engineering

Dada S. Patil[1], Dr. Rajendra B. Magar[2]

[1]Civil Engineering Department, Anjuman-I-Islam's Kalsekar Technical Campus, School of Engineering and Technology, Panvel, Navi Mumbai, 410206.
[2]Civil Engineering Department, Anjuman-I-Islam's Kalsekar Technical Campus, School of Engineering and Technology, Panvel, Navi Mumbai, 410206.
[1]dada.patil@aiktc.ac.in
[2]rajendra.magar@aiktc.ac.in
Track No: 1
Track Name: Different Dimensions of Teaching-Learning

Abstract: The Undergraduate Civil Engineering learners undergo various courses of Structural Engineering in their four years of studies. After they obtain the Bachelor's Degree, it is expected by the industry that their domain knowledge should be strong, accompanied by required software skills; moreover, they should be quick learners. In order to cater to the needs of the clients, the structural engineers must have adequate core knowledge. Now-a-day, many learners are confident enough of analyzing and designing structures by making use of commercially available softwares. They are normally under the impression that they can carry out analysis and design of any structure owing to the fact that they have an access to the softwares. However, they are unaware about certain limitations of the softwares and tend to believe the software results blindly, without realizing that the output is dependent on the input given. Erroneous structural inputs would obviously lead to the wrong outputs, which may not go hand-in-hand with the actual structural behaviour. In order to check their understanding of the behaviour of structural elements, a small test was given to the current Final Year learners of Civil Engineering Program. Few simple beam elements were given and the learners were asked to draw the deflected shapes of the elements qualitatively, simply by applying the logic of behaviour of structural members. Many learners were unable to draw the correct deflected shapes owing to the fact that they lacked the fundamental knowledge in connection with the behviour of the structure. In this paper, an attempt has been made to stress upon the fact that even the top ranked learners in the routine university papers were also not able to attempt all the problems correctly. However, the paper does not aim at providing the quantitative data of the test conducted. It is more directed towards the qualitative discussion in order to enhance the Teaching-Learning process of Structural Engineering. It also attempts to bring to the light that using the commercially available softwares without realizing that those are merely the time saving tools for the structural engineers, sometimes, results in to an output as per an old saying *"Garbage In Garbage Out"*. The changes needed to be incorporated in the present day Civil Engineering Curriculum, particularly Structural Engineering Curriculum, in a broader sense, are highlighted. The paper discusses about a dire need of imparting knowledge to the learners through the structural model making in the laboratory and testing it. The vitality of conducting Training Programs, for both the faculty members and learners, through the seminars, workshops, Faculty Development Programs (FDPs), industry interaction, etc. is stressed upon. The importance of availability of specialized literature and resource in the library, apart from the regular curriculum books, which facilitates to get acquainted with the new developments in the field, is stressed upon briefly. The paper concludes with a very vital note that the learners need to have a sound and fundamental understanding of the core field; they must be able to quickly learn the required softwares and deliberate efforts are to be made to learn through testing the small scale structural models. This would definitely lead to an enhanced Teaching-Learning process in the Structural Engineering.

Key Words: Domain knowledge, deflected shapes, commercial softwares, teaching–learning process, structural engineering, garbage in garbage out, structural model, resource material, etc.

1. Introduction

Structural Engineering is one of the vital domains in Civil Engineering course demanding logical and conceptually accurate thinking from the learners. A Civil Engineering graduate with an adequate structural engineering knowledge has an enormous scope in the design industry. The undergraduate Civil Engineering learners study various Structural Engineering courses, both analysis based and design based, in their four years of degree program. However, many times it is observed that the fresh Civil Engineering graduates are incapable of handling even simple and basic design problems [1]. This is due to the fact that they lack fundamental knowledge in connection with the basic structural analysis and design. Many learners learn various softwares to analyze and design the structures usually in their final year of engineering. They tend to think that they are capable of analyzing and designing any structure by utilizing ready-to-use softwares. However, they inadvertently forget that wrong structural inputs to the software would lead to the incorrect outputs. The learners should realize that merely knowing how to use the softwares alone would not serve the purpose, but the core knowledge of Structural Engineering domain is a must. Therefore, more impetus must be given to an enhanced Teaching-Learning process in Structural Engineering. This would facilitate to contribute towards the outcome based education.

2. Undue Reliance on Softwares

Most of the Civil Engineering learners are computer literates in this modern age. They get acquainted with the various commercially available softwares in order to analyze and design the structures. Ironically, this computer literacy and usage of softwares, many times, lead to the problems. Many fresh Civil Engineering graduates do not know how to write a software program, but they are quick enough to make use of readily available softwares like STAAD Pro, SAP, ETABS, STRUDS, etc. The learners develop an attitude that by simply using the softwares, they are in a position to carry out analysis and design of any structure [2]. They are to be deliberately made aware that the readily available softwares are mere tools created to help the structural engineer to save the time and to deal with complex structures. While using the softwares, one must be aware of their limitations [3, 4, 5]. The learners must be taught that any amount of mathematical precision cannot make up for the usage of an analytical method which is not relevant to the structure being designed. If the input to the software is erroneous in terms of boundary conditions, modeling, joint rigidity, etc., it would obviously result in to an incorrect output. It is "Garbage In Garbage Out" situation. Dr. Emkin, founder and director, Computer Aided Structural Engineering Center and Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology states that "Large numbers of structural engineers actually believe that they are engineers by simply using computers, rather than realizing that quality engineering can only be an outcome of extensive knowledge of engineering principles, extensive and relevant experience and very hard human brain effort" [3]. As a matter of fact, engineers with strong structural engineering understanding do not need application software. They are capable of breaking down the complicated structures in to simple models and carry out the required analysis and design. The learners must be made aware that the frequent and consistent practice of manual calculations helps them to acquire knowledge about the analysis and design process. Moreover, they must be conveyed that such a practice would inadvertently impart them the sound engineering judgment skills.

3. A Quick Test to Check the Learners' Understanding of Behavior of the Structural Elements

The learners must have a sound understanding of behavior of structural elements subjected to the loads. When the learners take up a job in the design industry, they must be able to cross-check the results obtained by using softwares, through "back of the envelope" calculations. A quick test was given to the current Final Year learners of Civil Engineering Program to check their basic understanding of the behavior of structural elements. Some simple beam members were given and the learners were asked to draw the deflected shapes of the members in a qualitative manner. Figure 1 shows the test questions.

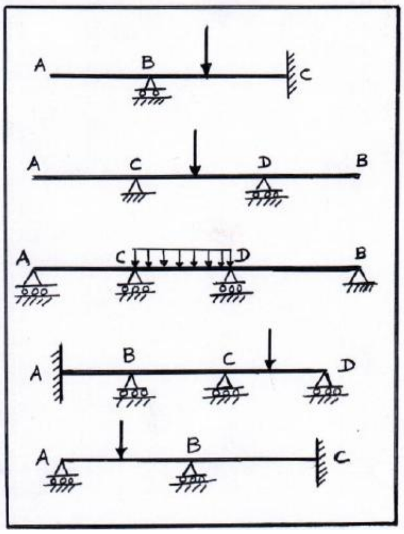


Fig.1. The Test Questions

It was found that many of them could not draw the correct deflected shapes of the beam elements. Those who had scored well in Structural Analysis course in their previous year (Third Year) University paper were also not capable of providing the correct solutions to all the problems. This clearly depicted that majority of the learners, including the toppers, lacked the fundamental knowledge in conformity with the structural analysis concepts. However, they were intentionally made aware that the structural engineering courses are not to be studied only mathematically, but one has to clearly understand the engineering principles and the behavior of structural elements in order to become a good structural engineering professional.

4. Need of Modifications in Engineering Curriculum

Referring the Undergraduate Civil Engineering syllabus, in general and syllabi of Structural Engineering courses, in particular across majority of the universities in India, it can be said that only theoretical content has been given more importance. Undoubtedly, sound theoretical knowledge is a key factor in Structural Engineering, but learners need to be taken to the construction sites, failure sites, special structures, testing laboratories, etc. They should be made aware about the professional ethics, rules and regulations, professional practice, etc. Many colleges do not train the learners on available softwares like STAAD or AutoCAD. The concept of detailing is very essential; rather it is as important as design. Unfortunately, it is missing in the curriculum of majority of the universities. The learners should get the practical training. It should be a mandatory part of the curriculum itself. Marks should be allotted for the same so that the learners take it up seriously. Frequent site visits and interaction with field professionals on continual basis will make the learners understand the concepts in a better way; moreover, it would also lead them to get acquainted with the latest field practices [6].

5. Physical Model Making

A major goal of Engineering Education is to develop budding engineers' minds. The learners should be taught to think critically and logically rather than filling them up with lots of facts. It's very apt in Structural Engineering courses. If the basic concepts are inculcated properly, the learners would be able to comfortably handle the complex analysis and design by applying the fundamental knowledge gained. The learners should be instructed to build models of structures in the laboratory, by using ice cream sticks, toothpicks, popsicle sticks, etc. The models can be tested by applying the loads and the winners can be chosen depending upon the highest overall score in terms of aesthetic appearance, originality, capacity, etc. Such exercises must be made mandatory as a part of curriculum, so that the learners are compelled to prepare the models. This greatly helps in opening up the young minds for critical and lateral thinking. More importantly, such practical oriented tasks make the learners understand the principles of engineering in a more interesting and creative way. It is also very vital to impart knowledge to the learners about the earlier failures of the structures and lessons to be learnt from the same. Unfortunately, in India the report of causes of failure is usually not an open document.

A group of second year Civil Engineering learners of our institute participated in "Stadio 2013" held at Indian Institute of Technology Bombay, Mumbai. They made a shell structure by using ice-cream sticks. Figure 2 shows the model being built. Figure 3 shows the testing of model.

Fig. 2. Learners building a Shell Structure model

Fig.3. Testing of Shell Structure Model

Their efforts were highly appreciated at IIT Bombay, Mumbai. This exercise helped them to understand that a shell having less thickness can also carry enormous load merely because of its shape (form). After this pioneering batch, every year Civil Engineering learners across the various classes have been participating in the competitions across all the IITs and winning them.

A group of Third Year Civil Engineering learners of our institute participated in "Inclino 2014" held at Indian Institute of Technology Bombay, Mumbai. They built models of an inclined structure by using ice-cream sticks. Figure 4 shows the models.

Fig. 4. Models of Inclined Structures

They bagged first prize in the competition. Such model making practice boosts the confidence of the learners. It facilitates to learn the Structural Engineering concepts through visualization and more pragmatic way.

6. Importance of Training Programs

For both, the faculty member and the learner, class room interaction for the theoretical concepts would not suffice in Civil Engineering, especially in Structural Engineering. There is a necessity of arranging frequent seminars and workshops for the learners so that apart from the routine and sometimes mundane academic knowledge, they would be also exposed to the field requirements, new developments in the field, etc. A Faculty Development Program (FDP) in Structural Engineering domain in each semester is a need of the hour. It would facilitate the faculty members to stay updated and relevant in today's dynamic world. More significantly, the technical skills acquired through an FDP can be effectively transferred to the learners through special classes.

7. Specialized Literature in the Library

It is very essential to stock the specialized literature in the college library. This helps the faculty members and learners to keep abreast with the new field developments. As a matter of fact, books containing the specialized literature and new technologies are published by many overseas publishers. They are quite costly too. Unfortunately, Indian publishers show a little inclination to publish the books on special topics. There is a dire need of large number of practicing engineers to write books based on their field experience. Their expertise in a particular field would definitely benefit the learners through such books. Very few practicing engineers write the books. However, it is nice to note that engineers like Buch, Raina and Varyani have published books on various special topics. If the learners make a regular habit of referring those books from the library, it would impart them the required practical knowledge.

8. Conclusion

A system must be in place to make the learners competent enough to confront with the challenges and problems in Structural Engineering profession. The learners must understand the importance of core Structural Engineering knowledge. They should be made to acquire adequate software knowledge during the degree program itself, so that they would be a finished product before sneaking in to the professional world. The university has to give an impetus on updating the curriculum periodically in order to cater for the market requirements. The learners and the faculty members need to be trained on a regular basis. The learners should be engaged in the laboratory to make physical models and test them to understand the structural behaviour in a better way. The learners should get accustomed to the habit of referring the specialized literature from the library, on a regular basis. This would surely result into measurable and significant outcome in the form of the end products as strong Structural Engineering professionals.

References

[1] Buch, J. D., Point of View: What Ails Structural Engineers? The Indian Concrete Journal, December 2010, Vol. 84, No. 12, pp. 19-21.

[2] N. Subramanian, Point of View: Are our Structural Engineers Geared Up for the Challenges of the Profession? The Indian Concrete Journal, January 2011, pp. 20-26.

[3] Emkin, L. Z., Misuse of Computers by Structural engineers – A Clear and Present Danger, Proceedings of the first Structural Engineers World Congress, SEWC 98, San Francisco, California, USA, July 19-23, 1998. http://www.custer.com/MisuseComputer.pdf.

[4] Powell, G. H., Structural Analysis: Are we Relaying Too Much on Computers? Part 1: The Problem, STRUCTURE magazine, ASCE, Nov. 2008, pp. 50-52.

[5] Powell, G. H., Structural Analysis: Are we Relaying Too Much on Computers? Part 2: A Solution, STRUCTURE magazine, ASCE, Dec. 2008, pp. 20-23.

[6] Patel P. V., Point of View: Role of Civil Engineers in Disaster Mitigation, The Indian Concrete Journal, November 2010, Vol. 84, No. 11, pp. 29-31.

A Comprehensive Review of Learning in Educational Psychology

P. Venkatesu[1], J. Subrahmanyam[2], V. Raja[2]

[1] Department of physics, NBKR Science and Arts College, Vidyanagar, Nellor (Andra Pradesh) - 524413
[2] Department of physics, NBKR Science and Arts College, Vidyanagar Nellor (Andra Pradesh) - 524413
[1]venkateshpudi@yahoo.co.in
Track No:1
Track Name: Different dimensions of Teaching-Learning

Abstract: Learning methods of education have been developed rapidly due to advances in technology. Learning is an organized, a complex and a goal directed activity. Learning is not preparation for life, it is life itself. Learning is placed as a central theme in educational psychology. Hence, in the present article the authors review the concept and nature of learning. Components of learning and methods of learning with differences. Advantages and disadvantages of the learning methods, briefly with different perspective, keeping in mind the varied concepts of learning proposed by eminent psychologists. This article also discusses the implications of the learning methods in real classroom situations. In addition to that advances in learning methods like programmed learning are also moderately explored. And in conclusion some of the methods and practices to be followed for the betterment of learning in the education system are suggested.

Keywords: Educational psychology, learning, transfer of learning, programmed learning

1. Introduction

Educational psychology is the scientific study of the application of the laws and principles of psychology to mould education effective in which the learning plays a vital role. Learning is designed based on motivated learners striving to attain a goal. Of course, the success or failure of individuals to reach a goal depends upon their readiness, opportunities and the effectiveness of their goal oriented activities. Learning is also one of the key psychological aspects that can modify the human behaviours. And these human behaviours either directly or indirectly are affected by the learning process. Besides, change in human behaviour also occurs considerably due to maturation. Though maturation and learning are closely related to each other, there is a bit difference. Maturation is the process by which behaviour is modified as a consequence of physical and psychological growth of individual. Whereas learning is changing of behaviour that occurs as a result of experience. Understanding of learning increases with maturation.

Pressey, Robinson and Horrocks (Pressey et al., 1959) represented the components of learning process in the following manner- Motivated learner > process of goal attainment > goal.

Again, they said that the learning takes place under the following conditions-

- The learner must be motivated because of his unsatisfied needs, wants and interests.
- A situation whose well off manipulation, the learner perceives, is leading to a state satisfying his motives.
- The learner's motivation should be enough stronger. Thus learning actually depends on so many factors as illustrated in the school learning situation in to the following components:
- The learner: - The first component of the school learning situation is the learner as a unique individual.
- Learning situation: - Every learning situation is different for every learner.
- The learning process: - This is the interaction that must take place between the learner and learning situation.
- The teacher: - The teacher is the central figure in the learning process.
- The curriculum: - It is the organization of the body of knowledge, skills and attitudes where the pupils are required to learn and develop.

Further, the amount of learning is figured out with learning curves. In general there are three forms of learning curves are identified. They are positively accelerated, negatively accelerated and sigmoid types. In the positively accelerated curve the change in increments of learning is small during the early trials and become larger as practice continues. In negatively accelerated curve there is rapid change in the beginning and as trials go on, the improvement becomes smaller and smaller. The sigmoid curve is one which is positively accelerated during the first half and negatively accelerated during the next half of the trials. Usually we may not get exact curves. An utmost physiological limit is noticed beyond which there is no development in learning and there are some temporary halts in the process of learning known as plateaus. And these are caused by lack of motivation, lack of interest, boredom, fatigue and modifications in the learning techniques. Plateaus are the challenges to the teacher. The teacher should try to avoid the plateaus right from the beginning of teaching a class by motivation through rewards and punishments, by preparing the content related to the needs of the pupils and by considering the maturity levels of the pupils. In fact learning curves help the teachers in knowing where the pupils have faced difficulty. This in turn helpful for the teacher to plan out his teaching strategies.

2. The methods of learning

There are three predominant learning methods namely associative learning, learning by trial and error, and learning by insight.

A. **Associative learning or Conditioning**

In this learning process a relationship is formed between a stimulus and a response. For instance, fire (stimulus) is related to avoidance (response). Pavlov (Pavlov, 2003) established the conditioning in a hungry dog salivary response to the ringing of the bell. It consists in the attachment of a new response to a stimulus which did not occur earlier.

Watson (Watson, 1919) also established the conditioning on a small child. And said that reinforcement of learning (immediate reward), introducing repetition in learning (drill and review), and removing distracting stimuli are some of the implications to the class room procedure.

According to Skinner (Skinner, 1938) there are two types of conditioning, viz. Classical conditioning and operant conditioning. Skinner box is the famous one in which Skinner did experiments on animals to differentiate the two above conditionings.

1) ***Classical conditioning*:**

It is also called respondent conditioning in which the neutral stimulus (reinforcing stimulus) is paired with unconditioned (natural) stimulus. Here the animal remains passive

2) ***Operant conditioning*:**

In this conditioning the response is instrumental to get reinforcement. Reinforcement is nothing but any instrument that can increase the probability to a given response. Here the animal is more active.

More clear distinction about the two conditionings is listed in the below Table.1

Table 1. Distinction between the conditionings

Classical conditioning	Operant conditioning
1. It is called Pavlovian conditioning. **2.** Reinforcement comes first and then the response. **3.** This is stimulus oriented. **4.** It is an internal behaviour. **5.** Conditioned response is forced by unconditioned stimulus. **6.** Here stimulus controls the response.	**1.** It is called Skinnerian conditioning. **2.** Reinforcement is provided only when the response is made. **3.** This is response oriented. **4.** It is an external behaviour. **5.** Here voluntary response is exhibited. **6.** Behaviour and response are controlled by their consequences.

B. **Trial-and-Error learning:**

It is like Maze learning – hit or miss process. This method is clearly explained through an experiment by Thorndike on a cat (Thorndike, 1905). A hungry cat is placed in a puzzle box. Fish is placed outside the cage. The cat exhibits random behaviours to open the door with some attempts. As the trails go on unnecessary and incorrect responses become less and less and finally right adjustments get established.

On the basis of his experiments he formulated some laws of learning. They are as follows.

1) ***The law of effect*:**

According to this law "when a modifiable connection between a stimulus and response has been made, it is strengthened if it results in satisfaction and weakened if it leads to annoyance". School experiences must be pleasant and gratifying. Classroom activities must be meaningful and they should be so arranged that they are within the power of the pupils to accomplish and finally introducing encouragement to promote efficient learning are some implications to class room work

2) The law of exercise:

According to this law "the more frequent a modifiable connection between a situation and response is made, the stronger is that connection". In the class room situation review and recitation may aid learning. Repetition combined with interest may lead to efficient learning. For example in the teaching of spelling, pupils must be trained to use them in sentences and in composition.

3) The law of readiness:

This law states that "when a person feels ready to act or learn, he learns more effectively and with greater satisfaction than when he is not ready". This is otherwise called the mindset. In the class room attempts should be made to develop readiness to learn. A good assignment which raises curiosity may develop a favourable mindset. Correlating lessons with excursions and encouraging lively discussions, pupils' participation could help to promote readiness mentally.

C. **Learning by insight:**

According to Kohler "the criteria of insight is appearance of a complete solution with reference to the whole layout of the field". He emphasised that in learning by insight the solution comes abruptly as a flash. It also comes by the learner perceiving the relationship in the scene, rather than by responding to isolated stimuli.

It is illustrated by the experiments conducted by Kohler on Chimpanzees (Kohler, 1925). He placed the chimpanzee inside the cage fitted with bars. A bunch of bananas was placed outside. The chimpanzee was supplied with two sticks of a given length and none of them could be useful singly to get the bananas. After a few attempts it suddenly struck to the animal that it is possible to reach the bananas by joining the two sticks. Thus insight is due to a new organization of the situation. In the words of Koffka

(Koffka, 1935) "insight is the sudden grasping of the solution which results in a process that runs its course in accordance with the nature of the situation."

The educational implications of this learning by insight are- the subject matter and activities must be organised in to larger units and in the teaching of subject matter, teacher must try to orient the pupils to the general organisation. And insight learning can be developed in pupils by taking them to Museums, Exhibitions and exposing them to industries and factories.

The following Table. 2, shows differences between Trial and Error learning and Insight Learning.

Table 2. Differences in Tail – and- Error and Insight Learning

Trial and Error	Insight Learning
1. This is based on experiments by Thorndike. **2.** This is illustrated on blind attempts made by a cat to open the door. **3.** Intelligence and experience are not necessary. **4.** Here perception is nothing to do.	**1.** This is based on experiments by Kohler. **2.** This is illustrated on known attempts made by a chimpanzee- Sultan, to solve a problem. **3.** Intelligence and experience are necessary. **4.** Here problem is solved in the perceptive field

3. Programmed learning

Programmed learning is also called teaching machine. This comprises of the application of learning theory, procedures of laboratory and modern technological process towards improvement of teaching in the classroom. It is one of the real breakthroughs in the history of education.

In programmed leaning there is an automatic self controlling mechanism. It works on the feedback principle which in turn controls pupil's learning. Feedback tells the student whether he has responded correctly or incorrectly. The correct response is reinforced or rewarded.

In 1923 professor Pressey introduced the first known model of teaching machine (Pressey, 1927). This was a fairly simple device. Pressey's model had a press item of information, a question and several possible answers. If the student answered the question correctly, he was awarded with a piece of candy. Later on professor Skinner introduced his own design. He succeeded in conditioning pigeons and other animals to perform complex tricks by reinforcing each correct move with a grain of corn. He was even able to peck out tunes on a piano (Skinner, 1951).

There are two methods in programmed learning- linear method and branching method.

A. Linear method in programmed learning:

The pupil learns the material line by line from beginning to end. This method was followed by Skinner in which the individual proceeds straight through the material.

B. Branching method in programmed learning:

This was designed by Crowder (Crowder, 1954) in which the student who makes a mistake while going through the branching method is shunted off the main line and on to a branch, where he received additional instruction.

In the advanced technology of education the place of programmed learning is a unique one. Dennis child pointed out that programmed instruction makes a valuable contribution to our educational system if it is wisely used. However, some authorities point out that the method prevents creative thinking and stunts self-expression that may cause boredom and monotony among the pupils.

4. Transfer of learning/training

The process of carrying over habits of thinking, knowledge, skills and attitudes from one learning situation to another is called the transfer of training or learning. By transfer of training we mean the resulting improvement or interference of experience or skill from one activity to another one. This leads to the question as to what extent the skill or experience gained in one activity can be applied in the learning of another activity.

Transfer is of two types, namely (a) positive transfer (b) negative transfer. If learning of one activity favours or aids or facilitates the learning of another one it is called positive transfer, and if it hinders or inhabits the learning of another, it is referred to as negative transfer.

A. Positive transfer:

Positive transfer occurs when there is similarity in content and techniques and there is generalization. We call it positive transfer when something previously learnt benefits performance or learning in new situation.

B. Negative transfer:

Negative transfer occurs when a new response must be made to an old stimulus. When something previously learnt hinders performance or learning in a new situation it is termed as negative transfer.

According to the theory of formal discipline proposed by William James (James, 1890) the mind is made up of faculties like the faculty of memory, reasoning, observation and so on. Training of the mental powers was attempted in the mental discipline. School subjects were taught for their disciplinary value. The improved faculty functions in a better manner in the newer situation. The theory of formal discipline assumes that transfer of training takes place but the theory of transfer of training need not assume the existence of formal discipline.

The experiment conducted by William James threw a challenge to the theory of formal discipline. First he memorized 158 lines from ‘satyr’. Then he gave training in the memorization of Milton’s “paradise lost”. Then he tested his ability to memorize another 158 lines of “satyr”. It took more time to memorize the second 158 lines than the first 158 lines. Later on many studies were made on scientific lines and the results indicated positive, negative as well as no transfer. The positive transfer results may seem to support the theory of formal discipline, but the fact the degree of positive transfer varied from very slight to very large offers little proof. Absence of transfer and negative transfer also go against formal discipline.

Ikehara (Ikehara, 1999) pointed out that according to Gestalt view transfer of learning depends up on whole-part relations between the old and new situation as well as the learner’s perception of the whole-part relations.

Thus, there are three main theories proposed under which transfer of learning takes place, namely theory of formal discipline, theory of identical elements and theory of generalization. Early psychologists tried to explain transfer of learning by means of the theory of formal discipline. It is stated that the mind is comprised of a number of divisions called ‘faculties’. School subjects were taught for their disciplinary value. This theory postulated the concept of general transfer. According to Thorndike’s theory of identical elements, transfer of learning takes place easily if there are common elements between the two situations. The identity may be in content, procedure or aims. Thus similarity between the two situations helps positive transfer. And the theory of generalisation in transfer of learning was explained by Judd (Judd, 1925). He took two groups of boys. One group was given an explanation of the principle of refraction of light in water. The other group was not given such explanation. When the target was one foot in water, both groups did equally well with regard to hitting the target. But when the target was four inches in water the trained group did well than other. So according to the theory of generalization there should be transfer when the principles acquired in one situation are applied to another situation.

In order to promote maximum transfer, the curriculum should be made relevant to the individual learner. It should be made purposeful and meaningful. The teacher should emphasise the possibilities for transfer and the principles underlying the material learnt. The teacher has to lay stress on promoting insight and interrelatedness among ideas and techniques. When a positive attitude is developed in the individual, he can approach the new situations with competency and confidence.

According to Andrews and others there are five major steps in the teaching for transferring.

- Pointing out the possibility of transfer: - If pupils expect that what they learn will help in later situations, they are more likely to use it when opportunity arises.
- Use varied teaching materials like those to which the learning is expected to transfer: - learning in life like situations as student body election.
- Develop meaningful generalisations: - making them to understand the broader principles.
- Provide practice in applying the generalisation: - recognising a new situation as a special case of an old type and providing problems calling for application of generalisations.
- Evaluate the learning experiences by determining how the behaviour in a new situation is changed: - this is very important step in teaching for transfer. It is essential to evaluate as to what extent the pupil is transferring the knowledge gained in one situation to another situation.

5. Aids for better learning

Lehner and Kube (Lehner and Kube, 1964) mentioned the following aids for better learning.

- Motivation to learn: - It is well known that proper motivation promotes learning. The student who is motivated towards goal works hard and learns more and more than a student without any purpose. Sometimes the goal may slip out of sight and the student may lose interest to learn. That is why it is advised that sub-goals help to promote motivation and thereby the learning process.
- Viewing what we are learning with proper perspective: - It is wise on the part of the learner to focus on the total picture. Thus getting an over-all view of the material to be learnt before splitting or breaking it down into its component parts is a helpful measure
- Active participation: - Another learning aid is active participation on the part of the learner active participation promotes interest and motivation and thereby leads to effective learning. Recitation, note-taking, and active work attitude help to achieve this.
- Distribution of effort: - Another important aid to learning is proper spacing or distribution of learning time the nature of spacing depends upon the material and the individual learner.
- Apply the materials learnt: - We learn much better if we can apply the materials learnt, practical application of knowledge motives us to learn more
- Less emotional behaviour during learning: - Emotionality may block or inhibit learning. Sometimes analysing a solving a problem may become difficult because of emotional blockade. So the emotions must be overcome to facilitate learning.

6. Conclusions

One important thing to be noticed in our educational system is to provide for learning in life like situations. The pupils should get a chance to apply what they learn. Strong motivation is the superb high-way for learning. One should see schooling as a meaningful activity. Otherwise the learning kills most of the life time of pupils with no beneficial outputs.

References

Pressey, S. L., Robinson, F. P., Horrocks, J. E. (1959) Psychology in Education, Harper and Bros publications, New York.
Pavlov, I. P. (2003) Conditioned Reflexes, Dover publications, New York.
Watson, J. B. (1916) The conditioned reflexes in psychology, Psychological Review, 23, 89-116.
Skinner, B. F. (1938) The Behavior of Organisms, An Experimental Psychology, 38, 168-172.
Thorndike, E. L. (1905) The elements of psychology, New York: A. G. Seiler.
Kohler, W. (1925) The Mentality of Apes, Liveright publications, New York.
Koffka, K. (1935) Principles of Gestalt Psychology, Lund Humphries publications, London.

H. (1925) Psychology as the basis of educational methods, Elementary School Journal, 26, 102-112.
Pressey, S. L. (1927) A machine for automatic teaching of drill material. School and Society, 25, 544-552.
Skinner, B. F. (1951) How to teach animals. Freeman.
Crowder, N. (1954) Intrinsic Programming. United States. Industries.
James, W. (1890) The principles of psychology, Henry Holt and Co. publications, New York.
Ikehara, H. T. (1999) Implications of Gestalt theory and practice for the learning organization, the learning organization, 6(2), 63-69.
Lehner, G.F. J. and Kube, E. (1964) The dynamics of personal adjustment, Prentice Hall psychology series, The University of Michigan.
Judd, C.

Evaluating Partial MOOC Outcomes in the Accreditation Era: 'Swayam' – A Case Study

Dr. Rajesh Kapur[1], Sneha Rane[2]

[1]MCA, TIMSCDR, Thakur Educational Trust, Thakur Village, Kandivali-E, Mumbai - 400101
[2]MCA, TIMSCDR, Thakur Educational Trust, Thakur Village, Kandivali-E, Mumbai - 400101
[1]rajesh.kapur@thakureducation.org
[2]sneha.rane@thakureducation.org
Track No: 01
Track Name: Different dimensions of Teaching-Learning

Abstract:
Massive Open Online Courses (MOOCs) offer substantial value for the student fraternity in India. Little value is accrued for the student however, if she does not get a certificate of successful completion at the culmination of the course. This paper investigates the value accrued for a student by registering and assimilating the essentials of MOOCs through statistical testing based on outcomes; even if final certification is not obtained. We map the value gained by MOOC content assimilation to student learning outcomes as specified by the National Board of Accreditation. We examine the results of the students who registered for MOOCs courses (Swayam / NPTEL / Coursera) and compare their sample programming test scores against a general population as a case study. We also specify which of the NBA criteria programme outcomes are partially achievable through MOOCs. The paper concludes with some recommendations of how to enhance the credibility and efficacy of MOOCs in the Indian context.

Keywords: MOOCs, accreditation, learning outcomes, Swayam

Introduction:
Massive open online courses (MOOCs) are not only a viable alternative to traditional class-room learning, but also offer an opportunity for students enrolled in regular courses to broaden and reinforce their learning. By enabling large-scale online student engagement, they provide a unique opportunity for student learning in India; thereby offering a substantial prospects for enhancing the technical standards of Indian students [1]. The main advantage of MOOCs is remote access to quality teaching - at nominal cost. They are generally characterized by voluntary student enrolment and participation; followed up by a certification by the conducting authority - if certain pre-specified conditions are fulfilled by the student. They typically attract tens of thousands of registrations; however only a small fraction of these are able to successfully get formally certified for a course. Even if those students who declare at the start of a course an intent to complete, 75% are not able to complete the course[1]. This results in a situation where there is no recorded outcome of the effort involved by the student or the agency conducting the MOOC course - even in partial completion of the course – other than the fact the student registered for the course.
Accreditation in the context of higher education in India centres on outcomes that foster knowledge, skill and attitudes in students. Accreditation in the higher education institutions (HEI) in India is primarily carried out by the National Assessment and Accreditation Council (NAAC) and the National Board of Accreditation (NBA). The process has found acceptance amongst the many technical institutions across India[2]. NAAC and NBA accreditation is considered a major indicator of an HEI's ability to deliver on academic, research and governance aspects; that are well supported by physical and academic infrastructure. The stress is on student learning outcomes as the ultimate basis of accreditation.

Based on our experience, we posit that the MOOCs provide value for the student by exposure to the subject domain; even if final certification is not obtained. Our paper attempts to quantify and assess the value accrued based on certain outcomes – much as the accreditation process by NBA and NAAC.

In this paper we test our hypothesis regarding the partial achievement of student learning outcomes without achieving formal certification. We base and instantiate our study data of student registration of MOOCs courses(Swayam / NPTEL / Coursera) at the Thakur Institute of Management Studies Career Development and Research (TIMSCDR), Mumbai during the academic year 2018-19.

[1]Modelling Learner Engagement in MOOCs using Probabilistic Soft Logic https://users.soe.ucsc.edu/~getoor/Papers/ramesh-nipsws13.pdf
[2]As of 01/04/19, 5341 institutions have been accredited by NAAC(http://naac.gov.in/19-quick-links/32-accreditation-status); and as of 10/04/2018 the NBA had accredited 1584 programmes https://www.facilities.aicte-india.org/dashboard/pages/aicte_nba.php

We have tested the hypothesis against total population of MCA students (at TIMSCDR). Using registration data in MOOCs courses and the marks obtained by the students as a case study, we investigate our hypothesis. We thus propose to link MOOCs to student test scores and consequently to NBA outcomes by hypothesis testing – even if formal certification is not obtained. We have also carried out an analysis on an individual basis; by comparing the mean score of student and the subjects in which she registered for the MOOC course. We conclude with certain recommendations on the future scope of our study – so that the value delivered by MOOCs can be further optimized through an outcome-based analysis based on a stochastic methodology.

Review of Literature

Though the study of MOOCs offers a unique and rich chance to study student engagement outcomes of the teaching-learning process at a large scale, the real benefits remain uncertain. Kizilcec et al., studied student engagement in MOOC courses by an analysis of learning trajectories based on clustering student attributes on pre-assigned parameters [2]. Kuh et al. [3] and Carini et al. [4] list several measures for student engagement for traditional classroom learning: primary amongst them being the extent of interaction between the instructor student; and the level of academic challenge in the content delivered. MOOCs are fundamentally different from traditional courses in, e.g., the number of students enrolled, student-faculty interactions, methods of assessment, and lack of personal interaction. We aim to gauge the correlation between student learning outcomes and registration in a MOOC course irrespective of whether final certification has been obtained. We highlight the work of Levy [5], during the initial period of MOOCs, where early MOOCs were designed to be tuition-free, openly accessible courses that did not generally incorporate formal certification or grading. Breslow et al. (2013) emphasize the large scale of data that is generated through MOOCs, and the insights that can be drawn through the immense data available to enhance the level of student learning [6]. Daniel has reviewed the financial aspects of MOOCs; and lists several myths and paradoxes that have risen around MOOCs [7]. These are mainly centered around quality and pedagogy of MOOCs. Gillani and Eynon discuss the demographics of the student participation, and the effect of MOOCs on student test scores [8]. Schuwer et al enunciate the threats that MOOCs pose to conventional learning in Europe and the USA. Though the demographics is very different from the Indian context, lessons where relevant may be drawn; especially in the area of granting formal recognition to MOOC by industry [9]. In a critique of MOOCs, Zamsky argues that MOOCs have already peaked, without any substantial achievement [10]. This paper is an effort to find the hidden value of MOOCs; so that their efficacy may be maximized. We do this by linking student results to NBA specified student learning outcomes.

Significance of the Study

The significance of the study lies in stochastically establishing that student learning outcomes as laid down by NBA criteria are partially enhanced when a student undergoes a MOOCs course.

This study attempts to further the credibility of MOOCs courses (especially through SWAYAM / NPTEL /Coursera) by establishing a stochastic basis for the assertion that value is achieved to the student learning process even if formal certification is not attained at the conclusion of the course.

Proposed Outcomes of MOOCs

Maintaining and cultivating student engagement is a prerequisite for MOOCs[3] to have broad educational impact. This is very unlike the dynamics of regular courses in which students are engaged with class materials in a structured and monitored way; thus, enabling instructors to directly observe student behaviour and obtain feedback. The remote nature of students and the sheer size of an online course audience require new approaches for providing student feedback and guiding instructor intervention. Quantification of outcome, however, has to the basis for assessing the efficacy of MOOCs. Furthermore, the program outcomes as highlighted by NBA offer a 360-degree student learning. The program outcomes listed by us have been obtained from a presentation by Dr Anil Sahasrabudhe, Chairman, AICTE [11]. The specific outcomes that MOOCs can be evaluated against are:

- Application of domain specific knowledge
- Understanding and analysis of a problem
- Use of appropriate techniques and software tools
- Ability to engage in independent learning
- Understanding of professional norm and regulations.

Research Questions

Our work focuses on ascertaining if NBA outcome for accreditation be even partially achieved by the student through MOOCs, even if she is unable to obtain a formal certification at the conclusion of the course. This leads us to the following research questions:

- Research Question 1: Can we assume that MOOCSs may be partially mapped to course outcome outcomes as per the criteria the laid down by the NBA, even if formal certification is not obtained at the conclusion of the course?
- Research Question 2: Can we model a stochastic basis on which to derive an inference for our assumption?

[3]The term MOOC was coined to refer to a course that was first implemented by Stephen Downes and George Siemens entitled Connectivism and Connectivity Knowledge in 2008 at the University of Manitoba, Canada. In 2011, Stanford offered three courses for free online. Over 20,000 students completed the course. https://www.mcgill.ca/maut/current-issues/moocs/history

Hypothesis Testing

We investigate the research questions by hypothesis testing. Hypothesis testing is a one of the basic techniques of statistics; used to assess the results of many studies. Testing is done to help determine if the variation between or among groups of data is due to true variation or if it is the result of sample variation. With the help of sample data, we form assumptions about the population, and are able to test our assumptions statistically. Our hypothesis are as follows:

- ***Null Hypothesis –***
  Undergoing a MOOCs enhances outcomes only if a student completes certification
- ***Alternate Hypothesis –***
  Undergoing a MOOCs enhances outcomes even if final certification is not obtained.

Testing Methodology

Our population size was the total number of students at the Thakur Institute of Career Development and Research (TIMSCDR), Mumbai – those in the 1st, 2nd, and 3rd year of the MCA course run at Mumbai University. Many students from the population size registered for MOOCs (through SWAYAM / NPTEL / Coursera) during 2018-19. Our sample size is hence those students of TIMSCDR who registered for programming-oriented courses during the same period.

Analysis

The z-score, $z = \mu_1 - \mu_0 / (\sigma / \sqrt{n})$,

Where

μ_1 **is sample mean in programming scores of Mumbai University,**

μ_0 **is population mean in programming scores of Mumbai University,**

σ is the population standard deviation,

n is the number of samples

For the 1st semester of the academic year 2018-19, we recorded the Mumbai University semester end scores data for (1st, 2nd, and 3rd year) students for programming related courses. Sixty-nine (69) out the three hundred and fifty-four (354) who appeared had registered for MOOC courses at Swayam/NPTEL/Coursera; they have however obtained the final certification. The population and sample means were computed to be 69.34 and 62.61 respectively. The standard deviation of the population mean was computed to be 12.86. The z-score was thus computed as

$$z = 69.34 - 62.61 / (12.86 / \sqrt{69}) = 6.73 / 1.55 = 4.34,$$

The p-value for this is less than .00001 (the result is significant at $p < .05$). The alternate hypothesis is thus accepted, viz MOOCs registration enhances outcomes, even if final certification is not obtained.

Testing For Individual Scores

We carried out a further verification of the value delivered by MOOCs. We have charted the percentage increase in marks for those students who took the MOOCs (Swayam/NPTEL) courses in a scatter plot.

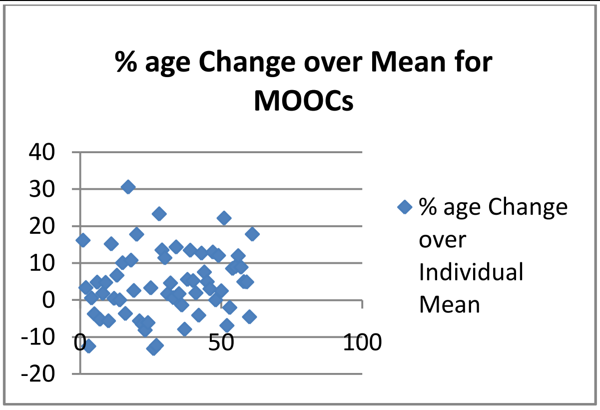


Fig. 1

The scatter plot (Figure 1) confirms the that most of the students who registered for Swayam/NPTEL courses scored higher in the respective subject than their individual overall percentage. A line diagram (in Figure 2) shows the same data with the frequency distribution of the class intervals.

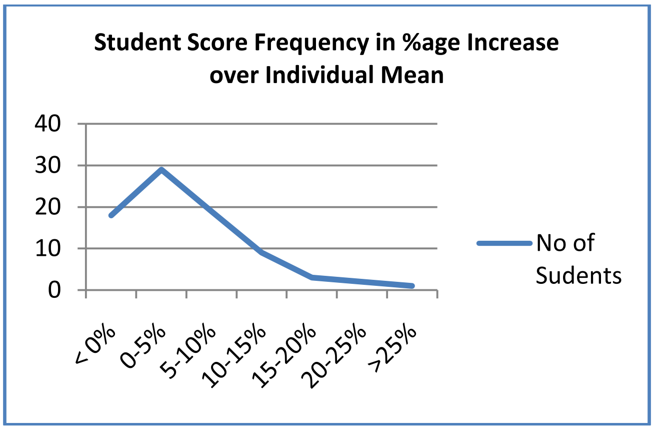


Fig. 2

Our study shows that a mean increase of slightly more than 4% per student occurred as result of registering in a MOOCs course in the sample size; with a standard deviation of 4.2.

Conclusion

We conclude that partial benefit can be accrued in the attainments of student learning outcomes, even if formal certification is not attained. Furthermore, we infer that there is a stochastic basis for the conclusion. We have shown through the hypothesis test that some NBA laid down criteria outcomes vis-a-vis the student are enhanced by registration and undergoing MOOCs courses, even if final certification is not obtained. There remain several relevant aspects that are still to be considered. We list some of these as scope for future study.

Scope for Further Study

In this paper we have introduced the notion of linking outcomes with MOOCs through university test scores; to further both their efficacy and credibility. Substantial analysis must be carried out before any definitive conclusion on assessing outcomes may be made. Some areas for further analysis for assessing outcome and efficacy include:

- Online assignments
- Student online interaction and online quiz tests.
- Projects, blogs, group posts
- Student feedback
- Long term results obtained by the student through longitudinal studies

References

[1] Chauhan, Jyoti. (2017). An Overview of MOOC in India. International Journal of Computer Trends and Technology. 49. 111-120. 10.14445 / 22312803/ IJCTT-V49P117.

[2] Kizilcec, R. F., Piech, C. and Schneider, E., Deconstructing disengagement: analyzing learner subpopulations in massive open online courses. In International Conference on Learning Analytics and Knowledge, 2013.

[3] Kuh, G. D., What we're learning about student engagement from NSSE: Benchmarks for effective educational practices. Change: The Magazine of Higher Learning, 2003.

[4] Carini,R. M., Kuh, G. D. and Klein, S. P., Student engag0ement and student learning: Testing the linkages. Research in Higher Education, 47(1), 1-32, 2006.
/obe-and-nba-accreditation.pdf

[5] Lévy, P. Collective Intelligence: Mankind's Emerging World in Cyberspace Plenum. New York, (1997).

[6] Breslow, L., Pritchard, D. E., DeBoer, J., Stump, G. S., Ho, A. D., and Seaton, D. T. (2013). Studying learning in the worldwide classroom: Research into edX's first MOOC. Research and Practice in Assessment, 8.

[7] Daniel, J. (2012). Making sense of MOOCs: Musings in a maze of myth, paradox and possibility. Journal of interactive Media in education, 2012(3).

[8] Gillani, N., and Eynon, R. (2014). Communication patterns in massively open online courses. The Internet and Higher Education, 23, 18-26.

[9] Schuwer, R., Jaurena, I. G., Aydin, C. H., Costello, E., Dalsgaard, C., Brown, M.,and Teixeira, A. (2015). Opportunities and threats of the MOOC movement for higher education: the European perspective. The International Review of Research in Open and Distributed Learning, 16(6).

[10] Zemsky, Robert (2014). "With a MOOC MOOC here and a MOOC MOOC there, here a MOOC, there a MOOC, everywhere a MOOC MOOC". Journal of General Education. **63** (4): 237–243.

[11] Outcome Based Education and NBA Accreditation Workshop Hyderabad 14 September 2015 Anil Sahasrabudhe Chairman AICTE
http://www.nbaind.org/files

Role Play Act: Key to Success for Tender Award Activity

Amol Thorbole[1], Tejaswini Sawant[2]

[1]Dept. of Civil Engineering, Rajarambapu Institute of Technology, Islampur
[2]Government registered contractor, Islampur
[1]amol.thorbole@ritindia.edu
[2]tejaswini.thorbole@gmail.com
Track No: 01
Track Name: Different dimensions of Teaching-Learning

Abstract: A construction bid is the process of providing a potential customer with a proposal to build or manage the building of a structure. Each one associated with project must be aware of his/her duties/obligations for smooth functioning of project. Tender award is one of the key activities in construction project. During this standard process is followed to avoid further complications. These steps are exercised during Construction Contract course sessions. Previously, we used to teach duties and procedure of tender award by conventional methods. During this, student's role was of listener and faculty's role was of speaker. Student's participation was missing during these days.
To overcome this, students were divided into groups to perform tasks of Owner, Consultant and Bidders. Sample project documents were provided to them. Each group was motivated to perform tasks during this activity of tender award. Right from publishing tender notices to award of tender, all activities were exercised by students independently. Performance of student was examined through course outcomes. Direct attainment through examinations and indirect attainment through course exit survey is calculated for the same course. Total attainment of course outcome' found to be 87.25 %.
From this study we come to know that application of this role play activity is panacea to overcome all such problems.

Keywords: Construction Project bidding, Tender, Role Plays.

1. Introduction

Understanding the various clauses of contract through conventional method becomes complex and tedious due to lack of confidence and theoretical nature of course. Every civil engineer must know provisions of Indian Contract Act 1872. Project tendering is the process by which bids are invited from interested construction contractors to carry out specific packages of construction work. The tendering process is an important means by which a fair price and best value for undertaking the works is obtained.
Activity based learning brings a new relevance to the learning at hand. By bringing real-life context and technology to the curriculum through a activity based learning approach, students are encouraged to become independent workers, critical thinkers, and lifelong learners. Active learning tools are not just a way of learning; it's a way of working together.
The old-school model of passively learning facts and reciting them out of context is no longer sufficient to prepare students to survive in today's world. Keeping this in view, we implemented role play as a tool to understand the procedure to be followed during tendering procedure which encourages students to actively take part in the various activities.
In tendering, owner invites interested contractors to quote rates for various items that are part of new project. During this, authority scrutinizes all the documents submitted by contractors as per rules and regulations and awards tender to one of the contactor. After all successful contractor has to execute the project as per conditions of contract. Engineer appointed on behalf of owner plays an important role in this tender process. Contractors and engineers involved in tender process are required to perform roles and responsibilities as per rules and regulations.
On the similar track, 15 students of F. M. Tech. Construction Management class were divided into four groups. Of these three acted as independent contractor and remaining as an authority appointed on behalf of owner.
The project was to award contract of construction of Director Bungalow at Institute. The projects details in the form of all drawings and Bill of Quantities were circulated among all students. Three groups were allowed to visit the site, collect the data related to site for the analysis of rates for different items of project. After analysis of data they had to quote their rates for different items of project.
An authority's role was to call tender meeting and follow the procedure of tender allotment as per Indian contract act 1872. At the same time the contractors had to quote rates for items and submission to the authority. These tasks were given well before tender meeting.
During tender meeting three groups played role of contractor and one group played role of an authority and tender were allotted to one of the contractor conforming to rules and regulations. The direct and indirect attainment of course outcomes was calculated.

2. Methodology

For better understanding of Tender we applied role Paly as active teaching learning Approach. The steps followed in our study are as follows.

- Introduction to Role Play- By faculty
- Identification of project- By faculty
- Formation of heterogeneous groups
- #Finalization of plan, elevation, section and all drawings-04 Groups
- #Preparation of Bill of Quantity.- 04 Groups
- #Preparation of blank tender form.- 01 Group
- #Quoting and submission of tender to authority. -03 Groups
- #Role play for Authority.- 01 Group
- #Role play of Contractor.- 03 Groups
- Award of tender
  #continuous assessment

3. Role Play

Role play for authority and role play for contractor were held at the time of tender meeting. The assessment of the student was held at the time of tender meeting. Following points were considered during assessment.

Involvement of student in finalization of Plans, Drawings for building construction project (10 Marks)

Participation of individual student in preparation of Bill of Quantity (20 Marks)

Involvement of Student in preparation of Notice Inviting Tender (10 Marks)

Active participation in quoting of Rates for Tender (30 Marks)

Team work during scrutiny of Tenders Documents (30)

Participation in role play for bidding (Contractor) 30 Marks

Participation in role play for bidding (Authority) 30 Marks
The attainment of course outcome was calculated by direct and indirect method. In direct method marks secured by students during end semester examinations are considered.
While, course exit survey were hosted to collect data for indirect method. 70% weightage was given for direct method and 30% weightage for indirect method. Fo rindirect attainment google form sheet was used to get responses from students. 14 out of 15 responded fot google form. Question based on course outcomes were asked through google form.

4. Result and Discussion

Application of this techniques leads to improvement in student learning. Understanding of concepts is well understood by course outcomes attainment. The direct and indirect attainment of the course outcomes is highlighted in the following table.

Course Outcome	Direct Attainment	Indirect Attainment	Total Attainment
After successful completion of this task student should be able to: Discuss types of contract and its features.	62.25 %	25 %	87.25%

Following photos shows students participation and responses.

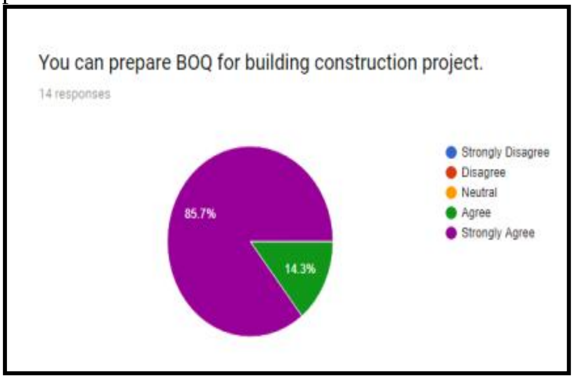


Photo 1.1 Student response for first Course Outcome.

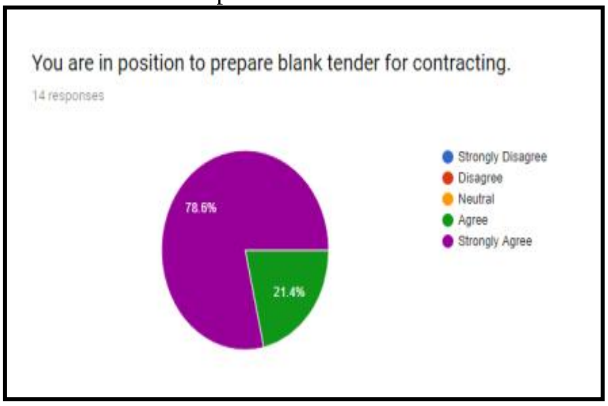


Photo 1.2 Student response for Second Course Outcome.

Photo 1.3 Students participation during tender meeting

Photo 1.4 Students participation during tender meeting

Conclusions

From this study it is concluded that, role play activity is one of the powerful tool to dealt with construction contracts. Student's involvement through role play seems to be more effective for theoretical courses. Practical exposure to such tasks leads to deep understanding of concepts.

Expectations of this course from industry can be systematically achieved. Application of role play techniques drastically increased course attainment level.

Acknowledgement

Author would like to thanks Dr. Mrs. S. S. Kulkarni Director Rajarambapu Institute of Technology Rajaramnagar and Dr. P D. Kumbhar, Head of Civil Engineering Department for encouragement and motivation during this study. Also author would like to thanks Ms. Tejaswini Sawant for providing all necessary standard documents for tender award activity.

References

Patil B. S., (2006), Contracts and Estimates 6^{th} Edition , Univeristies Press (India) Private Limited, Hyderabad, pp 26-45.

Modified Gallery Walk Technique of Cooperative Learning: a Case Study in Wastewater Engineering Course

Prof. Y. M. Patil*

Department of Civil Engineering,
K. E. Society's, Rajarambapu Institute of Technology, Rajaramnagar (Islampur), Dist. Sangli (MS, India), 415414
E mail-**yashawant.patil@ritindia.edu**
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract:
One of the latest buzzwords in engineering education is "active learning," but what does this really look like in the classroom? Active learning refers to the idea that students are actively engaged in the learning process, rather than passively absorbing content. Wastewater Engineering is the core subject of civil engineering which is related to collection, treatment and disposal of wastewater. Previously we used to teach this course by conventional method and we found students were unable to visualize various components of sewage treatment plant. This has led to poor attainment of course outcome.
In the present paper, the modified gallery walk technique as a cooperative learning tool was used to visualize various components of sewage treatment plant. Entire class was divided into heterogeneous 12 groups of 6 each. Well defined tasks were assigned to these groups and motivated to complete the task in group following timeline. Each group presented through poster and same was evaluated by external judges. Three best teams were identified and honoured by prize.
Due to this technique students become self learner and confident in public forum speaking. This technique contributed towards attainment of course outcome.

Keywords: Modified Gallery Walk, Critical thinking, Wastewater Engineering, Course outcome, lifelong learning skills.

1. Introduction:

Research and development in Outcome Base Education (OBE) is fast gaining importance due to the challenges being faced in rapidly changing dynamic environment.OBE, is one among the modern educational systems, recently implemented in engineering education in India, has shown improvements in the higher education system to a larger extent in view of reforming the youth potential into human resources. Active learning is an integral part of OBE, as successful completion of the task by student indicates system's effectiveness and curriculum. Several active learning approaches are used for effective learning experiences viz flipped class room, Jig-saw technique and gallery walk technique.

Wastewater Engineering is the core subject of civil engineering which is related to collection, treatment and disposal of wastewater. Previously we used to teach this course by conventional method and we found students were unable to visualize various components of sewage treatment plant. This has led to poor attainment of course outcome.
In the present paper, the modified gallery walk technique as a cooperative learning tool was used to visualize various components of sewage treatment plant. Modified Gallery walk is one of the collaborative learning techniques that promote use of higher order thinking skills like analysis, evaluation, synthesis etc. It is a presentation method in which students or their groups display their work products, normally on posters, and then move around the classroom observing each other's work. They may provide the comments on the work prepared by groups. **(Farrah, 2015).** Gallery walk allows students to get actively engaged as they walk throughout the classroom and share ideas, and respond to important questions, images, and problem-solving situations in a stress-free way **(Namaziandost et al, 2018).**

Cooperative Learning Methods:

Cooperative learning is a kind of learning that involves organizing the classes in small groups of students that work together so that each group member's success depends on the group's success. A large number of techniques are available for providing cooperative learning. Among the easiest methods to implement include, think-pair-share, think-pair-write, reciprocal teaching, jigsaw technique, modified gallery walk etc.
Modified Gallery walk allows students to get out of their seats and set into a mode of active engagement. The modified gallery walk technique is one of the learning strategies under cooperative learning in which, just like in a gallery walk, the content of the lesson is subdivided into different parts of information and then given to groups of students who would later prepared and present to each other in the form of a poster. The poster and group presentation was evaluated by external examiner as per guideline prepared by course teacher. In the application of the modified gallery walk technique, the teacher introduces a topic and its subtopics.

For the course ‘Wastewater Engineering (CE-3101)’ of T. Y. B. Tech. Civil Engineering, it was planned to teach the topic ‘Wastewater Treatment’ by using ‘modified Gallery Walk Technique’, which is one of the active learning methods of teaching. The existing Gallery Walk Technique was slightly modified and implemented for the entire class of 72 students’ to suit the requirements of class. The ‘modified gallery walk technique was used for learning the various wastewater treatment methods of wastewater.
Therefore, in the present paper, an attempt has been made to study the effect of modified gallery walk technique on academic performance of T.Y. Civil student for wastewater Engineering course

2. Procedure of Gallery walk Technique:

While using modified gallery walk, the students have to explore the texts or images that are displayed on walls of the classroom and physically move around the classroom to share their works with peers
The various steps involved in using Gallery Walk Technique are as given below

a) **Generation of Questions**
The teacher thinks of five to six questions (generally six or even more as per size of class) to use around a central class concept.

b) **Writing of Questions:**
Before class time, the questions for modified Gallery Walk are written on large sheets of self adhering chart, post-it paper, self supporting flip charts, whiteboards, or simply on pieces of normal paper (preferably, A3 size). One question should be written on one sheet of paper.

c) **Posting the Questions:**
The questions are posted on the walls of classroom, giving sufficient separation space between sheets. Alternatively, questions can be placed on desks or tables in the classroom.

d) **Preparation of Students**:
All the instructions are given to students before carrying out the ‘modified Gallery Walk’ technique. If the Gallery Walk has formal oral and written evaluation, the important components of that evaluation should be declared in the beginning.

e) **Grouping of Students and Assigning Roles**:
Students are arranged into groups of three to five. Few students shall be identified and assigned with roles like leader, reporter, monitor, and recorder for smooth conduct of modified gallery walk technique.

f) **Beginning of the Gallery Walk**:
The groups of students are directed to visit different charts or "stations." Upon arriving at the station, each team have to write comments on the question posed at the station. To avoid chart chaos and lengthy comments, recorder is encouraged to write the comments in a brief bulleted format at the top of chart.

g) **Rotating groups to new station and adding content**:
After a short period of time, generally5 to 7 minutes, the instructions to students should be given for rotating their groups. The group then rotates, clockwise, to the next station. At the new station the group adds new comments and also responds to comments written by the previous group.

h) **Monitoring the Progress**:
As groups rotate, the teacher looks after student discussion and involves all group members. The teacher has to rephrase questions or provide hints if students either don't understand or misinterpret questions.

i) **Returning to Starting Point**:
Groups continue to review the answers already contributed by previous groups, adding their own comments. This procedure continues until groups have visited all stations and returned to the station at which they started. Students are then instructed to record their original (starting) question and to sit down in their groups to begin the next stage (i.e. report out).

j) **Report Out**:
In this stage, the group synthesize what has been written about their original discussion question. The students are allowed for about ten minutes for synthesizing comments. The "reporter" selected earlier will be asked to summarize the group's comments with the help of other group members and gives an oral presentation to the class.

k) **Measuring Understanding of Students:**
In Report Out stage, the teacher emphasizes correctly expressed concepts and also corrects for misconceptions and errors, if any.

3. Methodology adopted in using Modified Gallery Walk Technique :

Modified Gallery Walk Technique was implemented for teaching the topic ‘wastewater Treatment’ (Unit No.4) of the course ‘Wastewater Engineering’ of Third Year B. Tech. Civil Engineering class (Sem. VI).
The existing gallery walk technique was slightly modified and implemented for the entire class of 72 students’ to suit the requirements of class. Thus, in the present work, instead of writing the questions and posting them on posters as is done in original Gallery Walk, teacher allotted different topics to students in groups for implementing the Gallery Walk method.

A. Criteria for Evaluation:

The criterion for evaluating student was decided based on 1- 5 scales considering following points:

- Quality of poster prepared for displaying required technical information of the topic (information, images, graphs, bar charts, pie charts, etc.)
- Organization of the information on the poster
- Communication skills with body language
- Homogeneity of group and effective team work
- Ability of the group members to answer the technical questions (related to the topics of respective groups as well as other groups)

B. Evaluation grades:

Following grades were fixed corresponding to the 1 to 5 scales:

1- Poor
2- Scope for betterment
3- Satisfactory
4- Good
5- Excellent

C. Steps Adopted in Implementing Gallery Walk:

- Formation of diverse groups
- Distribution of sub-topics to groups in 12 different groups is given in Table 2

Table 2: Topics for gallery walk technique

Group	Topic
G1	Chemical Treatment of Wastewater
G2	Sewage Treatment Plant for rural area
G3	Physical Treatment of Wastewater
G4	Biological Treatment of wastewater
G5	Sewage Treatment Plant for Urban area
G6	Root zone technology for wastewater Treatment
G7	Construction of Under drainage system for Islampur city
G8	Sludge Treatment Process
G9	Low cost wastewater treatment
G10	Anaerobic Process
G11	Oxidation Pond
G12	Wastewater Stabilization Pond

- Allowing students for downloading of topic related literature / articles from MOODLE server, internet and other sources
- Allowing students for discussion, study and preparation of posters
- Presentations of Groups on their selected topic
- Preparation of Posters size drawing sheet (A2 or A3)
- Arrangement for group wise display of posters
- Evaluation of students by Evaluation Team
- Visits of individual groups (rotation) to the groups displaying posters
- Finalizing student groups securing higher grades / ranks based on evaluators grading
- Prize distribution

The tasks performed in each step of gallery walk are briefly discussed below:

1) ***Formation of diverse groups for gallery walk:***
In all, 12 diverse groups of students were formed from the entire class of 72 students.

2) ***Distribution of sub-topics or articles to groups of students for study:***
Each group was assigned with a particular topic from Unit 4 (i.e. wastewater Treatment) for which the students were expected to prepare on the topic and present their learning in the form of a poster.

3) ***Downloading of topic related articles from MOODLE server, internet and other sources:***
The literature (notes, power point presentations, book chapters, internet information etc.) available was uploaded on MOODLE for preparation of students and the students were asked to get the resource material downloaded and study it by discussions in the group. The students were also informed to gather the necessary information pertaining to their topics.

4) ***Allowing students for discussion/study and preparation of posters:***
Students were allowed to study, prepare for the presentations by referring to the literature in 3 class hours (periods) and were informed to think on preparation of posters so that the required information can be presented on it in an organized manner.

5) ***Presentations of Groups of students on their selected topic:***
Each group was given opportunity to present on their topic and answer the queries of other group students.

6) ***Preparation of Posters (A2/A3 size)on drawing sheet:***
All the groups were asked to prepare the posters giving the required information of their topics preferably on A2 or A3 size drawing sheets.

7) ***Arrangement of group wise display of posters for gallery walk (exhibition):***
The students were informed about the layout of passage or corridor where they should display their posters.

8) ***Evaluation of students by Evaluation Team:***
The students were informed well in advance about the evaluation criteria and about announcement of prizes based on the evaluators' grades. The evaluators' team comprised of two senior faculty members **(Dr. P. D. Kumbhar and Prof. S. S. Kumbhar)** from department of civil engineering. The evaluators were also informed about the tasks of evaluating students well in advance and also about evaluation criteria.
Initially only 6 groups (Gr.1 to6) were allowed to display their posters and after one or two groups get evaluated, remaining 6 groups (Gr.7 to12) were asked to display their posters nearer to earlier groups.. The evaluators started evaluating students by visiting the stations sequentially following the guidelines.

9) ***Visits of individual groups (rotation) to the groups displaying posters:***
After the evaluation of a particular group was done by evaluators, remaining groups (Gr.7 to 12) were allowed to visit the stations (where posters of other groups were displayed) and listen to the presenters of the groups and get resolved their queries. This way the groups were rotated for getting the information on the topics chosen by other groups.
Four students, **Ms. Saniya Faras, Ms. Kshitija Mangaonkar, Mr. Shubham Mamulkar and Mr. Sangram Patil** voluntarily worked for reporting and monitoring this modified Gallery Walk Activity and these students contributed in completing this activity successfully.

10) ***Selection of groups securing higher grades / ranks based on evaluators grading:***

The evaluators were informed to evaluate all the groups and also individual members of every group following the evaluation guidelines rigorously. The result of modified gallery walk technique is given in Table 3

Table 3: Result of Gallery walk Technique

Group	Topic	Rank
G3	Construction of Under drainage system for Islampur city	1st
G6	Root zone technology for wastewater Treatment	2nd
G7	Physical Treatment of Wastewater	3rd

11) ***Prize distribution:***

After rigorous evaluation, three groups securing maximum grades were selected and prizes were distributed to these groups by evaluators. The evaluators expressed their views about the 'Gallery Walk Technique' and its advantages for better learning of students.

D. Evaluation of students in Unit Test Examinations:

The performance of students, after implementation of modified Gallery Walk, was evaluated through Unit Test examination (2018-19) by calculating the average marks scored by students. The Unit Test examination (2018-19) was conducted for 25 marks. Of the two total questions of the Unit Test examination, question no.1a, 1b and 2 a was set on the topic (Wastewater Treatment) taught by using **'modified Gallery Walk '**Technique.

Similarly, the performance of students in the Unit Test examination in the previous year 2017-18 was also evaluated. The Unit Test examination conducted in the year 2017-18 consisted questions on the same topic (wastewater Treatment) but the topic was taught by using **'Conventional Technique'.**

Table 2: Average Marks in Wastewater Engineering

	UNIT TEST- 2 : WE 2017-18 (Sem VI)			UNIT TEST- 2 : WE 2018-19 (Sem VI)		
Max Mark	5	8	6	7	6	4
Q. No	Q.1 (a)	Q.1 (b)	Q.2 (a)	Q.1 (a)	Q.1 (b)	Q.2 (a)
No. of Stud. attempting the Que.	75	76	76	67	70	66
Avg. marks	3.4	5.76	3.64	4.81	5.44	3.02
(%) Marks	68.15	72.03	60.74	68.84	90.74	75.79
Technique	Conventional Technique			Modified gallery Walk technique		

4. Results and Discussions:

From the results, it is seen that the performance of students'(i.e. average marks) gets improved by over 18% after implementing modified gallery walk compared to the results of tradition teaching. The percentage marks of students is graphically illustrated in Fig.1

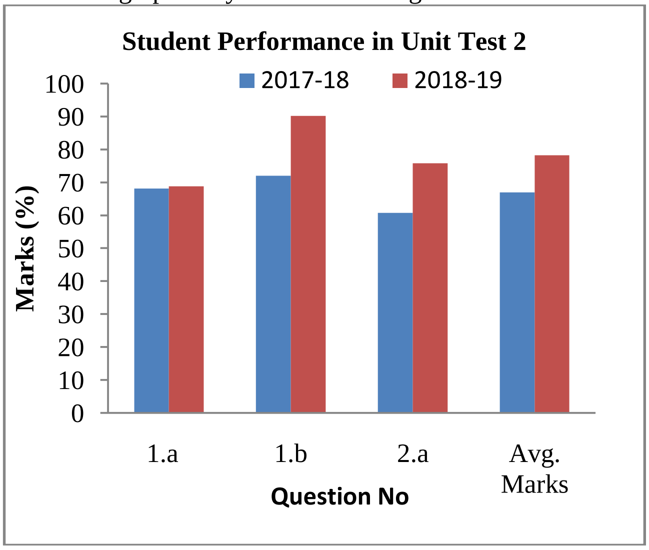


Fig. 1: Students Performance in Unit Test Exams using Modified Gallery Walk technique.

From the Fig.1, it is seen that the average marks of students' increased by 18% by using 'modified Gallery Walk techniques, Hence, it can be stated that 'Gallery Walk' method can be considered as a best cooperative learning technique which may result in the improvement in learning of students.

5. Conclusions:

From the study, following conclusions can be drawn:

- Implementation of 'Modified Gallery Walk' technique resulted into 18 % improvement of students' performance (average marks) in the Unit Test 2 examination over traditional teaching method.
- However, implementation of Gallery Walk method resulted in an increase in the confidence level of students, improvement in lifelong learning skills and joyful learning compared to the traditional method.
- The course teacher as well as evaluators also observed that improves public speaking skills, particularly of reserved students who otherwise do not get a chance to speak to an audience

Photo 1: Students Engaged in the Preparation of Posters for Gallery Walk

Photo 2: Students are displaying their Posters in the Corridor of Classroom

Photo 3: Evaluators Evaluating Students Groups

Photo 4: Award distribution to Winning Teams

Acknowledgement:

Author would like to thank Dr. Mrs. S. S. Kulkarni, Director and Dr. S. K. Patil, Dean Academic, of K. E. Society's, Rajarambapu Institute of Technology, Rajaramnagar for motivating in carrying out the study. Author would also like to thank Dr. P.D. kumbhar HoD Civil Engineering Department. The author appreciates the contribution of Third Year B. Tech. class students Ms. Saniya, Kshitija, Shubham and Mr. Sangram Patil for their active role during implementation of Modified Gallery Walk activity.

References:

- Edel-Malizia S. (2015) Pedagogical Practices—Gallery Walk Retrieved [7.5.2019] from https://scholarsphere. psu.edu/downloads/1jw827964s.
- Farrah, A.Z.(2015) doi: http://dx.doi.org/10.18326/rgt. v8i2.226-237.
- Muhammad, H. R.(2016) Gallery Walk; An Alternative Learning Strategy in Increasing Students' Active Learning. Retrieved [7.5.2019] from http://repository.unhas.ac.id/ handle/123456789/18762.
- Namaziandost E., Fariba R. E., Mehdi, N., and Rasool M.(2018) The Effect of Gallery Walk Technique on Pre-intermediate EFL Learners' Speaking Skill, Language Teaching Research Quarterly, (8), 1–15.

Active Learning Classrooms: Effective Teaching -Learning

Dr. Sharmishta Desai[1], Sarika Bobde[2],
Dr. Himangi Pande[3], Dr. Vrushali Kulkarni[4], Dr. Mangesh Bedekar[5]

[1]Assistant Professor, School of Computer Enggand Technology, MITWPU, Pune.
[2] Assistant Professor, School of Computer Enggand Technology, MITWPU, Pune.
[3] Associate Professor, School of Computer Enggand Technology, MITWPU, Pune.
[4]Professor, School of Computer Engg and Technology, MITWPU, Pune.
[5] Professor, School of Computer Engg and Technology, MITWPU, Pune.
[1]sharmishta.desai@mitwpu.edu.in
[2] sarika.bobde@mitwpu.edu.in
[3] himangi.pande@mitwpu.edu.in
[4]vrushali.kulkarni@mitwpu.edu.in
[5] mangesh.bedekar@mitwpu.edu.in
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Active learning technique is a replacement for traditional teacher learning process. It actively involves students of a class in teaching-learning process. It changes role of teacher from teacher to facilitator and role of student to active participant than listener. Active learning is useful to increase self-learning attitude in students. It is also useful to inculcate group learning, peer learning in students. We the faculties of school of Computer Engineering and Technology, MIT World Peace University, Pune uses many active learning strategies while teaching. We have observed lots of changes in student's participation in a class, their attendance and also in their grades of exam. As students are techno savvy, we have used their habit of using smart phones for more learning. We have created our google classrooms and created discussion forums to actively involve each student of a class. We discuss lab difficulties or problem solving difficulties in these forums. To increase peer learning, after teaching any concept we give different problems to students to solve in a group of two. We have observed that due to shy nature of many students, they like peer learning. To increase self-learning approach, we use flipped classroom concept. We share some good videos with students and ask them to study it in one weeks' time. Then in class, groups of four members are formed and problem sheets are circulated among them. Teacher interact with students in group or one to one and do the task of solving the queries of students. No teaching is done a class. We have observed 100%involvement of the class and complete understanding of that concept taught through Flipped activity. In this paper, we are sharing experiences S. Y. B. Tech teachers who have used active learning activities in their classes of data structure course. Also, we are explaining ways of conducting these active learning techniques along with experiences of the students.

Keywords: Active Learning, Flipped Classroom, Think Pair share, Problem Based Learning

1. Introduction

In recent years, active learning has become popular among college classroom. Active learning is an approach to instruction that involves actively engaging students with the course material through discussions, problem solving, case studies, role plays and other methods. Active learning approaches place a greater degree of responsibility on the learner than passive approaches such as lectures, but instructor guidance is still needed in the active learning classroom. Active learning activities may range in length from a couple of minutes to whole class sessions or may take place over multiple class sessions.

Primary goals for the class should be actively engage students with the material when lecture hall is filled with approximately 100 students. Learning from student is more when they actively participate in the process either through discussion, practice, review, or application [1]. It is completely contrasted to traditional way of teaching, where students are supposed to sit for hours, listening, consuming information presented by the instructor.

Integrating active learning strategies into every component of course design such as think-pare activity, case-based research projects to the curriculum, flipped classroom activity. This all are ways to actively engage students in learning.

A. Need of Active Learning :

The benefits of active learning have been supported time and again in the literature. By comparing student learning gains in introductory physics courses, it was able to show that interactive courses were over two times as effective in promoting conceptual understanding as compared to traditional ones[2]. A more recent meta-analysis [3] reported result from 225 studies across STEM disciplines, comparing traditional lecture to active learning. In general, students' average exam scores were shown to improve by around 6% in active learning classes. Additionally, students involved in traditional lecture were found to be 1.5 times more likely to fail as compared to those in classes with significant active learning.

It takes time and creativity to effectively incorporate active learning strategies into teaching and achieve the full benefits across instructional settings and disciplines. But as many of the faculty members demonstrate, active learning can easily and effectively be incorporated into existing courses and materials without the need for improving the course.

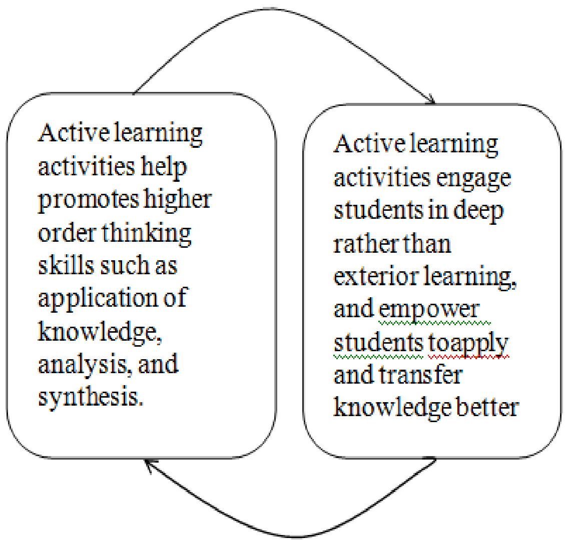


Fig. 1 Need of Active Learning

2. Literature Review

In this section we discussed and studied different active learning techniques.

In this paper [4], author explain Problem-based learning (PBL) is an instructional approach and their characteristics that has been used successfully in multiple disciplines. This methods endows learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem. It also explains similarities and differences between PBL and other experiential approaches likes project-based learning, case-based learning, and inquiry-based learning. Using this method, students can able to access lots of information that was unheard-of a decade ago, and find out more than enough problems to choose from in a range of disciplines. In author opinion, it is vitally important that current and future generations of students experience a problem-based learning approach and engage in constructive solution-seeking activities.

As enrolments in online courses continue to increase, there is a need to understand how students can best apply self-regulated learning strategies to achieve academic success within the online environment. In this paper [5], a searcher focuses the different strategies of time management, metacognition, effort regulation, and critical thinking were positively correlated with academic outcomes, whereas rehearsal, elaboration, and organization had the least empirical support. He also suggested that Peer learning had a moderate positive effect, however its confidence intervals crossed zero.

In this paper [6], authors compares traditional lecturing learning with active learning in undergraduate science, technology, engineering, and mathematics (STEM) courses. Using active learning technique, on an average, students' performance increased by 0.47 % over the traditional lecture method for 158 studies. Also failing % was reduce to 1.95 for 67 studies. This heterogeneity analyses indicated that both results hold across the STEM disciplines, that active learning increases scores on concept inventories more than on course examinations, and that active learning appears effective across all class sizes—although the greatest effects are in small ($n \leq 50$) classes. This paper also suggest that Trim and fill analyses and fail-safe n calculations suggest that the results are not due to publication bias. The results also appear robust to variation in the methodological rigor of the included studies, based on the quality of controls over student quality and instructor identity. Author claims that this is the largest and most comprehensive meta-analysis of undergraduate STEM education published to date. The results raise questions about the continued use of traditional lecturing as a control in research studies, and support active learning as the preferred, empirically validated teaching practice in regular classrooms.

The purpose of this paper [7], was to evaluate how teacher education may promote active learning and what the main obstacles were to reach that target. The problem was investigated from the perspective of student teachers, teacher educators, teachers and pupils in schools. All these groups were evaluated how active learning was applied and what the obstacles was there in active learning. The results clearly indicated that schools and teacher education departments were in the middle of a cultural change. Many indicators of active learning can be seen, but there are many obstacles which should be overcome.

This paper [8], study and examines the evidence for the effectiveness of active learning. It describes the common forms of active learning most relevant for engineering faculty. It also evaluate and examines the critical and core element of each method. It was found that there was broad but uneven support for the core elements of active, collaborative, cooperative and problem-based learning. Although the results vary in strength, this study had found support for all forms of active learning examined. Some of the conclusions were the benefits of student engagement, were unlikely to be controversial although the magnitude of improvements resulting from Active-engagement methods may came as a surprise.

This paper also comment that faculty adopting PBL were unlikely to see improvements in student test scores, but were likely to positively influence student attitudes and study habits. Studies also suggest that students will retain information longer and perhaps develop enhanced critical thinking and problem-solving skills, especially if PBL is coupled with explicit instruction in these skills.

ISBN : 978-93-88441-93-3

3. Methodology

Before using active learning methods, our observations were as given below.

1. Students attendance in class was low
2. Students active participation was poor
3. Teaching was one way only
4. Self-learning was very less
5. Problem Solving Skills were poor.

To avoid all above problems, we have used active learning methods for our course "Data Structure". Our method comprises of four different modules. It is shown in fig2.

a. Google Classroom
b. Flipped classroom
c. Think Pair Share
d. Problem Based Learning

A. Google Classroom

Google provides a facility of creating virtual classroom of the teachers. Using google classroom, we can create discussion forum of students, Post questions and ask students reply it. Observe students replies on forum and use it for evaluating that student. This also can be used as one of the graded activity.

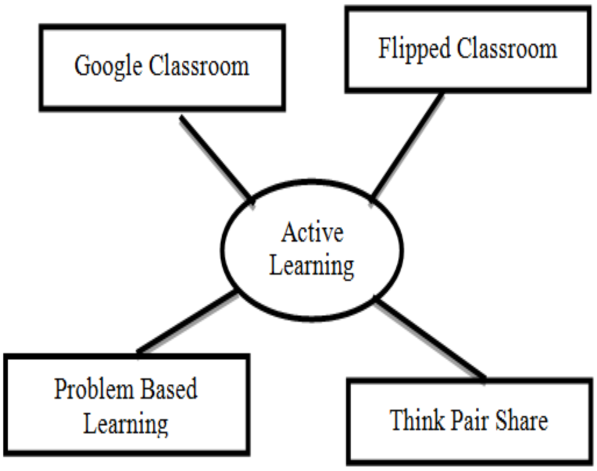


Fig. 2 Methodology Used

B. Flipped Classroom

It changes the traditional teacher's role. Teacher will not teach the concept. Students will learn it themselves. Students will learn outside the class and teacher will do the task facilitator inside the class. For implementing flipped classroom module below steps are taken.

1. Good videos are searched on the topic for which flipped activity is to be implemented.
2. Shorter duration videos (10-15mins) are selected purposefully.
3. Problem Statements are designed on respective topic
4. Students are asked to watch video
5. In a class, problem statements are distributed among students group.
6. Students are asked to discuss and solve problems in group
7. Teacher was taking round and solving queries of the students.
8. Rubric is used to evaluate students. It is given below.

Table 1. Assessment Rubric

Not watched video, understanding not clear, with teacher help also not solved problems	Watched video understanding not clear but with teacher help solved problems	Watched video, understanding is clear but not able to solve problem	Watched video, understanding is clear but problems solved with teacher's help	Watched video, understanding is clear and able to solve problems their own
0	**2**	**4**	**6**	**8**

C. Think Pair Share

It is one of the effective active learning method. This activity is conducted on already taught concept. Below steps are taken in this method.

1. Pairing students
2. Designing Problem Statements
3. Distributing problems among students
4. Ask students to solve problems individually
5. Solution will be discussed and compared among pair.
6. At the end teacher will verify all students solution

D. Problem Based Learning

It is one of the high level activity as per bloom's taxonomy. It is cognitive level activity. In this, teacher needs to design high level problem statements. It may include real time application of any concept taught or implementation of any concept. In this, designing problem statements is the critical task. Students will solve problem in group. They will be given longer duration for solving problem. Teacher will evaluate students based on solution. In this activity, more than one concept can be combined.

The comparison of all these methods is given below from our implementation.

Table 2. Comparison of Methods

Parameters	Google classroom	Flipped Classroom	Think Pair Share	Problem Based Learning
Concept	Taught in class	Self learning	Taught in class	Taught in class
Duration	Longer	Smaller	Smaller	Longer
Nature	Full Outside class activity	Semi class activity	Full Class Activity	Semi class activity

After Using Active Learning we have observed below changes in our students.

1) Attendance in class in increased
2) Active Participation is increased

3) Self-Learning is increased
4) Problem Solving skills are increased
5) Team skills are increased
6) Overall performance of the students is improved.

4. Results

We have conducted flipped classroom activity in class of 65 students of S.Y.B Tech. Course selected was “Data Structure”.
Results are given in below table.

Table 3. Before and After Results

	Before Active learning implementation	After Active learning implementation
Total Students in class	65	65
Total Students Participated	65	50
MCQ Result	48/65	58/65
Midterm exam Result	48/65(Passed) 5/65 scored more than 80%	
Practical Exam Result	40/65	60/65
Total Students in class	65	65
Total Students Participated	65	50
MCQ Result	48/65	58/65
Midterm exam Result	48/65(Passed) 5/65 scored more than 80%	44/65(Passed) 18/65 scored more than 80%
Practical Exam Result	40/65	60/65

Due to usage of active learning methods, student’s problem solving skills are improved. So the number of students scoring more than 80% marks are increased. The passing percentage is less because students were not serious about the activity at initial phase. MCQ and Practical exam result is increased more drastically.

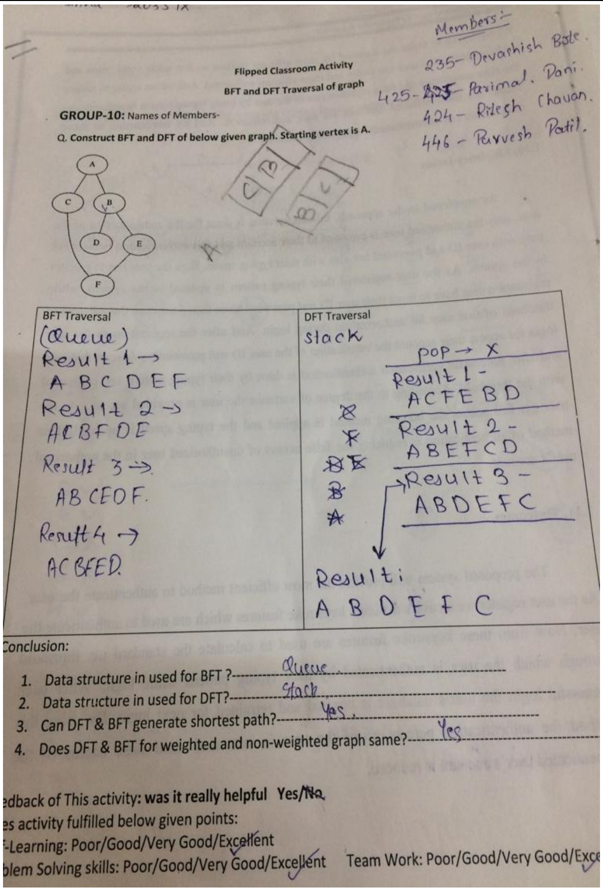

Flipped Classroom Activity
BFT and DFT Traversal of graph
GROUP-10: Names of Members-
Q. Construct BFT and DFT of below given graph. Starting vertex is A.
BFT Traversal
DFT Traversal
Conclusion:
1. Data structure in used for BFT ?
2. Data structure in used for DFT?
3. Can DFT & BFT generate shortest path?
4. Does DFT & BFT for weighted and non-weighted graph same?
Feedback of This activity: was it really helpful Yes/No
Has activity fulfilled below given points:
Self-Learning: Poor/Good/Very Good/Excellent
Problem Solving skills: Poor/Good/Very Good/Excellent Team Work: Poor/Good/Very Good/Excellent

Fig. 3 Flipped Classroom Activity Sample Sheet

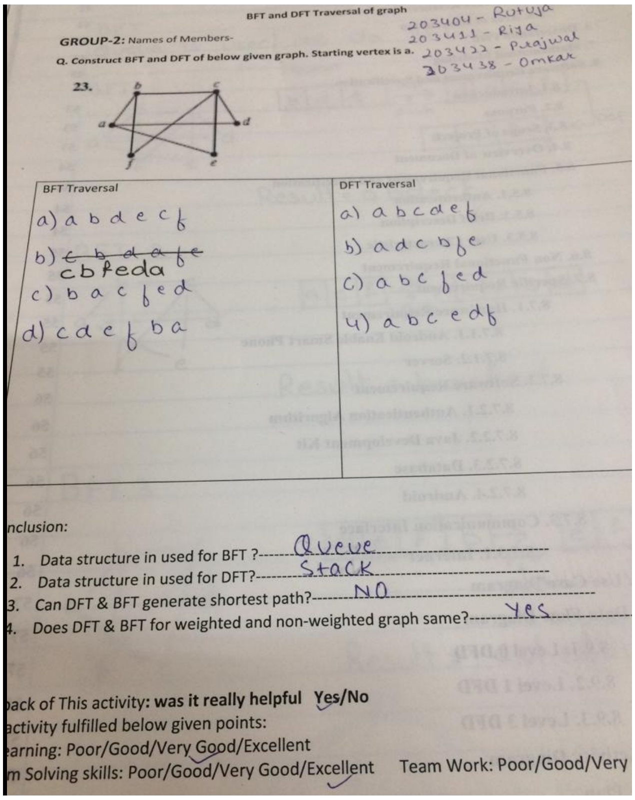

BFT and DFT Traversal of graph
GROUP-2: Names of Members-
Q. Construct BFT and DFT of below given graph. Starting vertex is a.
BFT Traversal
DFT Traversal
Conclusion:
1. Data structure in used for BFT ?
2. Data structure in used for DFT?
3. Can DFT & BFT generate shortest path?
4. Does DFT & BFT for weighted and non-weighted graph same?
Feedback of This activity: was it really helpful Yes/No
Has activity fulfilled below given points:
Self-Learning: Poor/Good/Very Good/Excellent
Problem Solving skills: Poor/Good/Very Good/Excellent Team Work: Poor/Good/Very

Fig. 4 Think Pair Share Activity Sample Sheet

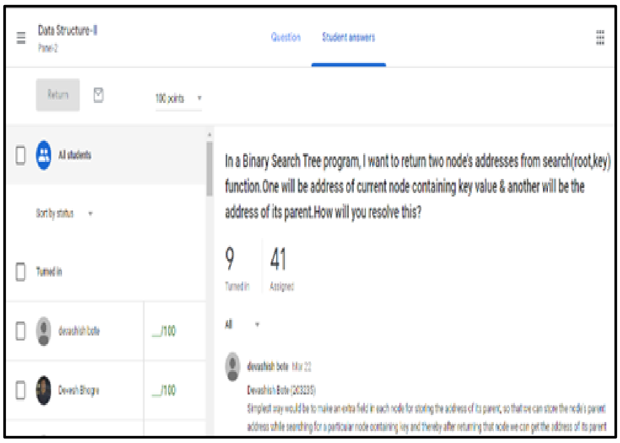


Fig. 5 Google Classroom of Data Structure

5. Conclusions

In our paper, we have shown that active learning methods can be successfully implemented for a data structure course for S. Y. B. Tech CSE students. We have observed increase in results, attendance and overall performance of the students. Google classroom is useful for laboratory performance improvement while remaining three methods are useful for theory as well as laboratory. At the end of very activity feedback is collected from students and 90% students gave positive feedback about active learning.

Acknowledgement

We are thankful to HoS, School of CET and management of MITWPU for giving us opportunity and resources to conduct active learning in class room.

References

1) Grunert, Judith, The Course Syllabus: A Learning-Centered Approach

2) Richard Hake, "Interactive-engagement vs. traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses", American Journal of Physics v66 p64-74, 1998

3) Scott Freeman, Sarah L. Eddy, Miles McDonough, Michelle K. Smith, Nnadozie Okorafor, Hannah Jordt and Marry Pat Wenderoth, "Active Learning increases students performance in science, engineering and mathematics", Proceedings of the National Academy of Sciences, 111(23), 8410-8414, 2014.

4) John R. Savery, "Overview of Problem-based Learning: Definitions and Distinctions", Interdisciplinary Journal of Problem-Based Learning, Volume 1, Issue 1 Article 3, 2006

5) J Broadbent, WL Poon, "Self-regulated learning strategies and academic achievement in online higher education learning environments: A systematic review", The Internet and Higher Education, 2015 – Elsevier.

6) Scott Freemana, Sarah L. Eddya, Miles McDonougha, Michelle K. Smithb, NnadozieOkoroafora, Hannah Jordta, and Mary Pat Wenderotha, "Active learning increases student performance in science, engineering, and mathematics", www.pnas.org/cgi/doi/10.1073/pnas.1319030111, April 15, 2014.

7) HanneleNiemi, "Active learning—a cultural change needed in teacher education and schools", Teaching and Teacher Education, Volume 18, Issue 7, October 2002, Pages 763-780, Elsever

8) Michael Prince, "Does Active Learning Work? A Review of the Research", The Research Journals of Engineering Educations, (JEE), 02 January 2013.

Curriculum Enrichment for Higher Education

I. Priyadarshini[1], A.V.Taware[2]

[1]Department of Computer Engineering, K. K. Wagh Institute of Engineering Education and Research, Nashik
[2]Department of Computer Engineering, K. K. Wagh Institute of Engineering Education and Research, Nashik
[1]ipriyadarshini@kkwagh.edu.in
[2]avtaware@kkwagh.edu.in
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Curriculum is the list of courses to be thought by the educational institute and also includes the learning experiences, skills and ability the students are expected to learn. Enrichment is enhancing the curriculum by including activities for extending students education beyond their main course of study. It provides them a new learning opportunity and environment to acquire mastery of standards expected at a deeper level. Stakeholders often make reference to curriculum as being irrelevant, boring, too academic and outdated and seek changes. So, the enrichment process should be dynamic instead of static. The curriculum enrichment should focus in students achieving graduate attribute. It should help the Institute to ensure the achievement of learning outcomes such as emotional maturity, social maturity, business acumen, professionalism and intellectual capabilities. The value-added programmes should be designed in each semester to show better performance both in curricular and competitive exams to get better job/higher educational opportunities through enhanced graduate attributes. Therefore, for the curriculum to be alive and meaningful, the role of the teacher is very vital. A teacher should be a first a learner and then a curriculum receiver, a curriculum modifier, a curriculum developer and a researcher. This paper focuses on different models of curriculum enrichment process along with teacher's role and responsibility in improving education.

Keywords: Graduate attributes, learning outcome

1. Introduction

Successful enrichment programmes enhance student's life at college by increasing their motivation and achievements. It is one of the means by which college responds to the demand and need of the employers. Enrichment programs help to overcome the weakness of the colleges. This paper discusses on various enrichment activities in section 2 followed by student's achievements in section3 and section4 briefs about various issues of enrichment programmes and section 5 discusses about teachers' role in enrichment

2. Case study on Enrichment Activities

Various colleges have achieved success through different enrichment programmes.

A. Srinivas Institute of Management Studies (SIMS):

SIMS is a higher educational institute in Mangalore established with the vision of imparting quality education and expanding opportunities to all the aspirants and across all realms of knowledge. In addition to the specialization required to be taught, the institute offers dual specialization facility of its own focusing vertically on chosen specializations and horizontally in related areas. some of their remarkable enrichment activitie (P. S. Aithal and A. Srinivas Rao and P. M. Suresh Kumar , 2015) are listed as below.

- A large number of certification program are offered to enhance their employability skill. Table 1 shows a few of the certification courses offered for MBA
- Short term enrichment courses like open source software usage, Excel application etc
- Value added chapters in all subjects
- Skill development package
- Exposure visits
- certificate course on Yoga and Mind control for enhancing the moral and ethical values of students.

Table 1. sample Certification course offered for MBA Programme

Sr. No	Name of the Course	Goals	Objective	Duration
1	Certificate Course in Online investment	Mastering in Share market investment	To identify the investment potentials and Methods	5 days
2	Certificate Course in Android Mobile Applications	Involvement in software development through innovativeness	Developing customized applications for open source Android operating system	5 days

Stage Model:

The institute also proposed the stage model (P. S. Aithal and P. M. Suresh Kumar, 2015) to enhance the student's achievement of graduate attribute in each semester. Each semester is referenced as a stage and enrichment activities are conducted throughout semester so that, at end of each stage the graduate attributes are achieved. The MBA programme with value addition is called as MBA++.

The table 2 list some of their value-added activities model (P. S. Aithal and P. M. Suresh Kumar, 2015).

Table 2. Value added part in curriculum

Sr. No	Type of the Enrichment programme	Number
1	Certificate Programme	3 / semester
2	Modular Programme	2 / semester
3	Workshops	3 / semester
4	Vivekananda Study Circle programmes	2
5	Value added Chapters	5
6	Soft skill program	1/week
7	Guest Lectures	6 / semester
8	Industry visits	1/team
9	Teaching Plan Booklet	1/subject
10	Study Material book	1/subject
11	Enrichment Programmes	3/semester
12	Student Project	1/semester
13	Business Newspaper analysis	2 teams/week
14	Placement related programme	1/week
15	Student Forum activities	1/week
16	Student Specialization exhibition	4/semester
17	Faculty Development Programme	4/semester
18	Student exchange programme	1/year
19	Team based activities/programmes	4/semester

B. National Survey Report

The report produced by "The Further Education Funding Council" on "Enrichment of Curriculum "after inspecting various colleges states that 63 % of enrichment session had strengths which outweighed the weaknesses. The survey was carried out from 207 colleges and inspectors observed 102 enrichment activities with documentary evidence. These include sport, music, drama, cultural and practical activities, work experience and work shadowing, residential visits and study tours, foreign exchanges, health education, personal and social education.

religious education, languages, information technology, group projects, outdoor pursuits, clubs and societies, and leisure interests.

Some colleges provide a compulsory enrichment programme, which can include as many as 120 options, and students are expected to follow the programme alongside their main course of study.

3. Students Achievement on Enrichment

Enrichment activities provide opportunities for students to try new experiences. The report (The Furthur Education funding council, 1996) states, the achievement of the students who participate in enrichment activities are high. It helped them to meet the needs of employer's organization. It enhanced their team work and organizational skill.

4. Management Issues on Enrichment Activities

The national survey report (The Furthur Education funding council, 1996)has stated that enrichment activities fail due to some of the reasons listed below.

1) The objective and outcome of the enrichment program is not defined clearly. A lack of clear curriculum policy will allow teachers to make a different assumptions and students will have a adverse experiences. clear curricuculum policy has to be framed initially for a developing institute.
2) Quality assurance for enrichment programmes is generally underdeveloped. Standards have to be set for performance and students satisfaction has to be reviewed. A few colleges have used external agencies to assist in quality assurance.
3) Low participation rates and Attendance in enrichment activities is less. Review is needed most often to find whether there is a need to change the current enrichment program or to extend and enhance its enrichment programmes to meet the needs and interest of the students. It also depends on when and how these activities are time tabled. On some occasion college may suspend all other activities for a limited period to focus on a particular topic.
4) Lack of sufficient skilled staff. Specialist teacher is needed to teach both examination course as well as enrichment programs.
5) Cost of enrichment program is a concern in many colleges. In some cases, college is not able to fund for the enrichment program and parents needs to pay extra fees. A cost and benefit analyses have to be done.

5. Teacher's role on Enrichment Activities

Curriculum Enrichment cannot take place without the involvement of teachers. Teachers' freedom to adopt more experimental methods of teaching and learning, without the constraints of an examination syllabus, is frequently stated as an advantage of enrichment activity.

Generally, students receive far less feedback on their progress and achievement in enrichment activities. Teachers should provide formal reporting on their progress. But usually the reports usually contain a record of activities undertaken rather than progress made.

6. Conclusions

Curriculum enrichment is necessary to make learning enjoyable and fun. It should focus on enhancing knowledge and skills of students and thereby enhancing their learning outcome. These activities improves the standards of many students.

Acknowledgement

We wish to thank Prof. Dr. S. S. Sane for his motivation and guidance for this work.

References

P. M. Suresh Kumar (2016) Curriculum Enrichment for learning outcome in higher education, International Journal of Scientific Research and Modern Education (IJSRME), Volume I, Issue II.

P. S. Aithal and P. M. Suresh Kumar (2015) Enhance men of graduate attributes in higher education institutions through stage models, International Journal of Research in Business Management,Vo1 3,Issue 3

P. S. Aithal, A. Srinivas Rao, P. M. Suresh Kumar (2015) Quality Enhancement in Higher Education Institutions: A case study of SIMS, International Journal of Multidisciplinary Research and Development, volume 2 issue 5

The Furthur Education funding council, (1996) Enrichment of curriculum, National Survey Report

P. Mythily Rajeswari. R,, curriculum enrichment in higher education

Reciprocal Teaching in Mathematics before, During and after Learning and Practicing Strategy

Umesh Bhujakkanavar

Department of Sciences and Humanities, Rajarambapu Institute of Technology,
Rajaramnagar Islampur.
umesh.bhujakkanavar@ritindia.edu

Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Reciprocal Teaching in Mathematics is a learning strategy that builds problem solving skills and improves mathematical skill for students. Reciprocal teaching is not only helps with learning, but it also gets students excited to participate in a lesson. Reciprocal teaching gets students excited to learn by actively involving them in study, making them more likely to understand given mathematical problems. Reciprocal Teaching strategy that encourages students to develop the skills that effective learners do automatically, the some modification in reciprocal teaching has four strategies which are predicting, clarifying, solving and summarizing respond to what they are learning. The main purpose of this activity for teaching mathematics subject that, students work in group to solve the given mathematical problems acting as unique role like summarizer, questioner, clarifier, predictor.

Keywords: Reciprocal teaching, learning, mathematics.

1. Introduction

Reciprocal teaching follows the "I do, we do, you do" formula. It is suitable for selection of the correct mathematical operations and identification of the processes involved. Reciprocal teaching refers to an instructional activity in which students become the teacher in small group. A general math concept or math problem could be analysed. It improves understanding of complex tasks and thus helps students to gain confidence and motivation to solve mathematics problems. Students were encouraged to predict the type of mathematical questions being asked and the mathematical operations required and what the answer might look like, using their prior knowledge. Students work together in small group to understand the solution of the mathematics problems.

While using this activity in the classroom used some strategy to solve mathematics problems which are predicting, summarizing, clarifying and questioning.

The questioner will ask the questions which will help the group to understand what has been studied about mathematics problems. The summarizer will tell the most important ideas about problem to the group. And the clarifier will clear the confusion in the problem about what they studying. The predictor will change their prediction like prediction will help to provide motivation to continue the solution of the problems.

2. Why use Reciprocal teaching in Mathematics.

Teaching mathematics by using reciprocal method which provides structure for problem solving. And it also helps to students critical thinking skills such as predicting, summarizing, questioning and clarifying which are essential in all content areas. And it encourages discussion about the math and how they solved the problem. Helps students to see there are multiple approaches to solving problems. Most can perform mathematical operations but struggle with problem solving and applications of those skills in real world situations. Mathematics skills means having the ability to problem solve reason and analyze information. Mathematics is the ability to use numbers to help solve real world problems. Mathematics is often the most difficult content area material to read and some of the challenges of comprehending in mathematics can be attributed summarizing. To its vocabulary as mathematics uses the standard 26 alphabet symbols, plus many non-alphabetic symbols, has differences in sentence structure to Standard English prose. A prediction is a good guess about what you think you will find out about or what will happen next in a text. Good readers make predications before they read and as they read. Using reciprocal teaching in mathematics provides structures for problem solving, improves critical thinking, encourages discussing about the problem solving and the problem and also helps to students to see there are multiple approaches to solving problems.

Implementing Reciprocal teaching method in Mathematics.

Reciprocal teaching method has four strategies, which are predicting, clarifying, questioning, summarizing.

Things that helps you make a prediction.

Headings, pictures and other text features. The questions the author asks. Making connections to what you already know your background knowledge and experience.

Prediction sentences starters: Based on the title, subheadings, picture/diagram, etc. I predict that this page/chapter will be about. I think the next chapter (or page) will be about. From the questions I think that I will find out about. Based on (a clue), I imagine that… Based on what I know about.

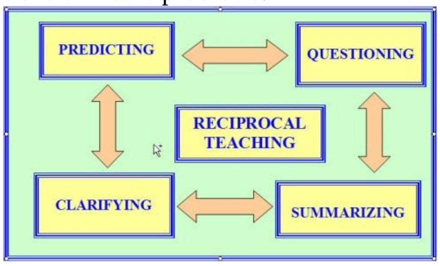
Questioning:
The questioning stage provides the learner with an opportunity to explore the meaning of the example. While doing activity the questioner may ask does anyone have any questions, about the problem? Asking questions about the problem will helps to have the purpose or reason of problem solving and understanding of the problem. This process ensures they become more actively involved by designing and answering questions rather than just responding to the teachers questions.

Summarizing:
The summarizing stage encourages the learner to identify and integrate important information presented within the maths problems. Summarizing a problems means picking out the main ideas and leaving out which is not essential.

Clarifying:
Clarification means making the meaning of the problem clear. Clarifying helps the students recognize when they don't understand the given problem. During the clarification stage the learner is required to list three groups of information. The first list contains words they are unfamiliar with, the second states all the facts they know, i.e. generally statements or values from the mathematical problem. The last list requires a higher order of mathematical thinking and asks the students to compile a list of the information they have yet to determine in order to successfully solve the problem.

Planning: The group develops a plan of the steps and operations needed to solve the problem:

- Role Cards which describes the steps for the leader of the group.
- Graphic organizer for the students to fill in as they work.
- Use of highlighter and other visual aids.
- Development of chart using card sheet.
- Questions of maths problems.



- **Outcome of an activity:**

➢ **Improve s Interest:** Students are encouraged to figure out what they mean, helping them with current and future.

➢ **Stay engaged** — Students are actively looking for different clues and ideas throughout study, and helping them to stay interested in a mathematical problem.

➢ **Boost problem solving** — The four students give their understanding and the ideas being presented to them.

➢ **Learn on their own or in groups** — Reciprocal teaching puts students in the position to improve their reading comprehension through teamwork so they are better suited to work by themselves on future projects.

➢ Reduces hateful behaviour and increasing cooperation in the classroom.

➢ Enhancing the thinking level, better understanding, team work.

Conclusion:
Reciprocal Teaching approach to small
group mathematical problem-solving groups, in order to support students to comprehend and solve mathematics word problems. The students in the reciprocal teaching group write significantly more when compared with the non-reciprocal teaching group. This we believe is primarily because the reciprocal teaching group has been supplied with a structure. Other studies should be conducted with other types of classroom management. Some of these different settings could include comparing between teaching a whole class and teaching in groups, comparing working in groups and working in pairs, and teaching in class with extra-curricular teaching. The results will show which types of classroom management improve engineering students' problem solving ability and which types of classroom management suit which types of students. This method appears to be the most appropriate for students because it provides high order thinking instructional strategy that can make the students fully engaged in reading learning process.

References:

1. Collen, M.H. (2011). *Fifth grade children's use of reciprocal teaching to solve word problems in mathematics* (Doctoral thesis, State University of New York at Albany). Retrieved from ProQuest Dissertations and Theses AandI database.
2. Moh. Rodli and Hari Prasty (2017) *Applying Reciprocal Teaching Method in Teaching Reading*. Madrasah Aliyah Negeri (State Islamic High School), Mojokerto, Indonesia.
3. K/lie Meyer, *Making meaning in mathematics problem-solving using the Reciprocal Teaching approach.* University o f Southern Queensland and Queensland University o f Technology, Queensland .
4. Yvonne Reilly, Jodie Parsons and Elizabeth Bortolot *RECIPROCAL TEACHING IN MATHEMATICS , Sunshine College, Victoria.*
5. National behaviour support service. RECIPROCAL TEACHING, Reading and learning strategy.
6. Timothy Cooper, The effectiveness of the methods of reciprocal teaching. Macquarie College, Newcastle, NSW
7. URL: https://prezi.com/uqu2gkqn0p7y/using-reciprocal-teaching-in-mathematics/

Obsolescence and Gap in the Academic Curriculum of Engineering

Mahendra Nannaware[1], Vishwanathan Kalyanakrishnan[2], Vishwajit Nalawade[3], Pravin Chaudhari[4]

[1,2,3,4]Civil and Environmental Engineering Department, Veermata Jijabai Technological Institute, Mumbai - 400019
[1]mahendra.nannaware@gmail.com
[2]vishwanathan.kalyanakrishnan@gmail.com
[3]nalawadevishwajit @gmail.com
[4]pschaudhari@ci.vjti.ac.in

Track No: 01
Track Name: Different Dimensions of teaching learning

Abstract: An engineering graduate is expected to perform basic design operations under varying field conditions. This study explores the academic curriculum followed by Institutes offering an undergraduate degree in Civil Engineering and the missing link between theoretical academic proficiency and practical field requirements. This has been portrayed based on a direct comparison of Structural and Water Supply Engineering curriculum.

Structural Engineering: It begins with foundation courses such as Engineering Mechanics and Strength of Materials followed by advanced courses such as Structural Analysis I and II in analysis and Design of RCC, PSC and Steel Structures in design. This flow of study provides the student with a firm platform before entering the work environment and ensures his/her capability in designing and analysing basic structures. Hence, the structural design curriculum can be assumed to be satisfactory to a great extent.

Water Supply Engineering: The primitive subjects studied by students in this domain are Fluid Mechanics and Engineering Hydraulics, followed by higher subjects such as Engineering Hydrology, Water Resource Engineering and Water and Wastewater Engineering. These subjects are fairly disconnected as compared to those in Structural Engineering. Also, there is a dearth of design problems related to water conveyance structures in the curriculum. These form the underlying causes for the lack of field proficiency among students.

Such issues can be resolved by introducing practical design problems in theory and laboratory sessions and further implementation of these refinements in the field by providing industry internship programmes to students with proper assessment systems.

Keywords: academic curriculum, engineering, virtual classroom, teaching learning, gap, collaboration

1. Introduction

Lectures and seminars currently form an integral part of the academic curriculum for every specialisation in existence. Classroom sessions form the base of the learning process which involves the conveyance of knowledge from accomplished and experienced professors to students. These interactive sessions are viewed as indispensable by educators around the world and it is widely believed that they cannot be replaced by other alternatives. Lectures are generally followed by relevant assignments which are to be completed and turned in by students on or before a specified deadline.

This format of academics has been prevalent since ancient times, but it possesses its own share of flaws. For example, handling of assignments has been an eternal problem for professors in most situations as it involves a thorough yet hectic procedure for assessment, monitoring and evaluation. Most causes of inefficiency are found in this section of the academic curriculum. Other problems such as plagiarism and deception are very difficult to track as well. This can be seen as a major drawback of the conventional teaching learning process.

The changes that will move engineering education in the desired directions (Armando Rugarcia et al, 2000) may be grouped into four categories:

1. Revisions in engineering curriculum and course structures;
2. implementation of alternative teaching methods and assessment of their effectiveness;
3. establishment of instructional development programs for faculty members and graduate students;
4. adoption of measures to raise the status of teaching in society and in institutional hiring, advancement, and reward policies.

Virtual Classroom is an emerging concept that might help address this call for changes in the Teaching-Learning practice. A virtual classroom is an academic environment wherein academicians can execute almost all the operations conventionally performed in a traditional way of teaching and learning. The participants generally include one or multiple instructors and students. The instructors can post assignments or tests and accept solutions for the same. The students on the other hand, can view questions and assignments, propose and submit solutions, communicate and interact with their peers, view and discuss learning resources, all the while working in virtual online groups. This permits numerous users from multiple locations to simultaneously work on a project. The instructor need only evaluate the students' work product. There is no requirement for an active instructor to supervise students working in a virtual classroom. However, this is subject to choice.

Virtual classrooms are of two types: unproctored virtual classrooms and proctored virtual classrooms. Unproctored virtual classrooms are characterised by ready-to-use learning materials that students can directly adhere to without the aid of an instructor. This makes it as good as a self-tutored course in which the exams can be automatically scheduled upon the completion of a course. Proctored virtual classrooms on the other hand are an online simulation of the traditional classroom experience. The students, being virtually present through the internet, respond to a minimum of one supervising authority. Here, an actual interaction exists between the correspondents, enabling the students to actively participate in class.

Some of the forms of collaborative teaching (Hiltz, S. R, 1994) include:

1. Informal Collaboration: Instructors ay different institutions work together to develop and exchange ideas and materials for course that have some content in common, "sit in" on one another's classes electronically, and/or act as "guest lecturers "in one another's online courses.
2. Formal co-teaching: Two or more instructors, from the same or different institutions, share teaching responsibilities for an online course, or join their online sections in some joint activities.
3. Collaborative Degree Programs: Faculty and staff from two or more institutions pool faculty resources via CMC to offer majors or degree programs which are richer than any one of the institutions could offer alone.

2. Body

Advancements in software technology has encouraged the use of computers for analysing and solving engineering problems. However, most of the software programmes used are domain specific (E.g. drafting, modelling, design etc.). This study aims to explore the inculcation of usage of available computer technology to develop one or more systems which can potentially enhance the teaching learning process as a whole, as well as improve the efficiency of learning by optimising the utilisation of time and resources.

2.1 Google Apps vs. Offline Software

Microsoft office is a utility tool which has been available to the public since 1990. And yet, there is a great deal of scope for effectively taking advantage of its information presenting ability in the teaching learning process. The standardised usage of this tool worldwide plays a vital role in substantiating its capability. However, it is quite a difficult task to make this software available to all students owing to the expense incurred in its procurement.

This problem can be countered by making use of the more recently developed Google apps. Some useful features of Google apps are:

1. Available Free of Cost: Since Microsoft Office is only available at a price, its implementation has largely failed at an institutional level, especially in less developed countries. Google apps require the user to own a Google account, which is available free of cost. These apps can be accessed from any compatible internet browser.
2. Cross Platform Access: Office and other similar local software are designed for specific operating systems and hence, they do not function on Linux based operating systems like Ubuntu, for example. Similarly, Windows users cannot use other system specific software. Google Apps are Java based. They can run on any renowned browser, thereby facilitating their usage on any platform.
3. Synchronisation: Online data sync is a key feature which enables the user to work on a single file using multiple devices simultaneously. This vital property is understandably non-existent on any offline software. Thus, students can initiate work from their Institute and continue from anywhere without the need of redoing from the beginning.

2.2 Virtual Classroom

The issue of collaboration which exists in offline mode can be addressed by the use of virtual classrooms. One of the most popular and reliable tools used for conducting online classes is the Google classroom. The advantages of Google classroom (Shampa Iftakhar, 2016) are explained hereby.

1. Google Classroom has the potential to streamline communication and workflow for students by providing a single access point to discussion threads and assigned work;
2. Google Classroom can help students to keep their files more organized because all their work can be stored paperlessly in a single program;
3. Faculty can more quickly identify which students may be struggling with their assignments due to the tracking mechanisms associated with assigned tasks;
4. Grading processes can be simplified because of the grading features associated with student submissions;

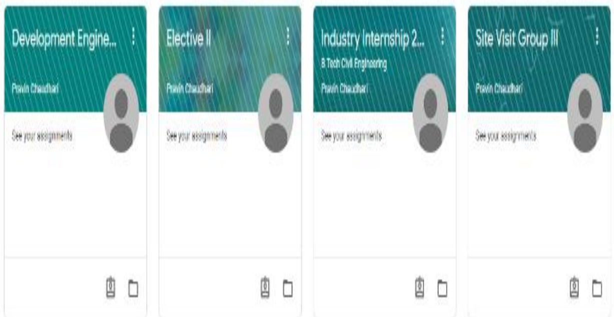


Fig. 1 Subjects

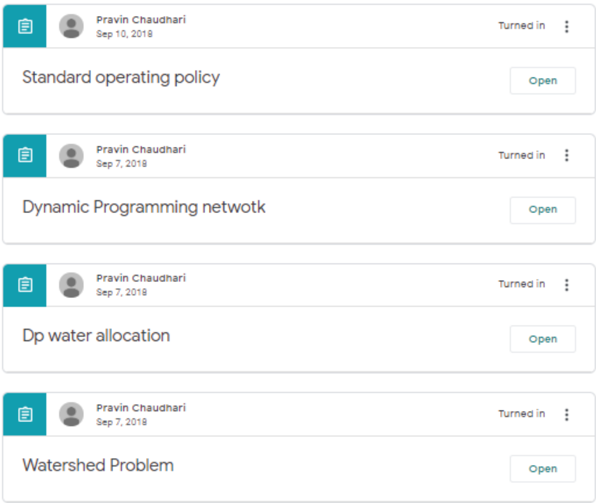


Fig. 2 Assignments

The screenshots in Fig. 1, Fig. 2 and Fig. 3 illustrate how subject wise assignments can be assigned to students that can be submitted either in the form of spreadsheets or documents. The general procedure is as follows:

1. Create classroom
2. Invitation of students to classroom
3. Create assignment with allotted deadline
4. Submission of assignment by students
5. Assessment by teachers

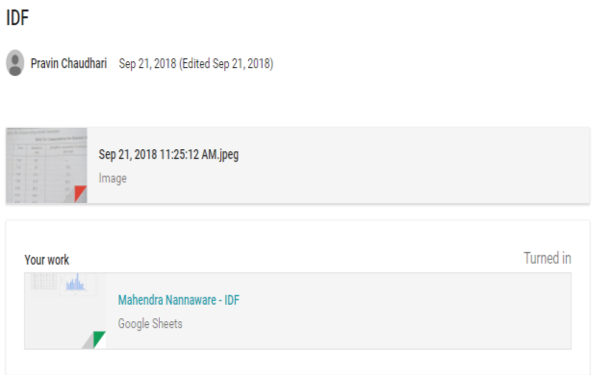


Fig 2.3 Submission

2.3 Field Related Lab Courses

Students learn all the concepts, terminologies and problem statements in the classroom and their application is studied during laboratory sessions. Although this theory-to-practical verification is crucial in achieving the desired course outcomes, laboratories still have a closed and controlled environment which is not truly replicable to the actual field scenario. The transition from student life to work life is not particularly smooth due to the gap that exists between the academic curriculum and practical field applications.

In order to assist students in getting acquainted with the field conditions, it is necessary to give them a requisite exposure to the working environment, so that the above mentioned transition will be smooth.

Fig. 4 Conventional approach

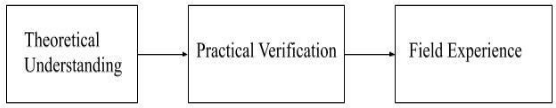


Fig. 5 Revised Approach

The field experience mentioned in the Fig. 5 can be obtained by conducting laboratory sessions that include site visits on a daily or weekly basis. This will enhance the student's clarity about engineering principles and their assessment can be done at the end of the term based on reports which are regularly submitted.

2.4 Industry Internship programme

As discussed in 2.3, the gap between theoretical understanding and practical application can be further reduced by introducing internship programmes in the academic curriculum. Internships can enhance a student's learning in the following ways:

1. Exposure to real life applications
2. Opportunity to handle and manoeuvre latest and running technology
3. Handling responsibilities boosts the confidence of students
4. Interaction with industry professionals
5. Integration of multiple disciplines of work
6. Studying the link between theoretical concepts and industrial know-how
7. Getting acquainted with field workflow

   The impact of this practice can be evaluated by conducting and assessing presentations by the students based on their experiences.

2.5 Public Service Correspondence

According to field observations, students are focussed solely on the technical aspects of the projects performed in their engineering curriculum. This monogamy affects the awareness of students regarding various government schemes. There are numerous schemes being launched by the government which have a direct relation with civil engineering. It is important to have this awareness, since it may affect the work life of students pursuing jobs in the public sector. A course can be conducted in which students will study particular government schemes and present them in an interactive session so that everyone gets to learn by means of interactive discussions. This will enhance social awareness in the student's mind. Also, there is a scope of learning the differences between rural and urban projects.

3. Case Study

An example which justifies the legibility of this study is the practical curriculum of applied hydraulics, in the experiment performed to determine the frictional coefficient of a pipe. The pipe material which is analysed in usually Cast Iron (CI) or Mild Steel (MS). But on the field, according to current trends, the usage of High-Density Polyethylene (HDPE) and unplaticised Polyvinyl Chloride (uPVC) pipes has increased to a great extent. This anomaly can be addressed by the introduction of application related laboratory courses and industry internship programmes.

Another example is the number of pages used by the students of a generic undergraduate class in one semester. One assignment or experiment consists of an average figure of 5 pages. The number of assignments or experiments are considered to be 5 per semester per course. So, the number pages used per course will be 25. Now consider the number of courses per semester to be 10, inclusive of theory and laboratory courses. Thus, the number of pages used by a student will be 250 per semester. An average of 60 students shall be considered per class, leading to the conclusion that the number of pages used by a single class in one semester is 15000 (ignoring minor submissions, quizzes, exam answer sheets, drawings etc.). An Institute requires only 10% (maximum) of the students' work for record keeping and for evaluation by the National Board of Accreditation. Thus, around 90% (i.e. 13500) of the pages are laid to waste by a single class of students in a semester. The above mentioned amount of paper can be saved if Institutes start allowing students to submit their assignments online. This will be beneficial to students, Institutes and to the environment.

4. Conclusions

This study attempts to address the existing gap between the academic curriculum and its applications in the work. It can be conclusively stated that there is an emerging need for integrating the latest advancements and techniques in academia to facilitate efficient and effective teaching learning progress.

Acknowledgement

The Authors would like to thank the Civil and Environmental Engineering Department of Veermata Jijabai Technological Institute for its assistance in shaping this idea. Also, the Authors express their sincere gratitude towards Dr. Sunil Kute for staying in correspondence throughout the course of the creation of this paper.

References

Armando Rugarcia et al, (2000), The Future Of Engineering Education I. A Vision For A New Century, United States of America, Digital Learning for Academics, http://dl4a.org/uploads/pdf/Quartet1.pdf (May 12, 2019);

Hiltz, S. R. (1995), Collaborative Teaching in Virtual Classroom, in The Virtual Classroom 2nd edition, Ablex Publishing Corporation, United States of America;

Shampa Iftakhar, (2016) Google Classroom: What Works And How?, Journal of Education and Social Science, http://jesoc.com/wp-content/uploads/2016/03/KC3_35.pdf (May 11, 2019).

A Cooperative Learning Approach Using Jigsaw Technology in Engineering Physics Course

S. N. Pusawale
Rajarambapu Institute of Technology, Rajaramnagar, Islampur
swati.pusawale@ritindia.edu
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: This paper reports the implementation of cooperative learning by using jigsaw teaching technique in Engineering Physics course taught in first year engineering. Engineering Physics is the fundamental course and the fundamentals of this course are directly applicable in the majority branches of engineering. Therefore, a good understanding of this course is highly essential for better learning in higher classes. However, this is also one course which students find difficult to learn. In this regard, we observed that instead of traditional teaching methodology there is a need for implementing active learning methodologies for meaningful learning. The jigsaw technique is useful for self as well as peer learning, through the division of tasks among the students. The purpose of this study is to investigate the effects of this technique on the learning of students. It was observed that with the implementation of the jigsaw technique it increased student's participation in classroom activities as well as they become considerate for self as well as their peers learning. In accordance with this the results obtained in terms of feedback and marks, we observed that this technique is more effective than the conventional teaching methods.
.

Keywords: Engineering Physics, Active Learning, Jigsaw technique, Course attainment.

1. Introduction

Over fast few years of the engineering education system in India is evolving rapidly with a major change in curriculum, teaching and assessment methodologies. The education system is more outcomes based nowadays. First-year engineering students learn different subjects from science, engineering, humanities, and social science. Among all these subjects Engineering Physics course attempts to explore the ways of working of nature and presents mankind, the new facts, their interpretation in the form of theories and a host of physical discoveries and, it is the engineer who has to use these advances in science for the betterment of life [1]. Therefore we need engineers whose learning in Physics should be clear and as a Course teacher, we should discover the different ways through which this is possible.

It has been already proved by many of the educational scientists that traditional teaching methodologies cannot take whole responsibilities of learning and there is a major need for activity based teaching methodologies. The advantage of active teaching methodology is that it is more students centric. As we are aware every graduate is required to have a certain skill set such as knowledge, teamwork, leadership, etc. and in order to enhance these skills, active teaching methods work effectively compared to traditional teaching.

Among the different active teaching methods, Jigsaw technique is a research-based cooperative learning technique invented and developed in the early 1970s by Elliot Aronson and his students at the University of Texas and the University of California [2]. This is a group activity in which the students learns through the material provided and discuss on particular topic or concept while keeping in mind the fact that they have to teach or explain it to their colleagues [3-7]. This technique is very popular as it ensures the teamwork; group learning and most importantly it makes students responsible for their own learning as well as learning of their peers.

In this paper we are describing the way this activity was carried out for Engineering Physics course and what impact it made on the learning of students through the feedback conducted and attainment of course outcomes

2. Methodology

The jigsaw method is applied in the class of F. Y. B. Tech for the topic Laser, Fiber Optics and Optoelectronic devices. The total strength of the class was 65. The following steps are followed for execution of this method

i) The class is divided into a group of 5-6 students based on gender and earlier performance. This way 10 groups are made of each 6 group members and one group is made with 5 members. Thus the totals of 11 groups are made. These 11 groups are assigned as home groups.

ii) After the formation of home group one leader is selected from each group, the leader is for smooth conduction of the activity and monitoring the performance of the group members, and keeping them on track.

iii) After the formation of the home group, the content of the particular topic is divided into segments according to the size of the group. For 6 members group, the topic is divided into 6 segments and for 5 member group, the topic is divided into 5 segments.

iv) Each student of the home group is assigned a particular segment of the topic.
v) Sufficient time is given to the students to read their segment and become familiar with it.
vi) Temporary expert groups are formed by having one student from each group; those are assigned with the same segment. Sufficient time was given to students in the expert group to discuss the main part of their segment
vii) Students are then sent back to their home group.
viii) Each student of the group is asked to present his/her segment in their home group. The group members are encouraged to ask doubts.
ix) During this presentation, instructor monitored the overall process and clarified the doubts raised by each group.
x) An assignment in the form of group presentation and written test is conducted at the last.
The overall steps of Jigsaw method are shown inFig.1

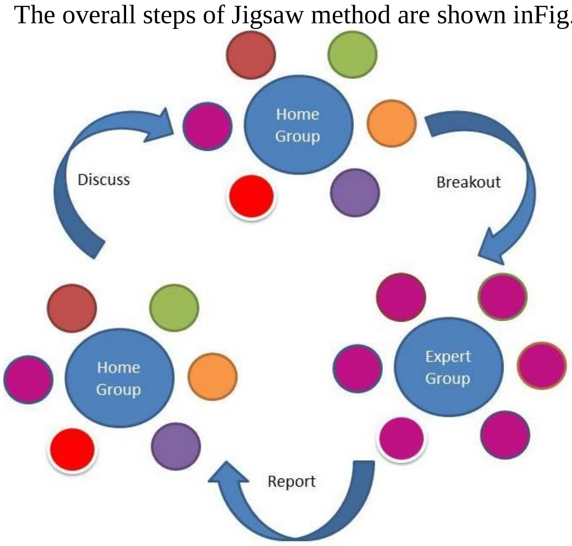


Fig.1 Jigsaw methodology

3. Result

In order to know the effect of the applied technique on the students learning, feedback had been taken in the form of questions and ratings. For conducting feedback we used online Monkey survey application, where the student can register their response anonymously. The total of 62 students has registered their response to this activity. The questions asked and the response by students is discussed below.
We asked students to rate the jigsaw active technique; the response we got is shown below in Fig. 2

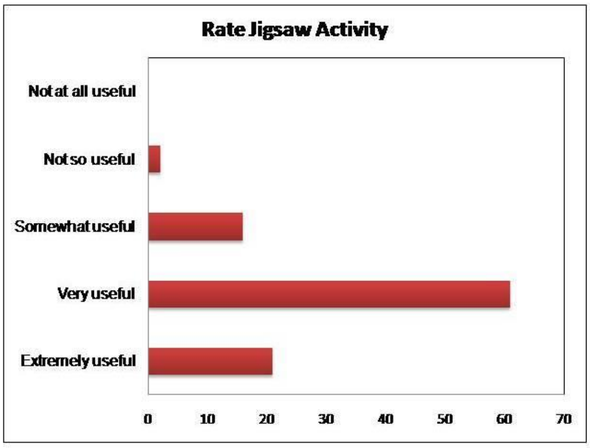


Fig. 2 Feedback given by students for Jigsaw activity

Majority of the students (82%) found the activity extremely useful in learning. Fig. 3 shows the response of students to the question asked about how this activity helped you to realize the importance of skills of proper planning, creativity, and participation.

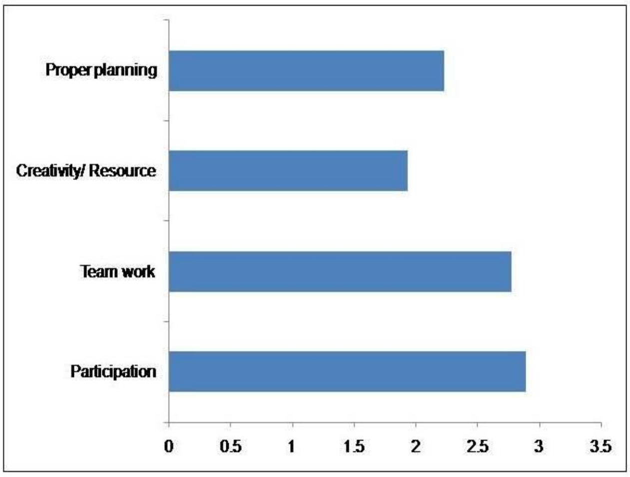


Fig. 3 Feedback given by students

The more rating had been registered for participation and proper planning. Slightly less rating had been given to creativity and resource preparation but this can be understood as creativity is a high-level skill and for first-year students this will be slightly difficult to achieve.
Fig. 4 shows the response to the question that does the student prefer the jigsaw activity over the traditional teaching styles. Most of the students not only agreed that they prefer such activity over traditional teaching methodology but they also demanded that such kind of activities should be incorporated as and whenever necessary for better class engagement. Some of the students also responded that due to this activity they took ownership of their learning as well as learning of their peers as this is cooperative learning method.

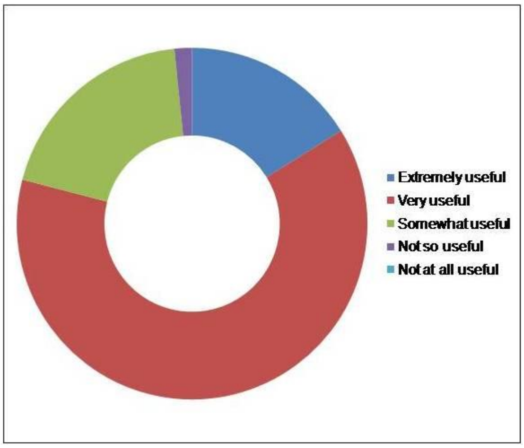


Figure 4 Feedback given by students

In order to know the students' performance in the test, we have considered course attainment. There are a total of six-topics each with particular course outcome from CO1 to CO6 respectively. For this particular topic, we have Course outcome no. 4 i.e. CO 4. The comparison for CO attainment is shown below. For attainment calculation, we had used IonCudos software available at RIT Islampur

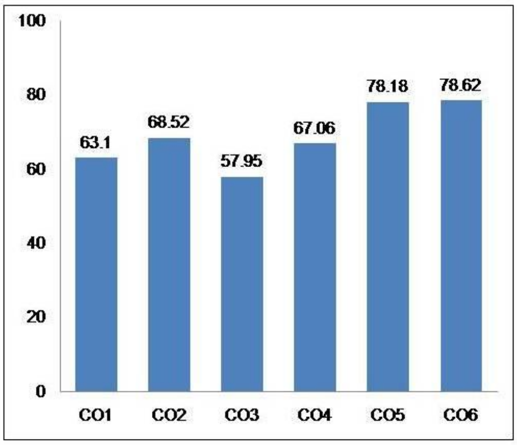


Figure. 5 CO attainment of Course

From the CO attainment comparison we observed that the maximum attainment 78.18% and 78.62% is observed for CO5 and CO6 which are related to topic no. 5 and 6 respectively. The reason why the attainment is larger is that these two topics carry more weightage in the end semester examination and students always pay more attention to these topics to score more. Now focussing on the rest of the course outcomes CO2 is having attainment 68.52% but for this topic, we have conducted a group problem-solving technique which might help better to attain the questions. Now from remaining COs the concerned CO for this activity is CO4 with the attainment of 67.06 % and this is the fourth highest among all COs. Definitely the attainment of CO4 is higher than the CO1 and CO3 where the topics were taught by using traditional teaching methodology. Although we are not claiming the whole credit is for the jigsaw activity for higher attainment as there are other parameters too that can affect CO attainment, but we do believe there is some positive impact of this activity on the performance of the students which they too admitted through feedback. Thus the activity had a positive impact on CO attainment as well as learning of students.

4. Conclusions

The Jigsaw active learning is successfully implemented in the First year engineering class. The activity managed to achieve the important goal of learning as well as developed certain skills within the students such as teamwork, leadership and making them responsible for their own and peers learning. As the CO attainment for this particular topic by this method is not very large but still this activity has raised awareness about active learning and the importance of different soft skills within students. We observed increased interaction of students with course teacher and among themselves too by using this activity. Incorporating such activities at First-year level will surely increase the bonding between student-student and student teacher and will make them confident in the process of learning.

References

1. A. P. Rao, (1994) Role of Physics in engineering Education, Journal of engineering education and transformations, 8 (2), 43-47. www.jigsaw.org
3. J. R. Dhage, M. S. Patil, A. B. Pawar (2017), Implementation and Feedback Analysis of Jigsaw Active Learning Method, Journal of Engineering Education Transformations, 30 (3) 192-199.
4. T. Renuka, C. Chitra, T. S. Pranesha (2016), Evolving Philosophy of OBE in Engineering Physics Course-A Case Study, 29 (3), 14-19.
5. Juweto G.A (2015), Effects of Jigsaw Co-Operative Teaching/Learning Strategy and \School Location on Students Achievement and Attitude towards Biology in Secondary School in Delta State", International Journal of Education and Research, 3(8), 31-40
6. Masoumeh Adhami, Amir Marzban (2014),The Effect of Jigsaw Task on Reading Ability of Iranian Intermediate High School EFL Learners, Journal of Academic And Applied Studies, 4(2), 13-24
7. Ali Göçer, (2010), A comparative research on the effectivity of cooperative learning method and jigsaw technique on teaching literary genres, Educational Research and Reviews, 5 (8), 439-445.

Application of Innovative Techniques in Pedagogy of Materials Engineering Course for Creating Active Learning Environment

Manoj Bhalwankar[1]

[1]School of Mechanical and Civil Engineering, MIT Academy of Engineering, Alandi, Pune
[1]mwbhalwankar@mitaoe.ac.in
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Materials Engineering is interdisciplinary program core course offered to S.Y. B.Tech students as per Autonomous academic structure of MIT AOE. It covers the fundamental aspects of materials related to the need, properties and applications in various engineering fields. Active learning environment is based on activity based learning which is performed by Think pair share, Technical poster presentation, oral presentation and poster presentation. The assessment is performed on predetermined and pre declared rubrics to the students. The set of rubrics is designed for internal marks and external presentation assessment, presentation exam, reflection report and experiment write up for practical experiments and activities assessment. The course outcome is achieved by combination of students' performance in theory and presentation exam, activities as per rubrics. The question paper is set as per aimed course outcomes and the difficulty level is matched with Revised Bloom's taxonomy level. The distribution of study material is done by using ICT tools such as Moodle, Google classroom and website. This enables millennial learner to engage positively in curriculum conduction process effectively with easy availability of information in environmentally sustainable approach. Ultimately, the content beyond syllabus is delivered by faculty as per requirement during sessions and invited experts at the end of cycle for giving overall utilization of characterization techniques in research fields. The content delivery is aimed to meet the professional knowledge requirements of industrial needs and the learning technique needs of millennial learners as per outcome based education.

Keywords: Activity based learning, Rubrics; Content beyond syllabus, Outcome based education

1. Introduction:

The demand of the industry has always been that, an engineer should have holistic system engineering approach. To fulfil this need from engineer's perspective, one should possess fundamental knowledge of structure, properties, processing of materials and its relationship with outcome applications in various engineering, science and health care domains. Materials Engineering is a program core course for S.Y.B.Tech curriculum in autonomous academic structure at MIT AOE. It consist of learning units such as Unit 1 Ferrous and Nonferrous Metals, heat treatment of steels, alloy steel; Unit 2 Polymers and ceramics; Unit 3 Composites; Unit 4 Electronic and photonic materials; Unit 5 Mechanical testing of metals; Unit 6 Nanomaterials. It basically aims to cover the fundamentals like structure, properties, processing and advanced applications of various engineering materials. Materials Engineering lab course consist of demonstration practical experiments based on Unit 5 such as destructive tests- Hardness tests like Vickers's, Poldi, Rockwell tests, Toughness tests like Izod and Charpy impact test, Jominy end quench for hardenability testing ; non-destructive tests- ultrasonic test and dye penetrant test; soldering and a virtual experiment-determination of Hall coefficient of semiconductor material. These experiments aim to assess the analysis of properties of metals in qualitative and quantitative manner. From these practical, students should realize the gap between theoretical and practical values of properties of metals pertaining to many attributes such as defects, allotropic changes, manufacturing process effects, heat treatment effects, packaging environment effects which leads to degradation of materials. Further, these defects lead to premature failure of product and the Failure Mode Effect Analysis (FMEA) shows the major reason as the variations in the material properties.

2. Theory course conduction techniques

The theory course of Materials Engineering consist of curriculum content delivery to students via interactive classroom teaching, question and answer sessions, utilization of ICT tools such as Moodle, Google classroom, course Google website for distribution of study material, conduction of quiz, activities, assessment rubrics for internal marks and external examination, announcements and notices related to academic activities. Theory content consists of utilization of power point presentation, videos and case studies of various advancements in material research via Materials Today newsletters etc.

2.1 Application of ICT tools

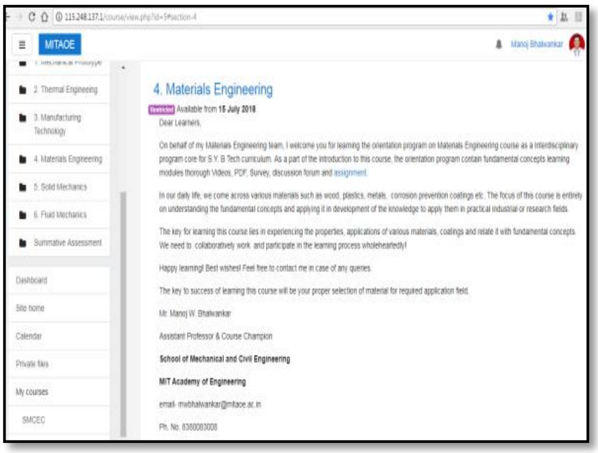


Fig. 1 ICT tool utilization-Moodle

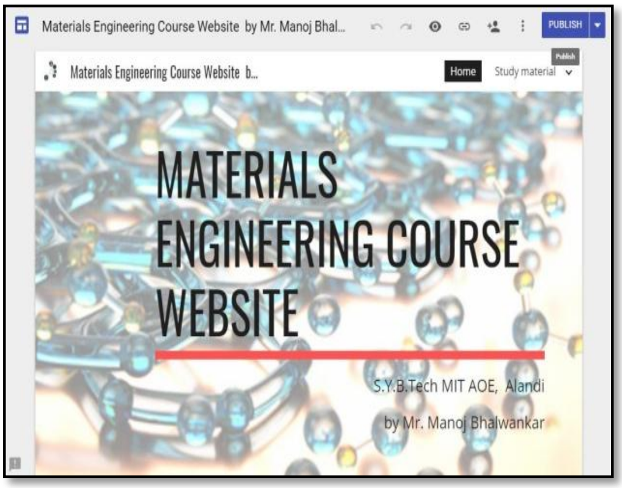


Fig. 2 ICT tool utilization –Website

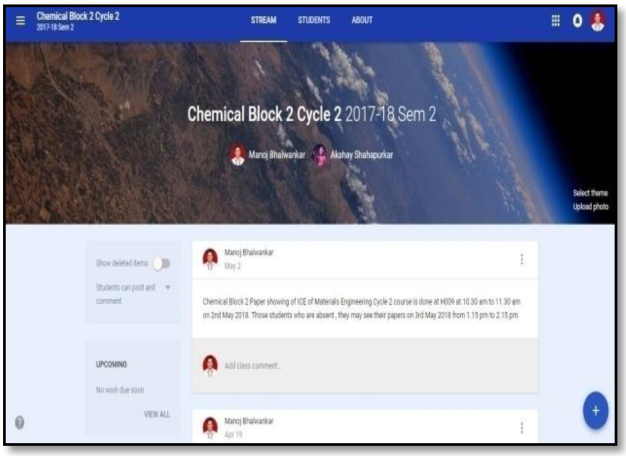


Fig. 3 ICT tool utilization- Classroom

The learning need of today's millennial learner is the availability of information online 24x7. The revision of the content covered in classroom, allocation of activities, assignments, conduction of assessment tests, making announcements, putting important notices for students has become convenient and at ease related to course instructor. From learners' perspective, the course evaluation is transparent since the assessment rubrics are declared, the study material is interactive and assessment tests contain multiple choices, drag and drop (image or word), match the pairs, essay type, short answer type, missing word type questions which enhances the interest among them and increases the attention span while attempting the test.

Figure 1 and 2 shows the utilization of Moodle, course Google website, Google classroom tools is performed for each cycle in semester for effective creation of active learning environment by each instructor of Materials Engineering course. The other important aspect of these tools is sustainability through no usage of paper.

3. Practical course conduction techniques

Practical course consist of all practical performance experiments which can be divided into destructive and non-destructive test, simulation experiment. Destructive tests consist of hardness test- Rockwell, Poldi, Vickers; toughness test- Izod and Charpy; Jominy end quench test for hardenability assessment non-destructive tests-ultrasonic test and dye penetrant test; soldering and a virtual experiment-determination of Hall coefficient of semiconductor material. These experiments aim to assess the analysis of properties of metals in qualitative and quantitative manner.

3.1 "Learning by doing" approach

The basic need of effective conduction of any course is that, there should be interdependency and linkage between theoretical concepts and experiments performed in lab and ultimately its application in industries and research field for solving real world problems. Accordingly, the learners should get the idea about performance of experiments, idea creation, problem solving ability, repeatability, accuracy and precision while conduction of experiments is necessary.

Hence, to achieve these goals, the course instructor allows and encourages learners to participate and contribute by performing the trails and taking readings or observation keenly while conduction of experiments.

4. Activity based learning

The learning needs of millennial learner are to maintain the learning attention span by various interactive tools and techniques such as activity based learning. The activities such as think pair share, technical poster presentation, jig saw, oral presentation help in development of interactive classroom environment. The sharing of knowledge, literature review analysis, development of presentation and communication skills are some of the intangible outcomes of conduction of activity based learning.

4.1 Think Pair Share Activity

Think pair share activity is related to development of skills among the learners for idea creation, problem solving, team building, communication techniques, logical thinking ability.

S.Y. B.Tech Materials Engineering Course –Think Pair Share activity Rubrics
Cycle 2 Semester IV A.Y. 2017-18

Category	Excellent(5)	Better(4)	Good (3)	Unsatisfactory(2)
Problem solving (Criteria 1)	Always shows interest in solving new problems by using fundamental knowledge with applications.	Most of the time shows interest in solving new problems by using fundamentals.	Sometimes show interest in solving new problems by using few fundamentals.	Does not show interest in solving new problems by using incorrect basic knowledge.
Conceptualization/idea creation (Criteria 2)	Very enthusiastic about representing new concepts/idea to group by logical thinking approach.	Most of the time enthusiastic about representing new concepts/idea to group by logical thinking approach.	Sometimes enthusiastic about representing new concepts/idea to group by using incorrect approach.	Does not appear enthusiastic about representing new concepts/idea to group by non logical thinking approach
Team work(criteria 3)	Always Very keen to listen patiently to other team member and supports/ explains points in sequential manner.	Most of the time listen patiently to other team member and supports/ explains points in sequential manner	Somewhat listen patiently to other team member and supports/ explains points in non sequential manner	Does not listen patiently to other team member and supports/ explains points in non sequential manner
Communication (Criteria 4)	Speaks very clearly. Very easy for the audience to understand.	Most of the time speaks clearly. Easy for the audience to understand.	Sometimes speaks clearly. Sometimes easy for the audience to understand.	Does not speak clearly. Difficult for the audience to understand.
Logical thinking (Criteria5)	Always perform logical thinking related to problem is very clear. Presents idea on the basis of facts on the basis of research work.	Most of times perform logical thinking related to problem is very clear. Presents idea on the basis of facts on the basis of research work.	Sometimes perform logical thinking related to problem is not too clear. Presents idea on the basis of facts on the basis of non standard references.	Does not perform logical thinking related to problem is not clear. Presents idea on the basis of facts on the basis of non standard references.

Name of student: **Branch:** **Block No:** **Date:** **Sign of student:**
Name and sign of Internal Examiner(s): **Name and sign of External Examiner(s):**

Mr. Bhalwankar M.W. Prof. Totla N.B. Prof. Bhagat S.M.

Course Champion **Head of Mechanical Engineering Department** **Dean Academics**

Fig. 4. TPS activity rubrics

The assessment rubrics of think pair share activities involve following criterion as shown in figure 3 such as conceptualization/idea creation, team work, communication, logical thinking. The assessment rubrics are communicated to learners via ICT tools at the commencement of cycle.

Fig. 5 TPS activity conduction details

Figure 4 shows the conduction of think pair share activity in Sem II 2017-18. Learners' batch was divided in groups of 4 each on randomization technique. The diversified topics were allocated to groups such as selection of suitable material for contact lenses at high temperature, concentrated sulphuric acid container, wheels for chairs, belt conveyor for heavy loads, flammable gas pipelines, medicine container and exhaust nozzle in aircrafts. These topics were included from variety of streams of engineering fields which include wide range of materials such as Polyurethanes-polymers, Hastalloy-Nickel alloys-metals. The aim of this activity is to motivate the learners to think logically within a team for solving a given problem. The literature review is soul need of the effective conduction of the activity.

4.2 Technical Poster Presentation Activity

S.Y. B.Tech Materials Engineering Course -Poster Presentation activity Rubrics
Cycle 2 Semester IV A.Y. 2017-18

Category	Excellent(5)	Better(4)	Good (3)	Unsatisfactory(2)
Technical content (Criteria 1)	All the related points are explained in detail with fundamentals and case study of examples.	Most of the points are covered sufficiently with detailed examples.	Some points are explained sufficiently with few examples.	Does not explain the points clearly with incorrect examples.
Pictorial representation (Criteria 2)	All the content represented in the form of graphs, schematic diagram, microstructures, SEM, TEM images.	Most of the content explained with graphs, diagram, microstructures, and SEM /TEM images.	Some content represented pictorially and other content in the form of text.	Does not explain the content in the form of pictures, all the content explained in the form of text.
Abstract (criteria 3)	Always it contains previous research work, materials, processes, key findings in brief with proper selection of words in word limit of 250.	Most of it contains previous research work, materials, processes, key findings in brief with proper selection of words in word limit of 250.	Some of it contains previous research work, materials, processes, key findings in brief with improper selection of words not in word limit of 250.	Does not contain previous research work, materials, processes, key findings in brief with improper selection of words not in word limit of 250.
Research methodology(Criteria 4)	All the content like materials, synthesis processes, process parameters, characterization and testing methods are included.	Most of the content like materials, synthesis processes, process parameters, characterization and testing methods are included.	Some of the content like materials, synthesis processes, process parameters, characterization and testing methods are included.	Does not include the content like materials, synthesis processes, process parameters, characterization and testing methods.
Conclusion(Criteria5)	Knowledge of conclusion of related topic is very clear. Student shows full understanding of content during presentation.	Knowledge of conclusion of related topic is clear most of the time during the presentation.	Knowledge of conclusion of related topic is sometimes evident during the presentation.	Knowledge of conclusion of related topic in not clear. Student does not show understanding during presentation.

Name of student: **Branch:** **Block No:** **Date:** **Sign of student:**
Name and sign of Internal Examiner(s): **Name and sign of External Examiner(s):**

Mr. Bhalwankar M.W. Prof. Totla N.B. Prof. Bhagat S.M.

Fig. 6 Poster pre. Activity rubrics

Technical poster presentation activity is aimed at developing the ability to perform literature review, reading of reference papers, analysis of results, developing technical content in logical manner, analysis of research methodology, putting pictorial representation for explanation rather than text which is basic need of effective poster presentation. The assessment rubrics enumerated as shown in figure 4.

First challenge in conduction of this activity was the interest level among learners. So, I motivated the learners by showing various research papers related to topic in curriculum and its advancements. So, learners then started to interact and shown interest in performing this activity. The vivid line of action of completion of tasks for performing this activity along with rubrics was explained 1 month before the date of activity as shown in figure 5. Learners started to come with their technical or non-technical problems such as understanding of particular concepts, downloading of reference papers etc. I tried to fulfill their learning needs and difficulties during practical experiments sessions. A standard format of A1 size technical poster was distributed to all learners for editing and completion of their poster on particular topic.

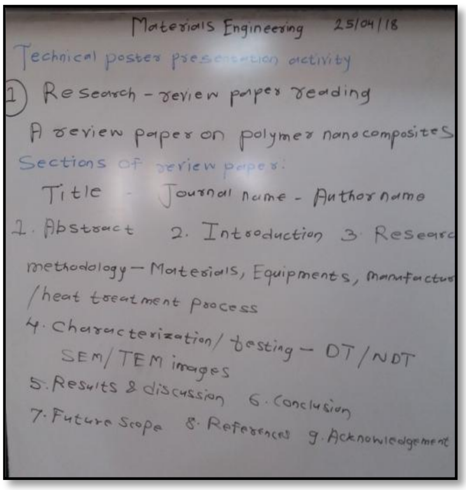


Fig. 7 Poster presentation detailing work

The topics were distributed as per their interest in particular unit of Materials Engineering curriculum such as ultrasonic test, Elastomers, effect of sintering parameters on strength of powder metallurgical components, nanomaterials, nickel alloys etc. Learners effectively collaborated for this activity and explained the details of the respective posters effectively to eminent adjunct faculty such as Dr. N.S. Babu, ex scientist, ISRO, Dr. P.W. Deshmukh, Ph.D. IIT Bombay, Dr. P. P. Bakshe, Darmstadt University, Germany as shown in Figure 6 a. The feedback of the learners was taken as shown in figure 6 b and they were satisfied through the learning process. They developed the confidence that, they can perform literature review effectively needed for minor project and major project in near future.

Fig. 8 Poster presentation evaluation by externals

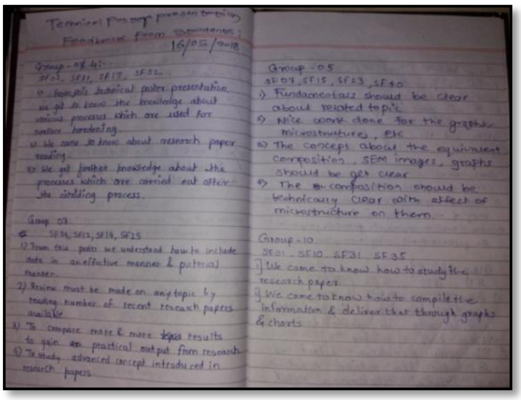


Fig. 9 Poster presentation feedback by students

5. Assessment rubrics

The rubrics are explained to the learners at the start of the cycle to effectively communicate the requirements of the assessment of activity performance, presentation exam, reflection report of the experiments and experiment write up continuous assessment. The respective factors are considered for internal marks and external presentation exam marks allocation.

5.1 Presentation exam assessment rubrics

Presentation exam of Materials Engineering has 25 marks Weightage. The assessment rubrics as shown in figure 7 consist of parameters like introduction, technical content, team work, presentation skills, question and answers. The presentation exam assessment should have the holistic approach of technical content and presentation skills. Some learners may have issue with communication skills but on other side they may be technically strong. Hence, various aspects of assessment have been taken into consideration.

S.Y. B.Tech Materials Engineering Course –Presentation Examination Rubrics
Cycle 2 Semester IV A.Y. 2017-18

Category	Excellent(5)	Better(4)	Good (3)	Unsatisfactory(2)
Introduction to topic (Criteria 1)	Always explains new topic by using related background to signify the learning objectives.	Most of the time explains new topic by using related background to signify the learning objectives.	Sometimes explains new topic by using related background. Does not signify the learning objectives.	Does not show explain new topic by using related background, Does not signify the learning objectives.
Technical content (Criteria 2)	Very enthusiastic about explaining technical content of the topic related to process by logical thinking approach.	Most of the time enthusiastic about explaining technical content of the topic related to process by logical thinking approach..	Sometimes enthusiastic about explaining technical content of the topic related to process by logical thinking approach.	Does not appear enthusiastic about explaining technical content of the topic related to process Does not apply logical thinking approach.
Team work (criteria 3)	Always Very keen to listen patiently to other team member and supports/ explains points in sequential manner.	Most of the time listen patiently to other team member and supports/ explains points in sequential manner	Somewhat listen patiently to other team member and supports/ explains points in non sequential manner	Does not listen patiently to other team member and supports/ explains points in non sequential manner
Presentation skills (Criteria 4)	Always speaks very clearly. Very easy for the audience to understand. Makes eye contact with audience	Most of the time speaks clearly. Very easy for the audience to understand. Makes eye contact with audience	Sometimes speaks clearly. Very easy for the audience to understand. Does not make eye contact with audience	Does not speak clearly. Difficult for the audience to understand. Does not make eye contact with audience
Questions and answers (Criteria5)	Always perform logical thinking related to question is very clear. Always supports answer on the basis of facts on the basis of concepts and applications.	Most of times perform logical thinking related to question is very clear. Mostly supports answer on the basis of facts on the basis of concepts and applications.	Sometimes perform logical thinking related to question is not too clear. Sometimes supports answer on the basis of facts on the basis of concepts and applications.	Does not perform logical thinking related to question. Does not support answer on the basis of facts on the basis of concepts and applications.

Name of student: Branch: Block No: Date: Sign of student:
Name and sign of Internal Examiner(s): Name and sign of External Examiner(s):

Mr. Bhalwankar M.W. Prof. Totla N.B. Prof. Bhagat S.M.

Fig. 10 Presentation exam assessment rubrics

5.2 Experiment –reflection report rubrics

Reflection report is the representation of learners' knowledge based on remembering and understanding and to some extent applying level of revised bloom's taxonomy level. Since, the assessment rubrics consist of explanation of aim, principle, industrial/research case study and conclusion of experiment preformed in practical session.

S.Y. B.Tech Materials Engineering Course –Reflection Report Assessment Rubrics
Cycle 2 Semester IV A.Y. 2017-18

Category	Excellent(5)	Better(4)	Good (3)	Unsatisfactory(2)
Aim(Criteria 1)	Always explains aim in brief by point wise manner considering fundamental knowledge with applications.	Most of the time explains aim in brief by point wise manner considering fundamental knowledge with applications.	Sometimes explains aim in detail by point wise manner without considering fundamental knowledge with applications.	Does not explains aim in brief by detailed manner without considering fundamental knowledge with applications.
Principle (Criteria 2)	Always explains principle in single line by point wise manner considering fundamental knowledge of working of process.	Most of the time explains principle in single line by point wise manner considering fundamental knowledge of working of process.	Sometimes explain principle in single line by point wise manner without considering fundamental knowledge of working of process.	Does not explain principle in single line by point wise manner without considering fundamental knowledge of working of process.
Industrial/research case study(criteria 3)	Always explains cases study with technical details, diagram, procedure, advantages, limitations, applications.	Most of the time explains cases study with technical details, diagram, procedure, but without advantages, limitations, applications	Sometimes explains cases study without technical details, diagram, procedure, advantages, limitations, applications	Does not explains cases study with technical details, diagram, procedure, advantages, limitations, applications
Oral examination (Criteria 4)	Speaks very clearly. Very easy for the audience to understand.	Most of the time speaks clearly. Easy for the audience to understand.	Sometimes speaks clearly. Sometimes easy for the audience to understand.	Does not speak clearly. Difficult for the audience to understand.
Conclusion(Criteria5)	Always perform logical thinking related to conclusion very clearly considering outcome of experiment in point wise manner.	Most of times perform logical thinking related to conclusion very clearly considering outcome of experiment in point wise manner.	Sometimes perform logical thinking related to conclusion very clearly considering outcome of experiment in detailed manner.	Does not perform logical thinking related to conclusion not clearly considering outcome of experiment in detailed manner.

Name of student: Branch: Block No: Date: Sign of student:
Name and sign of Internal Examiner(s): Name and sign of External Examiner(s):

Mr. Bhalwankar M.W. Prof. Totla N.B. Prof. Bhagat S.M.

Course Champion Head of Mechanical Engineering Department Dean Academics

Fig. 11 Reflection report assessment rubrics

5.3 Experiment write-up assessment rubrics

The experiment write up assessment should be done on continuous basis in every lab session and the rubrics are defined as shown in figure 9. It consist of drawing of neat labeled diagram with proper scale, explanation of conclusion and oral examination based on the write up.

S.Y. B.Tech Materials Engineering Course –Experiment write Ups Assessment Rubrics
Cycle 2 Semester IV A.Y. 2017-18

Category	Excellent(5)	Better(4)	Good (3)	Unsatisfactory(2)
Diagram(Criteria 1)	Always draws neat labeled diagram to the scale in order to show the process clearly.	Most of the time draws neat labeled diagram to the scale in order to show the process clearly.	Sometimes draws neat labeled diagram to the scale. Does not show the process clearly.	Does not show draws neat labeled diagram to the scale Does not show the process clearly.
Conclusion (Criteria 2)	Always perform logical thinking related to conclusion very clearly considering outcome of experiment in point wise manner.	Most of times perform logical thinking related to conclusion very clearly considering outcome of experiment in point wise manner.	Sometimes perform logical thinking related to conclusion very clearly considering outcome of experiment in detailed manner.	Does not perform logical thinking related to conclusion not clearly considering outcome of experiment in detailed manner.
Oral examination (Criteria 3)	Always answers very clearly related to question. Supports the explanation with procedure performed in lab.	Most of the time answers clearly related to question. Supports the explanation with procedure performed in lab.	Sometimes answers very clearly related to question. Does not support the explanation with procedure performed in lab.	Does not speak clearly related to question. Does not support the explanation procedure performed in lab.

Name of student: Branch:

Block No: Date: Sign of student:

Name and sign of Internal Examiner(s):

Name and sign of External Examiner(s):

Mr. Bhalwankar M.W. Prof. Totla N.B. Prof. Bhagat S.M.

Course Champion Head of Mechanical Engineering Department Dean Academics

Fig. 12 Experiment write up assessment rubrics

6. Invited talks by expert faculty

The importance of invited talks has always been primitive since it gives summative information on the academic or research aspects of the curriculum to broader extent. Dr. N.S. Babu delivered the talk on Scanning and Transmission Electron Microscope for Chemical block in Sem IV 2017-18 as shown in figure 10. He has experimented on these techniques in his professional career at ISRO for 35 years. So, learners were keen to listen to his talk and the interest was generated among them for research opportunities in future.

Fig. 13 Invited talk by expert faculty

7. Results and discussion

7.1 Course Outcome Attainment

As per outcome based education, course outcome fulfillment is the criteria for successful conduction of course. Accordingly, in order to achieve this aim, the above mentioned teaching-learning tools and techniques such as activity based learning, assessment rubrics, ICT tools usage, reflection report writing are applied. As shown in figure 11 and 12 CO1 attainment level is increased from 25% to 26.3%. CO2 level increased from 6.3% to 12.5%. CO3 level increased from 22.5% to 23.8%. CO4 level increased from 26.3% to 28.8%. CO5 level increased from 27.5% to 32.5%. Hence, it can be analyzed that, the application of innovative techniques in pedagogy of Materials Engineering course such as activity based learning, ICT tools usage; rubrics based assessment has helped learners to gain higher achievement in course outcomes.

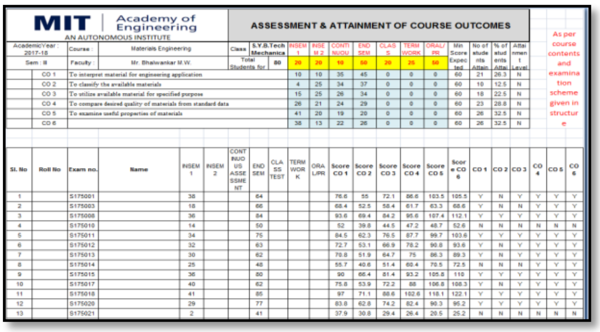


Fig. 14 CO attainment Mechanical block

MIT | Academy of Engineering
AN AUTONOMOUS INSTITUTE

ASSESSMENT & ATTAINMENT OF COURSE OUTCOMES

AcademicYear : 2017-18	Course :	Materials Engineering	Class	S.Y.B.Tech Mechanical	INSEM 1	INSEM 2	CONTINUOU	END SEM	CLASS	TERM WORK	ORAL/PR	Min Score Expected	No of students Attain	% of students Attai	Attainment Level
Sem : II	Faculty :	Mr. Bhalwankar M.W.	Total Students for	80	20	20	10	50	20	25	50				
	CO 1	To interpret material for engineering application			10	10	35	45	0	0	0	60	20	25	N
	CO 2	To classify the available materials			4	25	34	37	0	0	0	60	5	6.3	N
	CO 3	To utilize available material for specified purpose			15	25	26	34	0	0	0	60	19	23.8	N
	CO 4	To compare desired quality of materials from standard data			26	21	24	29	0	0	0	60	21	26.3	N
	CO 5	To examine useful properties of materials			41	20	19	20	0	0	0	60	22	27.5	N
	CO 6				38	13	22	26	0	0	0	60	23	28.8	N

As per course contents and examination scheme given in structure

Sl. No	Roll No	Exam no.	Name	INSEM 1	INSEM 2	CONTINUOUS ASSESSMENT	END SEM	CLASS TEST	TERM WORK	ORAL/PR	Score CO 1	Score CO 2	Score CO 3	Score CO 4	Score CO 5	Score CO 6	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6
1		S179001		40			54				68.6	48	66.8	83.4	103.6	104.1	Y	N	Y	Y	Y	Y
2		S179004		18			51				54.9	41.4	48.2	53	57.3	60.8	N	N	N	N	N	Y
3		S179005		34			71				80.9	59.4	73.8	85.4	98.1	101.6	Y	N	Y	Y	Y	Y
4		S179006		48			90				105	76.2	97.2	114.6	134.4	138	Y	Y	Y	Y	Y	Y
5		S179007		NP			NP				#####	#####	#####	#####	#####	#####	#####	####	####	###	####	####
6		S179009		43			77				90.8	65.6	84.7	100.6	119	121.8	Y	Y	Y	Y	Y	Y
7		S179010		37			71				82.4	60	76.1	89.3	104.3	107.3	Y	N	Y	Y	Y	Y
8		S179011		46			90				104	75.8	95.7	112	130.3	134.2	Y	Y	Y	Y	Y	Y
9		S179012		20			30				37	26.2	35.4	43.4	53	53.6	N	N	N	N	N	N
10		S179013		18			47				51.3	38.4	45.5	50.7	55.7	58.7	N	N	N	N	N	N
11		S179014		35			74				84.1	61.8	76.6	88.5	101.4	105	Y	Y	Y	Y	Y	Y
12		S179015		NP			NP				#####	#####	#####	#####	#####	#####	#####	####	####	###	####	####
13		S179016		3			NP				#####	#####	#####	#####	#####	#####	#####	####	####	###	####	####

Fig. 15 CO attainment of Chemical block

8. Conclusion

Materials Engineering course is deployed for S.Y. B.Tech curriculum for all disciplines of Engineering at MIT AOE. The main challenge in teaching learning process is students' attention span and interest especially for Computer, IT, EandTC and Electronics branch students. I order to make this course interesting, we use Gestalt's theory for creating relevance. The Attention-Relevance-Confidence-Satisfaction model needs to be implemented by the teacher well for effective course content delivery. The Course Outcome, students' confidence while presentation, oral examination and selection participation in minor and miny projects related to this course shows the immediate success of it. Further, implementation of the knowledge in industrial projects during students' internships at SY and TY level and then in professional career as well as at higher education like M.S. and M.Tech level will be the truest course outcome of our efforts.

In order to build research oriented approach among students, a research group related to Materials Engineering is established to cultivate their interest in the field of Material Science and Metallurgy.

9. Future Scope:

To organize a conference for paper presentation by the S.Y.B. Tech students at MITAOE.

10. Acknowledgement

The author would like to thank Director, Dean and faculty of School of Mechanical and Civil Engineering, Exam section of MITAOE for their continuous guidance in implementation of active learning techniques.

10. References

[1] Richard M. Felder "Learning Styles and Strategies"

Use of Innovative Pedagogical Methods to Enhance Creativity and Learning in Engineering Students.

Shraddha V. Shelke [1], Snehal D. Patil [2], Dr. Manisha P. Satone [3]

[1,2,3]Electronics and Telecommunication Department, K. K. Wagh Institute of Engineering Education and Research, Nashik
[1]svshelke@kkwagh.edu.in
[2]sdpatil@kkwagh.edu.in
[3]mpsatone@kkwagh.edu.in
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Today's generation is very smart and active they don't like traditional chalk and talk teaching methodology. It is observed that classrooms are filled with student's diversity; diversities are in terms of various aspects like culture, family background, region, different skills they have and schools where they have been studying. Because of these diversities their learning needs are also becoming increasingly diverse. It is therefore required to use different innovative teaching learning methodologies.
This paper described various innovative teaching learning methodologies used for second year and third year engineering students and their advantages. Flipped classroom was used along with cooperative learning activity during practical session, promotes student centered learning. It is observed that Project based learning (PBL) activity improved critical thinking, communication and coordination in students.3D Model making activity conducted for the subject Electromagnetics makes visualization and understanding of the concept very clear. To enhance teaching and learning process through effective use of ICT, technical blog is prepared explaining basics of electromagnetic. It is found that think pair share and team pair solo (TPS) activities are very effective for the subject having tutorial sessions. Feedback of all these activities is collected and used to calculate percentage attainment.

Keywords: Flipped learning, Project based learning, think pair share, team pair solo etc.

Introduction:

1. Flipped Classroom:

Flipped classroom is a type of blended learning in which contents are delivered to the students outside of the classroom either by providing short video lectures or notes etc. Here students can learn at their own speed, they can stop and replay videos again and again. They can discuss questions with their teachers also. During class time, instructors facilitate the learning process by helping students work through course material individually and in groups. Various cooperative learning methods can be used during classroom such as four corners, round robin, team pair solo, team pair share, three step interview, one stray etc.[1],[2],[4]

Figure 1shown below explains flipped learning approach

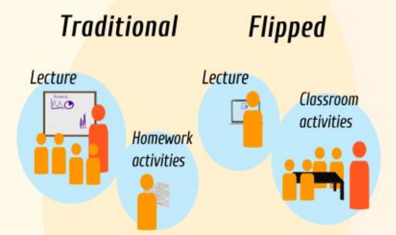


Fig. 1 Flipped learning approach

Methodology used:

Flipped learning is performed during practical session for course digital electronics, short animation video explaining working of logic gates is shared to all the students on Google classroom. During practical session students are divided in groups, each group contains 4 students. Boolean expression is given to each group and asked them to design and implement by using minimum number of logic gates. Round robin cooperative learning strategy is followed. In each group students take turn to share their ideas, one student from each group known as reporter records all the ideas shared in the group. At the end of discussion reporter from each group presented their answer with rest of the class. Photographs of this activity are shown in figure 2. After that students implemented same circuit on breadboard and verified its truth table. Impact analysis of flipped learning is done by taking technical and non technical feedback of the activity through Google form. Attainment is calculated from responses, 70% attainment is obtained for experiment based on logic gates and 90% attainment is obtained for experiment based on synchronous up/down counter.

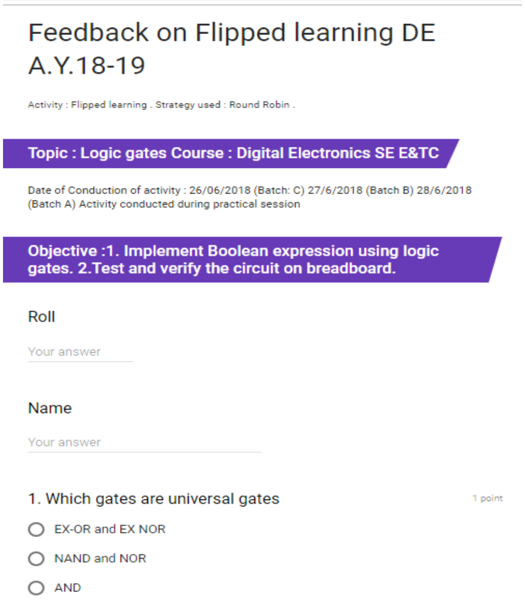
Fig 2 Photographs of flipped learning active

Impact analysis of flipped learning is done by taking technical feedback of the activity through Google form. Following table shows percentage attainment calculated from response obtained from students.

Table 1: Percentage attainment obtained from technical feedback.

Flipped learning	No of students particip ated	No of students scoring more than 60 % marks	Percentage attainment
Experiments based on logic gates	33	23	70
Synchronous up/down counter	42	43	98

Attainment is calculated from responses, 70% attainment is obtained for experiment based on logic gates and 98% attainment is obtained for experiment based on synchronous up/down counter.



Feedback on Flipped learning DE A.Y.18-19

Activity : Flipped learning . Strategy used : Round Robin .

Topic : Logic gates Course : Digital Electronics SE E&TC

Date of Conduction of activity : 26/06/2018 (Batch: C) 27/6/2018 (Batch B) 28/6/2018 (Batch A) Activity conducted during practical session

Objective :1. Implement Boolean expression using logic gates. 2.Test and verify the circuit on breadboard.

Roll

Your answer

Name

Your answer

1. Which gates are universal gates — 1 point

- EX-OR and EX NOR
- NAND and NOR
- AND

Fig 3 Technical feedback form collected from students

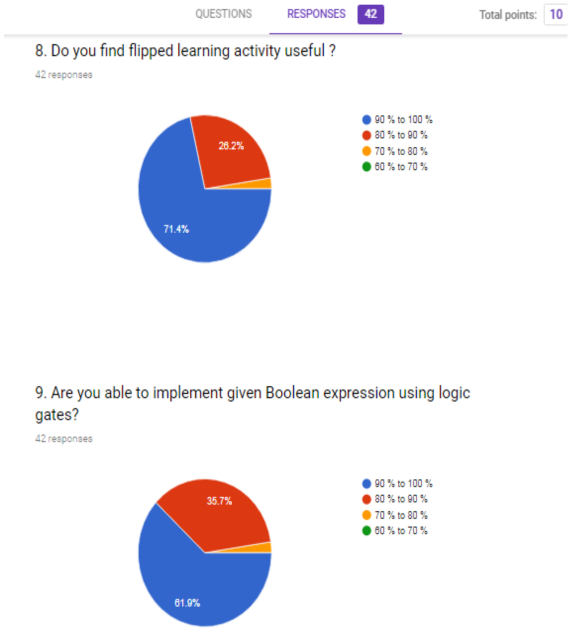


Fig. Responses obtained from students for technical feedback form

2. Project based learning (PBL)

To encourage students to learn and apply knowledge and skills project based learning can be conducted.

Objectives of project based learning are

1. To improves technical skills in students like Circuit Designing, Circuit testing (Hardware, software), troubleshooting and Programming etc.
2. To improve soft skills in students like Communication skills , Presentation , Report writing etc
3. This approach gives students a relevant learning experience and encourages the transfer of knowledge to new situations.
4. To improve following abilities in students like critical thinking, communication and cooperation in students [2].

Methodology used:

Around 50 micro and mini projects were allotted to second, third and fourth year of engineering students. Second year students have done projects under subject digital electronics and electronics test and measuring instruments. Third year students have done projects under subject electronics system design , project done by fourth year students are form the subject VLSI design and technology. Some of the students have implemented ideas under electronic hobby projects.

All the projects were exhibited and evaluated by the team of experts as shown in figure 5. Impact of PBL activity is obtained from feedback taken from students. It is observed that project based learning activity is useful to improve planning, critical thinking, reasoning, and creativity of the students.

Fig. 5 Photographs of Project based learning exhibition

3. Use of Information and Communication Technologies (ICT):

In most of the countries use of ICT in education and training has become priority during last decade. ICT enhances teaching and learning process, quality and accessibility of education and learning environment. The impact of the ICT on each sector of the life across the past two-three decades has been enormous. [3]

Advantages of using ICT in education

1. Use of technology in education encourages more active participation in the learning process which can be hard to achieve through a traditional lecture environment.
2. Different students are having different learning styles and different abilities. Learning can be done more effective with the help of technology, by using internet students get access to broad range of resources to conduct research in different ways, which in turn can increase the engagement.
3. There are some benefits for teachers also as it helps in improve teaching. Teacher can make use of trusted online resources to improve traditional teaching methods so as to keep students engaged. Visual lessons, animated video lectures, online assessments helps to understand concepts more clearly and it also save time. This is how it improves collaboration and knowledge sharing between teachers and students.

Methodology used:

Visualization of electromagnetic field parameter is difficult. In order to improve conceptual understanding 3D model making activity is conducted for third year engineering students. Models for cylindrical, spherical coordinate system and electromagnetic waves are prepared by students as shown in figure 6,7and 8. Technical blog explaining basics of Cartesian, cylindrical and spherical coordinate systems and including photographs of 3D models prepared having blog address as http://svselec.blogspot.com/. In order to find out attainment and understanding of the concept technical quizzes are posted on a blog. Percentage attainment is calculated from marks obtained in quiz. 30 out of 34 students score more than 60% marks in quiz based on coordinate system thus attainment is 88%. 25 out of 40 students score more than 60 % marks in quiz based on Magnetostatics, Electrostatics and Faraday's law thus percentage attainment is 62.5%.

Fig .6: 3D Model of cylindrical Coordinate system

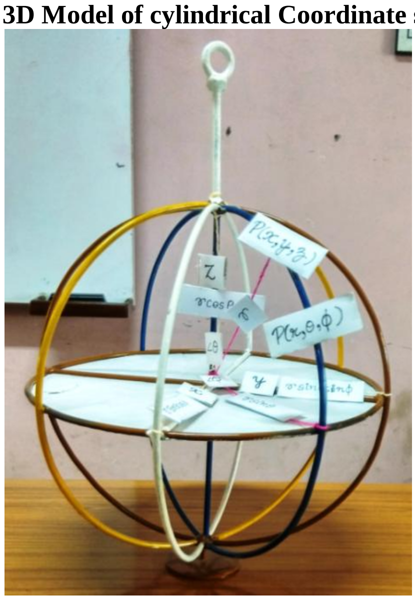


Fig. 7: 3D Model of Spherical Coordinate system

Fig. 8: 3D Model of cylindrical, Spherical Coordinate system and electromagnetic waves.

4. Think pair share

Think pair share is one of the cooperative learning strategies beneficial to improve interaction between students and facilitators. In this strategy question will be given by the facilitator and students are allowed to think on it individually then discuss in pair and then share their answer to rest of the class [5]

Objectives of this activity are to increase interaction among students and involve all the students in active learning. It also provides opportunity to improve students communication, listening and analysis skills.

Methodology used:

Think pair share activity is used during tutorial sessions of the subject electromagnetic. This activity found useful while solving problems.

Objective of this activity was

1. Students should actively participate in learning and problem solving

2. Students should understand Coulomb's Law

3. Students should be able to apply Coulomb's Law to calculate force acting on a charge.

Coulomb's Law was explained to students. Problem statement based on Coulomb's Law was given to students. Students were grouped in a pair and they discuss formula and solved problem. One student from each group shared his or her answer with other students. Throughout the session job of teacher was to supervise students closely and answer queries raised by them. Figure 9 shows photographs of think pair share activity.

Fig. 9: Photographs of Think pair share activity.

Conclusion:

It is observed that all these innovative pedagogical methods are having positive impact in engineering education.

Equal and active participation of the learners is the major benefit of Round Robin Strategy in the classroom. It enhances participation and encourages students to contribute in the process of learning as everyone equal opportunity to share gets his/her opinion.

Project based learning is found useful because students of PBL will enter the workforce with significant experience in the areas of research, logical reasoning, team cooperation and even project management.

Think pair share cooperative learning strategy is useful to improve communication and listening skills. Advantage of this activity is that all the students are engaged in the thinking process, including those quiet students. In this way it increases high degree of interaction and engagement between students and facilitator.

References

[1] Sara Arnold-Garza, "The flipped classroom teaching model and its use for information literacy instruction ",Communication in Information literacy ,Volume 8, Issue1, 2014

[2] Center for Teaching and Learning, https://www.washington.edu/teaching/teaching-resources/engaging-students-in-learning/flipping-the-classroom/

[3] Mrs. Swati Desai, "Role of information communication technologies in education", Proceedings of the 4th National Conference; INDIACom-2010

[4] Cooperative Learning Strategies. Retrieved March 2, 2016, from http://www.colorincolorado.org/article/cooperative-learning-strategies

[5] Take Two Minutes to Become an Expert in Cooperative Learning. Retrieved March 7, 2016, from http://k6educators.about.com/od/helpfornewteachers/qt/Cooperative-Learning-TipsAnd-Techniques.htm

Use of ICT for Assessment and Evaluation Electronic Devices and Circuits – A Case Study

Trupti Wagh[1], Vishwalata Bagal[2]

[1,2]Assistant Professor,

D.Y.P.C.O.E, Akurdi, Pune, Maharashtra, SPPU, Pune.
Corresponding author's email address – trupti_12@rediffmail.com
Track No: 1
Track Name: Different dimensions of Teaching-Learning

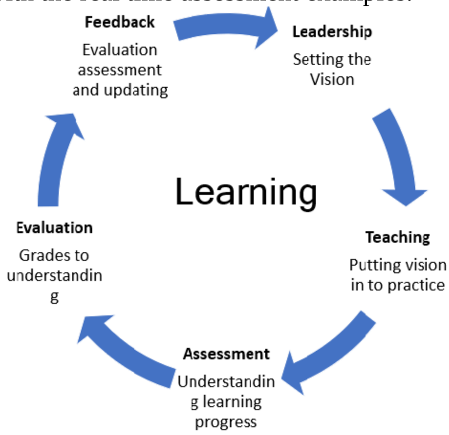
ABSTRACT

Electronic design has applications right from alarm clock to smart city. The device which controls the flow of electrons is called electronic device and they are the main building blocks of any electronic circuit. For connecting students to such a high application-oriented subject which has applications in benefit of society is a interesting task. But to make them understand and learn the functioning of device e.g. flow of electron as a current which is not physically observed, is a challenge. Use of ICT had made it possible to significant extent. Students interest and involvement in learning will increase through ICT as they can attend/participate in understanding it even out of the classroom very Easily, which is inclined with smart world. For enriched learning and evaluation innovative teaching methods like MCQ, MSQ, Crossword Puzzle, Video brainstorming, reflection spot analogy etc. Evaluation, Report generation and progress tracking is very easy through ICT so, ICT has evolved as game changer in teaching learning process.

INTRODUCTION

Assessment is one of the process of gathering and interpreting information about students' learning. Effective and efficient assessment of learning is possible through ICT. Use of Modern technology invented new tools that can be used in the classroom. ICT in assessment uses digital devices to help in the creation, conveyance, retorts, scores, feedback and many more advantages for teachers and learners. [1]Multiple-choice tests have gone through a great criticism in recent years, but whatever their flaws, they are a mature technology which offers some distinct advantages. In comparison to some other forms of assessments, they do not require a lot of time and generate scores that are familiar to both learners and educators. Technology now a days is used to personalize learning and give students insight for what and how they learn and at what pace.

Infrastructures as shown in figure Providing accessibility, resources and connectivity so that learning is everywhere, all the time through ICT. Leadership sets the vision, teaching puts it in to practice and assessment helps in understanding learning progress. Evaluation and feedback are extension of infrastructure which can be monitored through ICT and makes corrective measures for reseating new goals. [2] This paper presents the use of ICT for learning and assessment of second year engineering students to understand the subject electronic devices and circuits with the real time assessment examples.



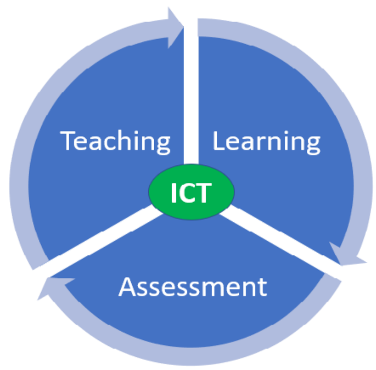


Fig.1 : Basic Infrastrucure
Fig: 2 ICT centric infrastructure

METHODOLOGY

For ICT based assessment formats, including text documents and multimedia formats such as sound, video or images are used. It can be undertaken by students in groups or individually and it can occur with large numbers of students. Methods used are MCQ, MSQ as an assignment, crossworld puzzle, presentations and Videos.

Assessment format is designed based on theoretical and practical aspects which sorts weak and bright students.

Identification of Grades(Rubrics : Week / Bright)

Roll No.	Name of student	Previous University Results	Unit Test-I Marks	Class Performance	Lab Performance	Remarks Weak/Bright

Rubrics for Class Performance:

Roll No.	Name Of student	Attendance In class	Assignment Submission (ICT) and Grades	Involvement in class work	Grades for class performance

Rubrics for Lab Performance:

Roll No.	Name of student	Attendance in Laboratory	Presentation (ICT)	Involvement in Lab work	Viva	Grades for class performance

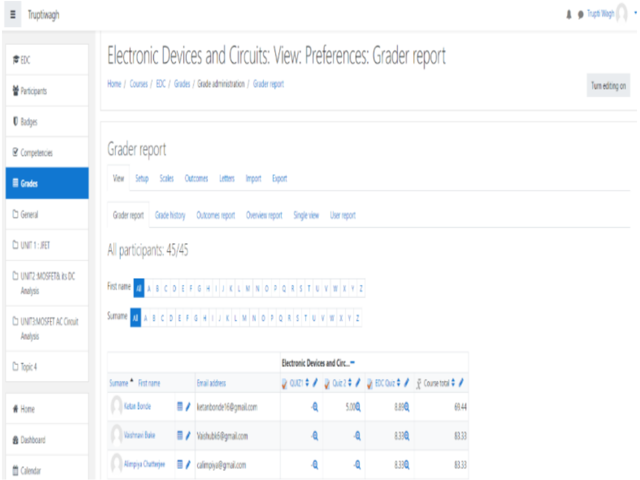
ICT-(Moodle-Gnomio website) grading has been used and more assignments are designed for weak students to creat interest into them with learner centric approach.

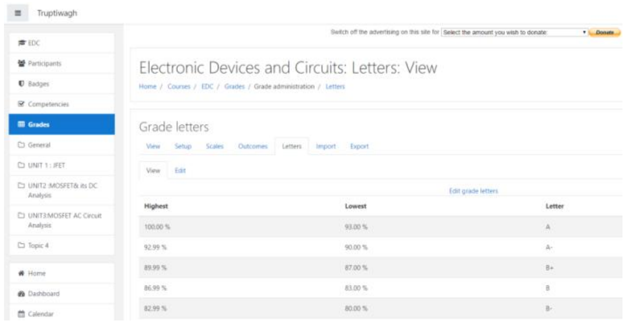
RESULTS AND DISCUSSION

Technosavy Students are Excited to learn and participate in ICT based assignments. It Helped students specially lateral entry students to practice for online exam (MCQs) as per our university exam pattern as we can customize the dates of submission, timings and gradings. Students enjoyed these resources and are very much excited when they use the simulations.

RESEARCH FINDINGS

GRADING EVIDENCES THROUGH GNOMIO [3]





CONCLUSIONS

ICT has increased access and efficiency of the teaching-learning process in my class. However, as an instructor, I need to spend more time in designing various activities and need to ensure that they are appropriate for specific topic and student. Sometimes Students seem to be more inclined to Social Media enjoyment and do not focus on the actual learning which is a main purpose behind the activity.

ACKNOWLEDGEMENT

I express my gratitude to team IIT Bombay FDP201X who have initiated this spark for faculty members to change conventional teaching learning chalk and talks one way technique to learner centric support system. I express my Gratitude to my organization D.Y.P.C.O.E, Akurdi and our NBA team for allowing and introducing me to this novel and smart teaching learning word which continued my passion of being learner and falicitator.

REFERENCES

[1] https://www.riemysore.ac.in/ict/unit__9__ict_in_assessment.html#9.3.1

[2] Office of educational technology, "Future Ready Learning, Reimagining the Role of Technology in Education" 2016 NATIONAL EDUCATION TECHNOLOGY PLAN, U.S. DEPARTMENT OF EDUCATION http://tech.ed.gov

[3] https://truptiwagh.gnomio.com

[4] Rajiv J Kapadia, "Teaching and Learning Styles in Engineering Education "38th ASEE/IEEE Frontiers in Education Conference, October 22 – 25, 2008.

[5] U.S. Department of Education, Office of Educational Technology, Future Ready Learning: Reimagining the Role of Technology in Education, Washington, D.C., 2016.

[6] Redecker Christine., "The Use of ICT for the Assessment of Key Competences." Luxembourg: Publications Office of the European Union (2013)

Practicing Problem Based Learning (PBL) for Teaching Quality Control Tools: A Case Study of Metrology and Quality Engineering Course

Ansari Zakir[1], Shaikh Saad[2]

[1,2] Department of Mechanical Engineering, Anjuman-I-Islam's Kalsekar Technical Campus, New Panvel, Navi Mumbai
[1]zakir.ansari@aiktc.ac.in,saad.shaikh@aiktc.ac.in[2]

Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Teaching is becoming a challenge in the current era. The student's interest is decreasing day by day due to a lot of other reasons such as use of social media, and other distractions. The conventional style of teaching is no more effective and lot of research has been made in the use of different teaching methods such as project based learning, peer to peer learning, problem based learning etc. All these tools happens to be effective for the current students. This is more often in subjects which are theory based. The current work aims at using the real life problems for teaching Quality Control Tools to students of Third Year Mechanical Engineering. There are some Quality Control tools which are used for imparting quality in the product or the process. These tools are useful for finding out the causes for a nonconforming process or a non conforming product such as Pareto Chart, Cause and effect diagram etc. The students were taught these tools with the help of some real life problems directly faced by the students. This helped in grabbing the attention of the students as they feel that whatever is taught is part of their daily routine. The students were also given assignments on the said topic related to their own problems. The effectiveness of the said work was determined by conducting a test on the said topic for the students who were taught using this tool and the other set of students who were taught the topic in the conventional way. It was found that there is a marginal difference between the learning levels of the students of both the groups. It can be concluded that the use of modern teaching methods proves effective for the learning of the students.

Keywords: Quality Control Tools, Problem Based Learning, Pareto Chart, Scatter Diagram.

1. Introduction

It is observed that the students are not interested in the conventional mode of teaching learning and they enjoy anything which involves them. It was also found that by involving the students through project based learning, problem based learning the learning levels of the students gets improved.

PBL is a pedagogical approach that enables students to learn while engaging actively with meaningful problems (Elaine H.J. Yew and Karen Goh, 2016).Students are given the opportunities to problem-solve in a collaborative setting, create mental models for learning, and form self-directed learning habits through practice and reflection(Schmidt HG and Moust JHC, 2000, Norman GR and Schmidt HG, 1992, Hmelo-Silver CE,2004.). Hence, the underpinning philosophy of PBL is that learning can be considered a "constructive, self-directed, collaborative and contextual" activity (Dolmans D et al., 2005). The principle of constructivism positions students as active knowledge seekers and co-creators who organise new relevant experiences into personal mental representations or schemata with the help of prior knowledge (Derry SJ, Mayer RE, 1996). This is further reinforced by social theories of learning that postulate the merits of social interaction in cognitive development (Vygotsky L S, 1978). In a typical PBL setting, learning is triggered by a problem which needs resolution (Elaine H.J. Yew and Karen Goh, 2016).. Dewey explains the cognitive element of learner engagement by describing how the origin of thinking is some "perplexity, confusion, or doubt" that is triggered by "something specific which occasions and evokes it." (Dewey J, 1991).Students make connections to this "perplexity, confusion, or doubt" by activating their individual and collective prior knowledge (Barrows HS and Tamblyn RM, 1980). and finding resources to make sense of the phenomenon; they also engage in peer learning through small-group discussion (Barrows HS,1992). and consolidate their learning through reflective writing (Woods DR, 1994). Beyond enabling students to make sense of the concepts and subject matter, this learning experience is also likely to help students "develop understandings of themselves and their contexts, and the ways and situations in which they learn effectively" (Savin-Baden M, 2000).

PBL as a pedagogical strategy appeals to many educators because it offers an instructional framework that supports active and group learning—premised on the belief that effective learning takes place when students both construct and co-construct ideas through social interactions and self-directed learning (Glaser R and Bassok M, 1989, Palincsar AS, 1998). Its implementation can vary across institutions and programs, but in general, it can be viewed as an iterative process made up of first, a problem analysis phase, a period of self-directed learning and lastly, a reporting phase (Schmidt HG and Moust JHC, 2000, Palincsar AS, 1998, Barrows HS, 1988). A tutor—also known as a facilitator acts as a guide to scaffold students' learning, particularly in the problem analysis and reporting components of the PBL tutorial, as well as facilitate students' inquiry paths as they make sense of their ideas through discussion and sharing(Elaine H.J. Yew and Karen Goh, 2016).

The current work is about involving the students for teaching them the Quality Control (QC) tools such as scatter diagram, cause and effect diagram, pareto chart etc. For the course Metrology and Quality Engineering of semester VI, the students were taught the topic of Quality Control tools by sharing with them the real life scenario which they are facing. A separate test was conducted for the students to check their learning levels of the same topic. Two such tools (Pareto chart and Scatter diagram) are explained in this paper for the sake of explaining the method.

2. Methodology

There are seven Quality Control tools through which the quality of any product can be controlled. While explaining the concept, the students were involved for the current scenario that they are facing. The real time data was collected in the class room during the lecture and based on the collected data, the given problem was addressed to be solved by a specific Quality Control tool. Also in another case, the actual data of the students results and attendance was shown to the students and they were conveyed about the significance of a specific quality control tool.

3. Case Study

The case study includes two problems which were presented to the students to explain the use of Quality Control Tools. In addition to these two problems the students were also given

E. Pareto Chart

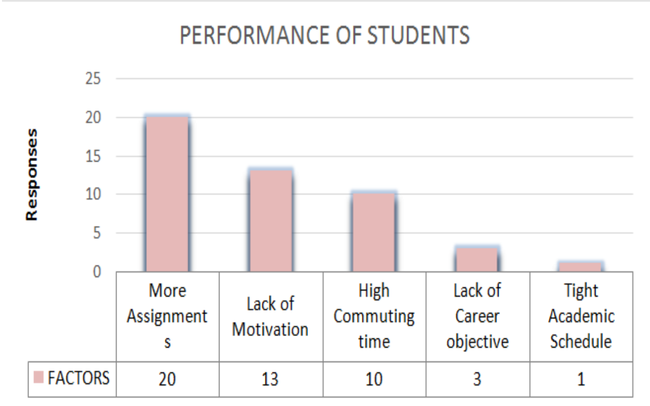
The students were asked a question related to their daily routine as depicted below

Explain the reasons for poor performance of students at AIKTC based on the following points

1. Due to excessive assignments
2. Due to lack of motivation
3. Due to tight schedule of the institute
4. Due to commuting over long distances from the house to the institute
5. Because they lack career objective

The responses were collected from the students in real time and the responses were then segregated in descending order. The data was plotted in Kingsoft Office as shown below.

No.	Responses	Frequency	Percentage
1	More Assignments	20	42.55
2	Lack of Motivation	13	27.66
3	Tight academic Schedule	1	2.12
4	High Commuting Time	10	21.28
5	Lack of career objective	3	6.39
	Total	47	100



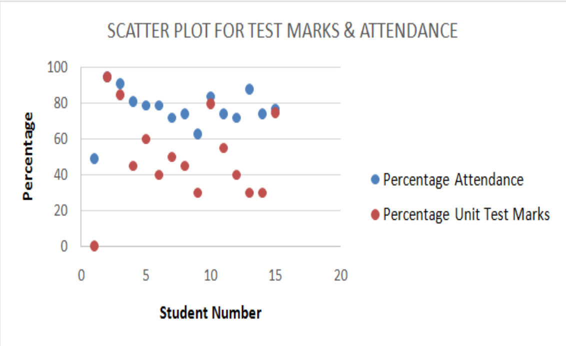
Scatter plot

Another example quoted for teaching the students about teaching the QC tools was scatter plot for a case of student's attendance and their test marks. A case study of their past course was taken for which the data of their attendance and corresponding unit test marks scored by them was available. They were introduced with MS Excel to plot the scatter chart and to determine if any correlation exists between both the data sets. The case study is as follows

Determine if any relationship exists between the students attendance percentage and the percentage of marks scored in unit test for the subject material technology for the batch of academic year 2016-17

Student No.	% Attendance	% of Unit test marks
1	49	0
2	95	95
3	91	85
4	81	45
5	79	60
6	79	40
7	72	50
8	74	45
9	63	30
10	84	80
11	74	55
12	72	40
13	88	30
14	74	30
15	77	75

The students were demonstrated to find the coefficient of correlation (r) in MS Excel and the significance of it was explained to them. Fortunately r came as 0.77 which meant that there exists a positive correlation between the student's attendance and their performance in unit test.



Assignment Problems:

An assignment was also given based on the same intention to involve them for better learning of the topic

1. Collect data for analyzing the reasons for poor communication of the students of AIKTC based on the following points, hence suggest some measures to overcome this problem. You can create a Google form and seek data from different students of AIKTC through their Whats App groups.

a) Because most of them are coming from vernacular medium
b) Because most of them have inferiority complex
c) Because most of them are from first generation learners
d) Because of lack of confidence
e) Because of casual attitude towards communication skills
f) Can't say

2. For your BE project, prepare a Gantt chart for completing the project between August 2019 to April 2020 (36 weeks) you may include the following major stages for your project completion. (Few activities can overlap)

a) Literature review (8weeks)
b) Finalizing problem statement (4 weeks)
c) Defining Methodology (10 weeks)
d) Project execution (16 weeks)
e) Project validation (4 weeks)
f) Report writing (2 weeks)

3. Divide your daily routine activities as per the points mentioned below and assign hours to every activity in the given table, collect real time data for one week and show your results through a pie chart.

Activity	Stay at College	Refreshment	Study	Socialising	Use of social media
Time spent (Hr)					
Total time (Hr)					
Percentage					

4. Evaluation of Effectiveness

After going through Case studies and assignment based on PBL, Evaluation of effectiveness was carried out. Two sample student groups were identified one was those who were taught using this technique and the other were taught in the conventional way. A small task was given to both the groups and they ware asked to identify the sources of non compliance by any two appropriate QC tools. It was found that the students who were trained using PBL based teaching method performed better than those who were trained using conventional teaching methods. Their result was 6% better than the other group.

5. Results and discussion

It was thus found that, making use of Problem Based learning that too including their day to day regular problems has certain advantages like the students pay more attention towards it and so they remain interested in the topic. Also as they are more interested so their learning gets improved. By putting in front of them similar real life problems they would be able to understand the problem and solve it using appropriate QC tool. This it can be concluded that PBL gives better results for students learning.

6. Conclusions

Thus it is concluded that by incorporating real life problems for teaching the Quality Tools topic makes the students interested in the topic and thus enhances their learning level.

References

E.H.J. Yew, K. Goh (2016), Problem-Based Learning: An Overview of its Process and Impact on Learning, Health Professions Education 2, p.75–79.
Schmidt HG, Moust J HC (2000) Factors affecting small-group tutorial learning: a review of research. In: Evensen DH, Hmelo-Silver CE, editors. Problem-based Learning: A Research Perspective on Learning Interactions. Mahwah, N J: Lawrence Erlbaum; p. 19–52.
Norman G R, Schmidt H G.(1992), The psychological basis of problem- based learning-a review of the evidence. A cad Med; 67(9): 557–565.
Hmelo-Silver C E.(2004), Problem-based learning: What and how do students learn?. Educ Psychol Rev; 16(3):235–266.
Dolmans D, DeGrave W, Wolfhagen I, vander Vleuten CPM.(2005) Problem-based learning: future challenges for educational practice and research. Med Educ;39(7):732–741.
Derry S J.(1996), Cognitives chematheory in the constructivist debate. Educ Psychol; 31(3and4):163–174.
Mayer R E. (1996), Learners as in for mation processors:legacie sand limitations of educational psychology's second metaphor. Educ Psychol; 31(3 and4):151–161.

Schmidt H G. (1993), Foundations of problem- based learning-some explanatory notes. Med Educ; 27(5):422–432.

Glaser R, Bassok M.(1998), Learning theory and the study of instruction. Ann Rev Psychol, 40:631–666.

Palincsar A S.(1998), Social constructivist perspectives on teaching and learning. Ann Rev Psychol; 49, 345–375.

Vygotsky L S.(1978), Mind in Society: The Development of Higher Psychological Processes. Cambridge, MA: Harvard University Press.

Dewey J (1910/ 1991), How we think. Buffalo, N.Y: Prometheus Books.

Barrows H S,(1980) Tamblyn R M. Problem-based Learning: An Approach To Medical Education. New York. Co: Springer Pub.

Barrows HS.(1992), The Tutorial Process. Springfield, Ill: Southern Illinois University School of Medicine.

Woods D R. (1994), Problem-based Learning: Helping Your Students Gain the Most from PBL. Water down, Ont.: D.R.Woods.

Savin-Baden M.(2000), Problem-based Learning in Higher Education: Untold Stories. Buckingham: Society for Research into Higher Education: Open University Press.

Barrows H S.(1988), The tutorial Process. Springfield, ILL: Southern Illinois University School of Medicine.

Use of Virtual Laboratory in Chemistry Course for Enhancing Students Understanding

Sandip Patange[1], Avinash Nalawade[2], Rekha Nalawade[2]

[1]Department of Sciences and Humanities, Rajarambapu Institute of Technology, Rajaramnagar, (Islampur) – 415414 (M. S.) India.
[2] Lal Bahadhur Shastri College, Satara-415002, Maharashtra, India
[1]*sandip.patange@ritindia.edu*
[2]*mnavinash1170@gmail.com*

Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Conventional educating does not frequently permit dynamic contribution of students in class. Virtual labs are computer simulations that creates real world environment. Virtual lab tools can be used for improvement of contribution and understanding of students in Engineering Chemistry Course and also to create real life environment. Study showed that using virtual labs furnishes understudies with the opportunity to create basic reasoning, inventive and group working abilities. Various virtual labs have been created by different organizations and a considerable lot of these are accessible as open source programming.

Keywords: Virtual Laboratory, Chemistry, real life environment, computer simulation.

1. Introduction

Chemistry is one of the basic sciences required in part of discipline. It's related to study of structure and composition of matter. It is one of challenging subjects for concept understanding [1]. Very Little part of this subject student learns in school education. Best way to understand chemistry through experiments and laboratory. Laboratories provide environment for learning and training. Main aim of laboratory is to gain practical knowledge and to study application. But some time it is not possible due to shortage of chemicals, unavailability of instrument [2]. Pedagogic studies also showed effect of laboratory platforms [3]. Laboratory sessions are vital as one should check reliability and authenticity of theoretical knowledge available.

So, for better understanding of subjects like Chemistry theoretical knowledge should be provided through laboratory experiments. But, it is very difficult to bring laboratory to the classroom. As it require space, instruments, glasswares and lot of investment too. Now we can bring laboratory to classroom virtually by means of virtual lab.

Virtual labs are computer simulations that creates real world environment.Virtual labs are electronic programs used to simulate real experiments [4]. It helps us to perform experiments virtually in the classroom. Animations are virtualization systems that get students attention and connect with their learning [5]. Most virtual laboratories are available online today, which are free to use.

Now a day's online and web based teaching is well adapted as a part of Information and Communication Technologies (ICT). ICT also plays an important role while planning and managing lessons [6]. So virtual laboratory used as alternative for laboratory. It can also used along with theory sessions to make teaching interactive. In this paper presents use of virtual laboratory to improve understanding of difficult concepts in chemistry.

2. Purpose

We are part of imaginary world. We are using lots of technologies, mobile applications and websites like facebook, instagram etc. While teaching and learning chemistry students as well as teacher may face many problems. So, we thought why not we use same kind of approach to improve understanding of complex concepts in chemistry using virtual labs.

As to understand concepts like structure of atom, molecules, and their orientation in space require lots of imagination. Even to understand stereochemistry of molecule virtual labs can be used, otherwise it is very difficult to understand same concept through tradition teaching.

Mechanisms of reactions can also be studied very efficiently by using virtual lab method. It is also applicable to study basic concepts in quantum chemistry.

3. Method

We specially used virtual lab method for Instrumental methods in chemistry. It enables to understand working of given instrumental method even students can handle given instruments virtually in school, at home. For this purpose we used "Amrita Lab", which one of the best virtual lab available online as open source. We just have to register to use the same. Some of the methods we studied are:

a. Spectrophotometry

We use virtual lab for understanding spectroscopic methods in chemistry.

Spectroscopic methods are most essential part of instrumental methods in chemistry. We can see various tabs like theory, procedure, simulator that can give real life experience of same instrument also some assignment are also available [7].

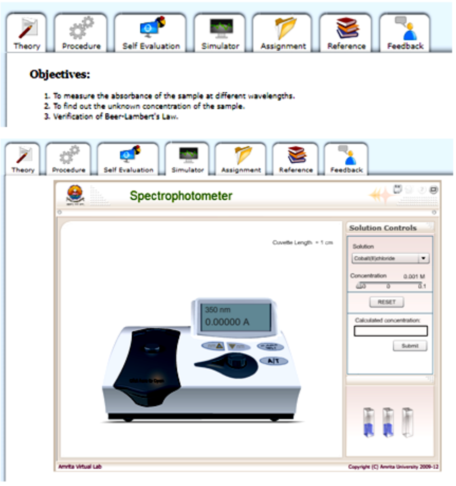
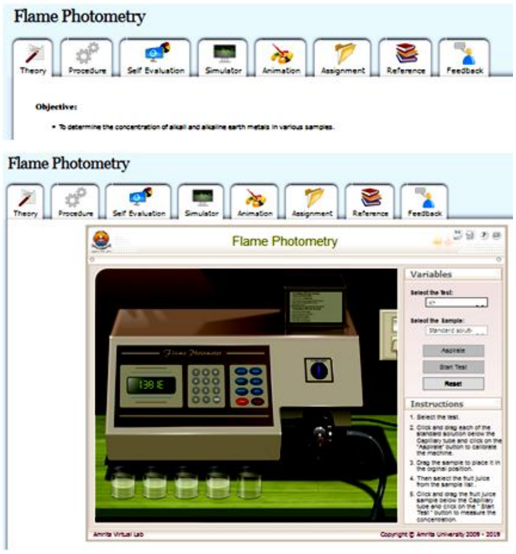


Fig. 1 Virtual lab for Spectrophotometry with simulation

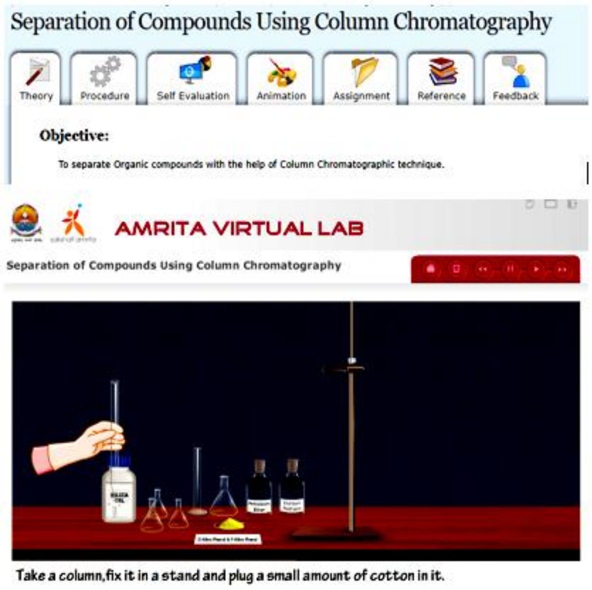
b. Flame Photometry

Another instrumental method that is Flame Photometry. Theory, procedure of technique can be well understood using simulation.[8]



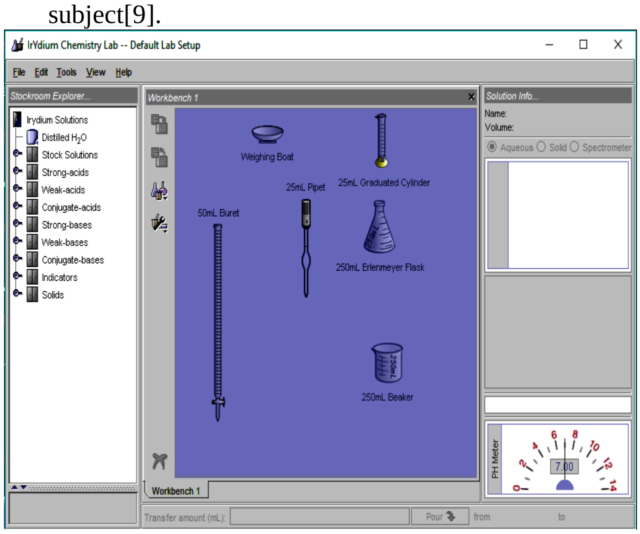
c. Chromatography

It is one of the most important technique used for separation of components in mixture. It is somewhat complicated to understand, but using some simulation one can understand it [9].



d. Softwares :

Even some virtual lab softwares are also available. Which also give real life environment for not only conducting experiments but also understand subject[9].



So, this method is found to be very useful as,

1. Students not need to imagine for understanding what they studying.
2. Teachers can use virtual labs to make classroom sessions more informative.
3. Students can use this tool even at home, college.
4. As most of virtual labs are available as open source, no need to invest money, only laptop and internet connection is sufficient.
5. Students can make up if they are absent in the class.
6. It is very easy to use, no special training is required.
7. Students can get feel of using the instrument.
8. As student get an ideal about how to use instrument, so that students can use real instrument more confidently without damaging to the instrument.

4. Difference between Traditional and Virtual Lab Method

Traditional Method of teaching	Virtual Lab Method
1. Traditional and verbal teaching. 2. Time bounded. 3. Whole class is involved. 4. Faculty using classroom tools like chalk and board only. 5. No 100% participation of all students.	1. It is modern teaching and uses interactive simulations. 2. No time limitation, students at use virtual labs even at home. 3. Small group of student or individual student involved. 4. Faculty use virtual lab simulations along with chalk and board. 5. All students can participate actively and positively

5. Conclusions

Previously Virtual Laboratories can be used only for practical sessions. Same method can also be used for classroom sessions to improve student's participation in the class. It's a new learning technique based on advanced technology. It improves students understanding capacity by creating virtual environment which looks like real. It makes positive and efficient impact on student's knowledge.

6. Acknowledgement

One of the author SMP is thankful to the authorities of Rajarambapu Institute of Technology, Rajaramnagar, (Islampur) – 415414 (Maharshtra) India to encourage for using active learning methods in classrooms.

References

1. Ayas, A. and Demirbas, A. (1997). Turkish secondary students' conceptions of introductory chemistry concepts, Journal ofChemical Education 745, 518–521.
2. Rakhi Radhamaniand et. al. (2015) International Conference on Interactive Mobile Communication Technologies and Learning (IMCL), 28-32.
3. R. Raman, K. Achuthan, P. Nedungadi, S. Diwakar, and R. Bose, (2014) "The VLAB OER Experience: Modeling Potential-Adopter Student Acceptance," IEEE Transactions on Education 57, 235-241.
4. E. Harry, and B. Edward. (2005) Making Real Virtual Lab. The Science Education Review, 4, 2-11.
5. R. K. Lowe. (2004), "Animation and learning : Value for money ?," in Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference, 558–561.
6. Grimaldi, D. and Rapuano, S. (2009). Hardware and software to design virtual laboratory for education in instrumentation and measurement. Measurement, 42, 485-493.
7. Spectrophotometry: https://vlab.amrita.edu/?sub=2andbrch=190andsim=338andcnt=4
8. Flame Photometry: https://vlab.amrita.edu/index.php?sub=2andbrch=294andsim=1351andcnt=4
9. Chromatography: https://vlab.amrita.edu/?sub=2andbrch=191andsim=341andcnt=1
10. Vlab Software: http://chemcollective.org/vlab_download

Agile in Education: System and Process to Deliver Quality Education with Lifelong BML Cycles

Deepali Naik[1], Nilesh Naik[2]
[1]IT Department, P.E.S Modern College of Engineering, Shivajinagar, Pune 411005
[2]Data Protection and Governance Engineering, Veritas Software, Baner, Pune 411045
[1]*deepali.bhanage@gmail.com* , [2]nhnaik@gmail.com
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Over more than past decade, Agile and Scrum has been extremely successful in rapidly delivering quality software and satisfying clients. This method is tried and tested in software as well as non-software industries. With simple Manifesto, Values and Principles teams are getting exceptional results.
Our paper talk about how Agile can be implemented in Education Field. Both Scrum and Kanban[3] can be extremely successfully if used in day to day tasks in Education field. With our 12+ years of experience in software industry, we will share values, principle, tools and techniques that can be easily applied in Education field. Considering students, their parents and college management body are our customers, with Agile, we can do exceptionally well to improve quality of education with less cost and faster speed. With appropriately established Build-Measure-Learn cycle, we can retrospect and improve performance of system over the time with great extent. Our paper also talk about how can we help students and staff to improve themselves with visualization techniques.

Keywords: Agile, Scrum, Faculty Management, Agile in Education, Values, outcome.

1. About Agile and Scrum[11][13]

Scrum is not a process, technique, or definitive method. Rather, it is a framework within which you can employ various processes and techniques. According to Scrum guide, Scrum is a framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value. Scrum is:

- Lightweight
- Simple to understand
- Challenging to master

Scrum is a process framework that has been used to manage work on complex products since the early 1990s. The Scrum framework consists of Scrum Teams and their associated roles, events, artifacts, and rules. Each component within the framework serves a specific purpose and is essential to Scrum's success and usage. In the agile Scrum world, instead of providing complete, detailed descriptions of how everything is to be done on a project, much of it is left up to the Scrum software development team. This is because the team will know best how to solve the problem they are presented.

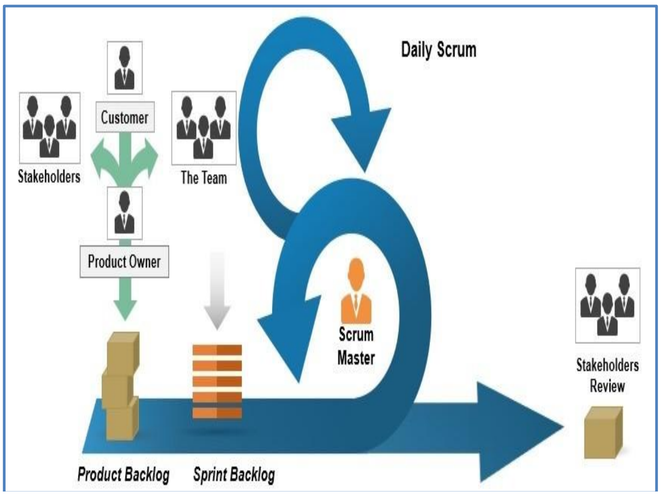


Fig 1. Scrum

2. Usage of Scrum

Scrum was initially developed for managing and developing products. Starting in the early 1990s, Scrum has been used extensively, worldwide, to:

1. Research and identify viable markets, technologies, and product capabilities;
2. Develop products and enhancements;
3. Release products and enhancements, as frequently as many times per day;
4. Develop and sustain Cloud (online, secure, on-demand) and other operational environments for product use; and,
5. Sustain and renew products.

It can be easily adapted in system where Build-Measure-Learn cycle can be implemented.
Here is State of Scrum Survey feedback of scrum[12]

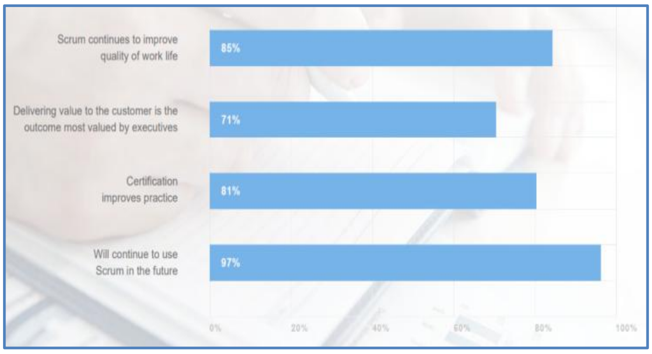


Fig 2. State of Scrum

3. Origins of Scrum[11]

In 2001, a group of 17 software developers met at the Snowbird resort in Utah to discuss alternative ways of building software, and published the influential "Manifesto for Agile Software Development". They worked to create a set of compatible values based on trust and respect for each other, and to promote organizational models centered on people, collaboration, and building communities in which they and others would want to work. The Agile Manifesto[6] was as follows

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation
Responding to change over following a plan

Using these as a guidepost, additional Scrum values have been created, and continue to be developed and modified. These five values are the foundation for a Scrum team's processes and interaction.

Fig. 3 Scrum Values

A. Focus
Everyone focuses on the work of the Sprint and the goals of the Scrum Team.

B. Courage
Scrum Team members have courage to do the right thing and work on tough problems.

C. Openness
The Scrum Team and its stakeholders agree to be open about all the work and the challenges with performing the work.

D. Commitment
People personally commit to achieving the goals of the Scrum Team.

E. Respect
Scrum Team members respect each other to be capable, independent people

4. 12 principles behind Agile Manifesto[2]

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity — the art of maximizing the amount of work not done — is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly.

5. THE "WHO": Scrum Roles

A. Scrum Master
The Scrum Master helps the Scrum Team perform at their highest level. They also protect the team from both internal and external distractions.

B. Product Owner
The Product Owner is expected to do the best possible job of satisfying all stakeholders, maintain the Product Backlog, and ensure that everyone knows the priorities.

C. The Development Team
Development Teams are structured and empowered to organize and manage their own work. The resulting synergy optimizes overall efficiency and effectiveness.

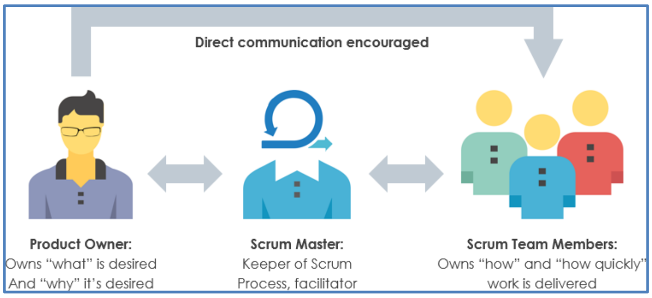


Fig. 4Scrum Roles

6. THE "HOW": Scrum Artifacts

A. Backlog

The Product Backlog is an ordered list of everything that is known to be needed in a product. It is constantly evolving and is never complete.

B. The Sprint

The heart of Scrum is a Sprint, during which a useable and potentially releasable product Increment is created. Sprints can be one week to one month in length and happen one right after the other to keep projects moving. There are four events that happen with each Sprint:

- **Sprint Planning** – The Team decides what to work on for the current period.
- **Daily Scrum** – The Development Team meets for 15 minutes (or less) every day of the Sprint to inspect progress toward the Sprint Goal.
- **Sprint Review** – The Team collaborates about what was done and adapts the Backlog as needed.
- **Sprint Retrospective** – The Team discusses what went right, what went wrong, and how to improve.

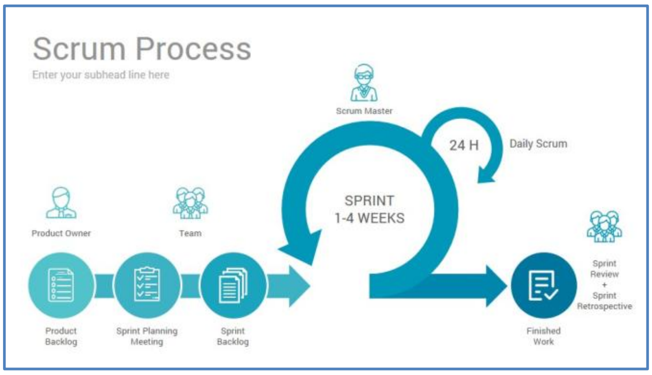


Fig. 5 Scrum Ceremonies

7. Agile in Education

In 2014 International Software development conference, Amsterdam, renowned Author Steve Peha, talked about "The future of Education is Agile". In his talk he explained about how Agile can be helpful in schools and education system. Peha proposed following Agile School Manifesto[8][9]

Individuals and interactions over processes and tools
Meaningful learning over the measurement of things
Stakeholder collaboration over complex negotiation
Responding to change over following a plan

In the second instance, Kamat (2012), at the 2012 IEEE Fourth International Conference on Technology for Education, similarly called for changes in three core areas of educational work: teaching/learning, evaluation, and administration. Aiming primarily at schools of engineering, Kamat presented an Agile Manifesto in Higher Education that called for a new emphasis on[14]

Teachers and students over administration and infrastructure
Competence and collaboration over compliance and competition
Employability and marketability over syllabus and marks,
Attitude and learning skills over aptitude and degree.

Agile provides a manageable set of proven principles that inform the culture and behaviour of organizations interested in extraordinary results using lightweight approaches that solve significant problems in unpredictable environments. School leaders need principles like these because there are few environments more unpredictable than schools. Steve Peha proposed following principles for Agile in education system. [7]

1. Our highest priority is to satisfy the needs of children and their families through early and continuous delivery of meaningful learning.
2. Welcome changing requirements, even late in a learning cycle. Harness change for the benefit of children and their families.
3. Deliver meaningful learning frequently, from a couple of days to a couple of weeks, with a preference to the shorter timescale.
4. School and family team members work together daily to create learning opportunities for all participants.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a team is face-to-face conversation.
7. Meaningful learning is the primary measure of progress.
8. Our processes promote sustainability. Educators, students, and families should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances adaptability.
10. Simplicity-the art of maximizing the amount of work not done-is essential.
11. The best ideas and initiatives emerge from self-organizing teams.
12. At regular intervals, teams reflect on how to become more effective, then tune and adjust their behaviour accordingly.

In our experience, Agile School manifesto with values and principles can definitely help to improve on delivery of education to students.

Let's see how these principles helps in improving learning and education delivery. [4][10]

1. **Our highest priority is to satisfy the needs of students and their families through early and continuous delivery of meaningful learning.**
- Even though college help with other things, meaningful learning for students remain highest priority for staff and colleges.
2. **Welcome changing requirements, even late in a learning cycle. Harness change for the benefit of children and their families.**
- Change is only constant. Accept change over following plan.
3. **Deliver meaningful learning frequently, from a couple of days to a couple of weeks, with a preference to the shorter timescale.**
- With fixed sprint cycles, deliver more things which can be validated in sprint cycles. Shorter cycles gives opportunity to BML.
4. **School and family team members work together daily to create learning opportunities for all participants.**
- Make parents and families partner over customer. This will create more opportunities for learning.
5. **Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.**
- Give whatever possible support to individuals and keep them motivated. Build systems around them for better delivery.
6. **The most efficient and effective method of conveying information to and within a team is face-to-face conversation.**
- Give preference to face to face to talk than email or phone communication. It helps to have clear communication and avoid ambiguity. Also, individuals connect well face to face.
7. **Meaningful learning is the primary measure of progress.**
- Over anything else, meaning learning is ultimate success criteria.
8. **Our processes promote sustainability. Educators, students, and families should be able to maintain a constant pace indefinitely.**
- Rather than pushing too hard, focus on sustainable pace. Try to avoid student syndrome by smaller BML cycles.
9. **Continuous attention to technical excellence and good design enhances adaptability.**
- Keep high standard in technical excellence and good system design. People feel more excited with excellence. It increases adaptability.
10. **Simplicity-the art of maximizing the amount of work not done-is essential.**
- Keep it simple.
11. **The best ideas and initiatives emerge from self-organizing teams.**
- Try to create Self-organizing teams who can find solutions on their own. Take teams from command and control to energy and innovation. Give them more freedom and more ownership.
12. **At regular intervals, teams reflect on how to become more effective, then tune and adjust their behaviour accordingly.**
- Retrospectives gives opportunity to reflect and see how we are doing and what need to improved. Good retrospectives help to create Build-Measure Learn Cycle which help to learn and improve in better way.

8. Scrum Ceremonies at college

A. Sprint Planning:

As suggested by Scrum, we have 2-4 week sprint in college. At the start of sprint, we can conduct sprint planning meeting. In meeting we can plan what we want to deliver as a team. Teachers can plan what they want to achieve in that 2 week sprint. It can be student learning or any other tasks based on current theme in college. The plan can be added in softwares like JIRA, Trello etc. Visualization boards can also be set, depending on team's maturity level in Scrum.

B. Daily Scrum

Everyday, typically at start of the day, everyone gathers to explain what they have accomplished yesterday, what they are planning to do today do they need any help. Seniors members and head of the department can help to resolve dependency if required. Team try to become self-organised over the time.

C. Sprint Review

At the end of sprint, teams demo what they have achieved. They share there understandings and learnings with each other. If certain exams and tests are covered as part of that sprint, team share results with each other and try to learn.

D. Retrospective

Retrospective is most important part of Build-Measure-Learn-Cycle. In this event teachers, staff and student joins in group to retrospect. They look at what went well in last sprint, what can be improved. They note down action. Retrospective is conducted in spirit of self-improvement and not escalation or blaming someone for some fault. Good retrospective can help to build BML cycles in team which intern help to build openness and transparency within team.

9. The visualization

Visualization means that you make things visible, things that people don't see or might have different views on. Once things are visual it becomes possible for people to discuss it, share their views, and align their thinking.[5]

Visualization increases collaboration. Once things are visible it becomes a lot easier to work together on something.

You can use visualization for many different things:

1. Discuss the way of working in a team
2. Solve a problem that a team needs to deal with
3. Agree upon new functionality that you want to develop

4. Get insight into the progress that is being made towards delivery
5. Align different views in a team on a specific topic

You can use visualization any time; when you want to discuss something, when there's an issue or impediment that needs to be solved, or when you're stuck. It's also a great technique to use in agile retrospectives.

10. Kanban

Kanban is a scheduling system for lean manufacturing and just-in-time manufacturing (JIT). Taiichi Ohno, an industrial engineer at Toyota, developed kanban to improve manufacturing efficiency. Kanban is one method to achieve JIT. The system takes its name from the cards that track production within a factory.

A goal of the kanban system is to limit the buildup of excess inventory at any point in production. Limits on the number of items waiting at supply points are established and then reduced as inefficiencies are identified and removed. Whenever a limit is exceeded, this points to an inefficiency that should be addressed. Kanban card provides excellent visualization to any teams. It is very easy to implement

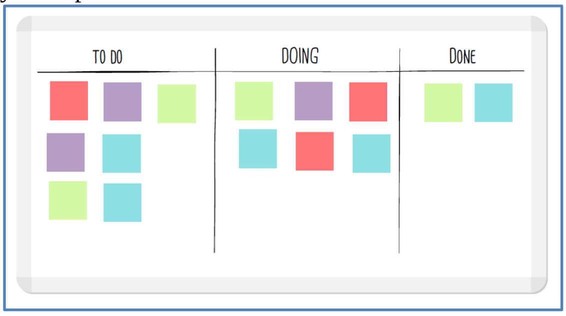


Fig. 6 Kanban Visualization

11. Challenges in implementing Scrum

Scrum implementation is simple but challenging to master. There are certain challenges we may face depending on College's culture. Based on State of Scrum survey, here are challenges faced by organizations while implementing scrum.

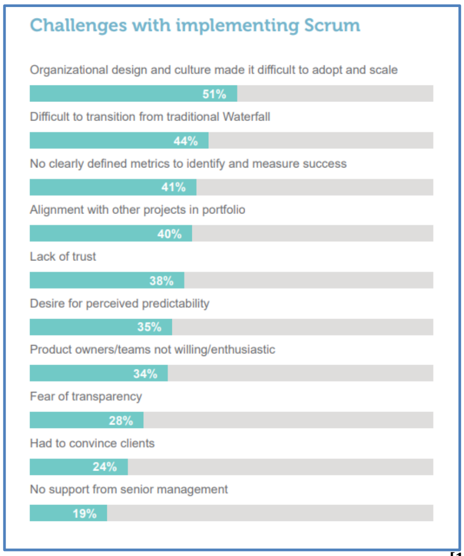


Fig. 7 Challenges in implementing Scrum[12]

To overcome these challenges here are some considerations we need to keep in mind for successful Agile and Scrum transformations.

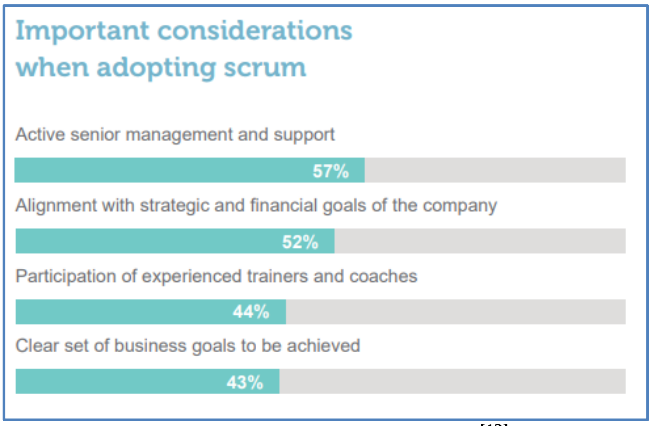


Fig. 8Important considerations[12]

Conclusions

As discussed, it is extremely simple and practical to implement Agile in Education. With some customization as required, scrum can be very useful to deliver quality learning and build lifelong Build Measure Learn cycle in schools and colleges.

References

[1] Agile Based Learning: What Is It and How Can It Change Education? (2014, Feb). Retrieved from informED: Agile Based Learning: What Is It and How Can It Change Education?

[2] Hasan, S. (2017, February Thursday). 12 Key Principles of Agile Project Management. Retrieved from TaskQue: https://blog.taskque.com/principles-agile-project-management/

[3] How to Stay Organized in College With Kanban - Vista College. (2015, December Sunday). Retrieved from Vista College: https://www.vistacollege.edu/blog/online-learning/how-to-stay-organized-in-college-with-kanban/

[4] Krebs, J. (. (2018, March Friday). Scrum in the Classroom (Part 2) | Time For Change. Retrieved from Scrum.org: https://www.scrum.org/resources/blog/scrum-classroom-part-2-time-change

[5] Linders, B. (2017, March Tuesday). Agile Practice: Visualization. Retrieved from benlinders.com: https://www.benlinders.com/2017/agile-practice-visualization/

[6] others, K. B. (2001). Manifesto for Agile Software Development. Retrieved from agilemanifesto.org: https://agilemanifesto.org/

[7] Peha, S. (2011, June). Agile Schools: How Technology Saves Education (Just Not the Way We Thought it Would). Retrieved from InfoQ: https://www.infoq.com/articles/agile-schools-education b Peha, S. (2014). The Future of Education is Agile. Retrieved from gotocon.com: http://gotocon.com/dl/goto-amsterdam-2014/slides/StevePeha_TheFutureOfEducationIsAgile.pdf

[9] Peha, S. (2014). The Future of Education is Agile. Amsterdam International Softeare Development Conference 2014. Amsterdam: goto Conference.

[10] Prieto, R. J. (2016, August Wed). The Agile Classroom: Embracing an Agile Mindset In Education. Retrieved from A Medium Corporation: https://medium.com/laboratoria/the-agile-classroom-embracing-an-agile-mindset-in-education-ae0f19e801f3

[11] Scrum Methodology and Project Management. (n.d.). Retrieved from Mountain Goat Software: https://www.mountaingoatsoftware.com/agile/scrum

[12] (2017-18). State of Scrum Report Scaling and Agile Transformation. Scrum Alliance.

[13] Sutherland, K. S. (2017, November). The Scrum Guide. Retrieved from Scrum.org: https://www.scrum.org/resources/scrum-guide?gclid=Cj0KCQjwtr_mBRDeARIsALfBZA4WBejcDru4YXvi6pzi0J31DXhimF5a_NBSUbyTAatQBEjOmAVAKfIaAvorEALw_wcB

[14] Timothy C. Krehbiel, P. A. (2017). Agile Manifesto for Teaching and Learning. The Journal of Effective Teaching, 90-95.

Use of Python Programming for Interactive Design of Reinforced Concrete Structures

Shivaji M. Sarvade[1], Sachin M. Pore[2], Vipul Prakash[3]
[1,2]Department of Civil Engineering, Dr. B.A.T.U., Vidyavihar, Lonere, Maharashtra.
3 Department of Civil Engineering, IIT Roorkee, Roorkee, Uttarakhand
[1]shivaji.sarvade@gmail.com
[2]smpore@dbatu.ac.in
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: In India, majority of construction activities are of reinforced concrete structures, therefore design of reinforced concrete structures is one of the important subject considering employment aspect of Civil Engineering students. With diversified structural configurations it is imperative to use computer programs for analysis and design of structures. Many commercial programs are available for design of reinforced concrete structures, however they are expensive and provide limited user licence. Every software has inherent assumptions which must be clearly understood before its implementation in design. It is always advisable to develop own programs for design of structures, as normally practised in most design firms, either by using MS-Excel spreadsheet or any other computer programs. The only disadvantage with these programs is that they are expensive and are not customisable/flexible for individual needs. Python has been developing as a most favoured language for computer programing over other languages because of its ease in programming. A user without any programming background can also effectively start developing programs in Python [1]. This tool can be very effectively utilised in teaching-learning process of design of concrete structures. Advantage with use of Python is that a designer can create a customised program for interactive design. Python programs can also be converted in executable softwares. The paper discusses few programs developed using Python as a part of enhancement in teaching-learning process. Implementation of Python programming in undergraduate design course will improve the analytical skills of the students and have significant contribution to make them design industry ready professionals.

Keywords: Python, Structural Design, Reinforced Concrete Structures, Interactive Design

1. Python for Civil Engineering

Python is a high level open source programming language which is extensively used by programmers across the world for various applications. It is available for free and can work easily on personal computers with minimum configuration.

Design of reinforced concrete structure has been carried out using various commercial softwares available in the market and this has been introduced in the academics to a certain extent as well. However, these softwares are expensive and it is not affordable for most institutes to purchase in sufficient number. Moreover, use of these readily available softwares does not enhance learning aspect much as the students can get the output with just few clicks. Programming on the other hand, can enhance the learning of the students as they need to develop the program for the solving the problem with diversified scenarios. Use of programming in Civil Engineering has lots of advantages and languages such as C, C++ are the part of curriculum in Civil Engineering in some of the universities. Though this has not resulted in appreciable success owing to one fundamental problem that these courses are delivered by a faculty from either Computer Science or by non-Civil Engineering faculty. Here lies the advantage of Python compared with the other languages. Any person who does not have programming background can start using Python as it is very interactive and easy to program. Therefore, a Civil Engineering faculty can use this language without consuming extensive time on learning the language and start developing tutorials to utilize this language for his course.

2. Important Python Libraries for Civil Engineering

Python has extensive standard library and as it is an open source language, many useful libraries are developed for its use in data science. Import function of the standard library of Python gives the flexibility to use these libraries in programming. Some of the libraries which are very useful from Civil Engineering aspect are discussed here, but one can search the library (package) for his own purpose from many available libraries.

A. NumPy

NumPy[iv] is probably the most important library and most of the libraries are built using NumPy. It helps in creating the arrays of multi dimension with ease. For example, we have to interpolate for shear strength of concrete based on grade of concrete and provided percentage of reinforcement. This data is given in the table number 19 of

IS 456-2000. With the use of NumPy, these arrays can be used in programming for further calculations.

B. SciPy

SciPy[v] is another most important library which is extensively used for mathematics and engineering. For example, we have to interpolate for values from the code and this interpolation in design of reinforced concrete structure is mostly one dimensional. The SciPy function "interp1d" seamlessly perform such interpolations for a user value in the program from given NumPy array. SciPy can also be used for performing numerical integration, solving differential equations etc.

C. Pandas

Pandas[vi] is another important library which gives access to use of MS-Excel in the programming besides many other built in functions. Pandas are not used in this paper, however, it is an important library for Civil Engineers handling large data with MS-Excel spreadsheets.

D. Matplotlib

Matplotlib[v] is the library for plotting multiple types of 2D graphs using Python. It can produce high quality bar charts, histograms, power spectra etc. This library is not used in the paper but it is very useful library for Civil Engineering.

3. Implementation of Python for RCC Design Course

Design of reinforced concrete structures can be taught very effectively using Python as design of any structural element follows a stepwise procedure with checks from IS 456-2000. The stepwise procedure can help to form the algorithm for the program. From the programmers perspective it is relatively easy to program for such cases as it has constant procedure with variable input from the user and checks from the standard tables, clauses of the IS code. Students are required to design various structural elements like, beams, slabs, columns, footings etc. for different inputs of span, loading and support conditions. If they are asked to develop the algorithm for each structural element (which is nothing but the stepwise procedure), and asked to program the same using Python it can boost their understanding to an appreciable level. Further, it will enhance the creativity of the students as the programs can be written in numerous ways for the same element and application of their creativity will encourage them to write the code in the least possible lines for a complicated structural design. The results of the developed programs can also be compared with the available commercial softwares to develop the confidence of the students in the programming. This skill will definitely increase their employment probability.

4. Challenges for Implementing Python in course

As discussed earlier, Python is an open source language and is developing day by day by various contributors. Till now two major versions of Python exists, Python 2 and Python 3. Python 3 is a considerable improvement over Python 2 and some of the functions in Python 2 are not supported by the latest version. Also, the supporting libraries are under development which may not be compatible with the older version. The latest version of Python is Python 3.7.3 released on 25th March, 2019[i] which is used in this paper. Python lacks in the resources for learning for non-computer science student to certain extent and one has to spend bit of time on searching the information from the documentation web portal of each library. Though it is not that time consuming because of large community websites helping for Python programming, hard copy references are difficult to find for the latest version. There are different IDLEs (Integrated Development Learning Environment) for Python like Spyder, PyCharm, Jupyter Notebook[ii] etc. and one may find it difficult to choose the IDLE for the task at hand. It is recommended to use only one IDLE in the beginning till one is familiar with the IDLE. In this paper, default IDLE of Python is used.

5. Illustrative Python Programs for Design Course

Following are few illustrative programs which aim to explain applications of various Python functions. Python has extensive documentation available on the official website and online communities. Built in help function can be used for help on any argument or keyword.

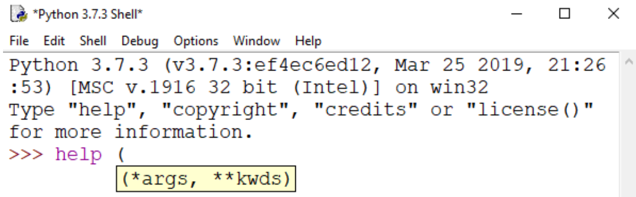


Fig. 1 Help Function in Python

A. Python program for type of beam section.

IS code does not allow use of over-Reinforced (ORF) section and it is required to check the design to ensure the design is under-reinforced (URF) or at the most balanced section. Algorithm for the same can be summarised in the following table.

Table 1. Stepsto check the type of beam section

No.	Step
1	Calculate Provided Area of Steel
2	Find actual depth of NA (x_a) by Cu =Tu
3	From given grade of steel, find x_{ulim}
4	Compare x_{ulim} with x_a
5	If $x_{ulim} > x_a$ the section is URF, If $x_{ulim} < x_a$ the section is ORF If $x_{ulim} = x_a$ the section is Balanced

Table2. Common functions required in Python

Function	Use
input()	Takes user input (can be float, integer, string)
print()	Displays anything written in quotes
import__as_	Imports a library with user defined

	short name to call the library function

To program this we have to utilise *comparison operator* and if-else statement. Common functions used in Python 3 are illustrated in table no.2. Following python code can be used to check type of section for Fe 415.

```
File  Edit  Format  Run  Options  Window  Help
print('Enter the value of chateristic strenght of Concrete in MPa')
fck=float(input())
print('Enter the value of chateristic strenght of Steel in MPa')
fy=float(input())
print('Enter the value of width of beam in mm')
b=float(input())
print('Enter the value of effective depth of beam in mm')
d=float(input())
print('Enter the area of reinforcement in square mm')
Ast=float(input())
x=float((0.87*fy*Ast)/(0.36*fck*b))
print('Depth of neutral axis in mm is',round(x,3))
if(x<0.479*d):
    print('The section is Under-Reinforced')
else:
    print('The section is Over-Reinforced')
```

Figure 2. Type of Section program in Python for Fe 415.

B. Shear strength of concrete form IS 456-2000

To find shear strength of concrete for given grade of concrete and provided percentage of reinforcement, we have to use NumPy and SciPy libraries. NumPy library is used to form database given in table no.19 of IS code[2] and SciPy interpolation function interp1d will be used for linear interpolation. The program can calculate shear strength of concrete for grade up to M30, however it can be expanded further.

```
File  Edit  Format  Run  Options  Window  Help
import numpy as np
from scipy.interpolate import interp1d
print('Entre width of Beam in mm')
b=float(input())
print('Entre effective depth of Beam in mm')
d=float(input())
print('Enter the provided area of Reinforcement in square mm')
Astp=float(input())
print('Entre the value of Charecterisitc Strength of Concrete at 28 days
fck=int(input())
if fck==20:
    ptpercentage= np.array([0.15,0.25,0.5,0.75,1,1.25,1.5,1.75,2,2.25,2.
    tauc=np.array([0.28,0.36,0.48,0.56,0.62,0.67,0.72,0.75,0.79,0.81,0.8
elif fck==25:
    ptpercentage= np.array([0.15,0.25,0.5,0.75,1,1.25,1.5,1.75,2,2.25,2.
    tauc=np.array([0.29,0.36,0.49,0.57,0.64,0.70,0.74,0.78,0.82,0.85,0.8
else:
    ptpercentage= np.array([0.15,0.25,0.5,0.75,1,1.25,1.5,1.75,2,2.25,2.
    tauc=np.array([0.29,0.37,0.5,0.59,0.66,0.71,0.76,0.8,0.84,0.88,0.91,
ptp=float((Astp/(b*d))*100)
print('Provided Pt % is',round(ptp,2))
tauc1=interp1d(ptpercentage,tauc)
print('Corresponding value of tau c in MPa for M',fck,'is',np.round(tauc
```

Fig 3. Program to calculate shear strength of Concrete.

C. Design of Two way slab as per Annexure D, IS 456-2000

This is probably most tricky problem to program as it involves 9 different end conditions and requires interpolation for the bending moment coefficients at four different locations. Corresponding reinforcement is to be provided at appropriate location. This program also requires use of NumPy and SciPy. Further, we can write the output to a text file (.txt) using write (w+) function of Python. For reinforcement calculations, inbuilt math function is also required to take square root in the reinforcement calculation formula.

```
File  Edit  Format  Run  Options  Window  Help
f= open("Output.txt","w+")
f.write('The Case Number from Table Number 26 IS 456-2000 is
f.write(str(case))
f.write('\n')
f.write('The BM in kN M are as follows \n')
f.write('Negative BM along short span at long contineous edg
f.write(str(round(Mxneg,2)))
f.write('\n')
f.write('Positive BM at center of short span is \t')
f.write(str(round(Mxpos,2)))
f.write('\n')
f.write('Negative BM along long span at short contineous edg
f.write(str(round(Myneg,2)))
f.write('\n')
f.write('Positive BM at center of long span is \t')
```

Fig 4. Write function in Python

Here f is defined as a function to create a .txt file with the file name Output. Important thing to note with write function is that it takes only one argument and the data type must be string. The output file can be formatted by using ‘\n’ to add a new line and ‘\t’ to add a tab separator.

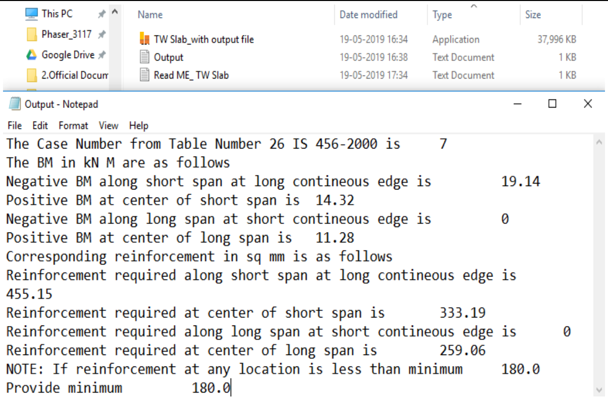
```
File  Edit  Format  Run  Options  Window  Help
import math as m
import numpy as np
from scipy.interpolate import interp1d
print('Enter Short Clear Span of the Slab in m')
Lx=float(input())
print('Enter Long Clear Span of the Slab in m')
Ly=float(input())
ratio=Ly/Lx
if ratio >2:
    print('The Slab is not Two Way')
else:
        print('Enter the grade of Concrete')
        fck=float(input())
        print('Enter the grade of Steel')
        fy=float(input())
        print('Enter width of support in mm')
        b=float(input())
        print('Enter Assumed Overall Depth in mm')
        D=float(input())
        print('Enter Clear Cover of the slab in mm')
        dc=float(input())
        print('Enter preffered diameter of bar in mm')
        dia=float(input())
        d=round((D-dc-dia/2),2)
```

Fig 5. Importing of libraries in the program

All nine conditions and their corresponding bending moment coefficients are put in the program in the form of NumPy array. Based on the user values of Ly and Lx ratios and the case number, it not only calculates the Bending moments and corresponding reinforcements, but also writes the important output information such as case number, bending moments and reinforcements to a text file named Output.txt.

6. Converting Python script to Windows Application

Python programs are called as Python scripts which can be converted to Windows applications (.exe program) which can be run on any machine that does not have Python installed. Python can also be used to create android apps but this is not in the scope of the paper. To convert a Python script to .exe application, we have to install pyinstaller to the system and with the help of pyinstaller any Python script can be converted to an .exe or an application program.




```
The Case Number from Table Number 26 IS 456-2000 is     7
The BM in kN M are as follows
Negative BM along short span at long contineous edge is         19.14
Positive BM at center of short span is  14.32
Negative BM along long span at short contineous edge is         0
Positive BM at center of long span is   11.28
Corresponding reinforcement in sq mm is as follows
Reinforcement required along short span at long contineous edge is
455.15
Reinforcement required at center of short span is       333.19
Reinforcement required along long span at short contineous edge is      0
Reinforcement required at center of long span is        259.06
NOTE: If reinforcement at any location is less than minimum     180.0
Provide minimum         180.0
```

Fig 6. Windows application of TW slab and sample output text file

6. Conclusion

Use of Python programming in the teaching-learning process of Design of RCC structure can be very beneficial. The programming not only develops the analytical skills but creates a problem solving attitude in the students while debugging the programs. This skill also enhances their employment potential as the design industry is looking for a customized, cost effective solution for design of structures. If the students are exposed to Python programming they can prepare programs for real life structural design as well. The language is open source and can be used free of cost to develop programs even on the personal computers with minimum hardware configuration.

References

1. McGrath M. (2018), Python in easy steps, 2013 Edition, Ninth Reprint, McGraw Hill Education Pvt. Ltd, Chennai
2. BIS, IS 456-2000, Tenth reprint 2007,Bureau of Indian Standards, New Delhi

A. *Web References*:

i) https://www.python.org/ (last accessed on 20th May 2019)
ii) https://www.datacamp.com/community/tutorials/data-science-python-ide(last accessed on 20th May 2019)
iii) https://docs.python.org/3/library/index.html#library-index(last accessed on 20th May 2019)
iv) https://www.numpy.org/(last accessed on 20th May 2019)
v) https://docs.scipy.org/doc/scipy/reference/(last accessed on 20th May 2019)
vi) https://pandas.pydata.org/(last accessed on 20th May 2019)

Employing an Unconventional Methodology to Teach Project Planning and Management: Use of Video Case Studies

Kamal Shaikh[1], Chaitanya Ganu[2], Shailesh Agrawal[3]

[1,2,3]Department of Chemical Engineering, Visvesvaraya National Institute of Technology, South Ambazari Road, Nagpur-10
[1]shaikkamal777@gmail.com
[2]chaiganu@gmail.com
[3]sgagrawal28783@gmail.com
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: A few episodes from famous western reality shows were used to facilitate the learning of project management principles to final year UG students. The shows document innovative and interesting construction/renovation and aims at providing entertainment by dramatization of the central characters' struggles while undertaking the project. There are pertinent project management principles which can be deciphered from these shows and used to teach/strengthen students' concepts.
A link to the video and a detailed list of questions were sent to the students via mail. The students were asked to watch the shows and ponder about few technical questions relating to Project Management like crashing, risk identification, risk response, project manager personality traits, scope creep, scheduling etc. The students were already exposed to these concepts in the theory classes in advance. A detailed discussion of the various answers and ideas of the students was undertaken in the following class. Two such case studies are presented and discussed in this paper.
A completely anonymous feedback survey was undertaken to gauge the effectiveness of using these video case studies in teaching the theoretical concepts. The average weighted score of the responses from the 37 students was above 4 (on a scale of 1-5) and showed that the video case studies are a very useful, effective and an enjoyable way of imparting project management principles.

Keywords: Project management, teaching, reality shows, video case studies,

I. INTRODUCTION

Movies/documentary/videos had been used widely to teach a variety of subjects like communication (Kavan and Burne, 2009), history and social sciences. They are a very effective tool to teach concepts in an engaging way as the students relate with the characters in these videos and forms an emotional connect. The reality shows are especially entertaining as they create drama and story around central characters. Videos are a medium which can provide content that transcends cultures and countries with ease. This allows students to understand puzzling concepts and exposing them to ideas outside their comfort zone.

Project Planning and Management covers the various techniques used to manage industrial projects. However, for students at the undergraduate level, it is difficult to understand these concepts from industry examples. The same concepts, however, are applicable everywhere. A few interesting and simple case studies of relatively more significant everyday life activities have been chosen in order to effectively impart various lessons of project planning and management to the students. The case studies were typically in the form of videos available in the public domain.

In this study, videos of the few popular reality show series dealing with an individual or family taking a non-familiar path to build their dream homes are used as case studies to teach project management principles. With inherent drama and suspense, these video case studies make for a great watching experience and in turn help student learn more effectively. A couple of these episodes available on public domain video sharing platform like YouTube were mailed to students in advance along with a set of questions. The students were instructed to watch the video and form their opinion on these questions, which were then discussed in the following class.

The study was conducted with the assumption that the basic principles of managing a project such as; defining the scope, budget and schedule; dividing the work into smaller work packages which can be assigned to individuals; identifying risks and constraints associated with a project; and monitoring the status are analogous to all projects, be it something as trivial as planning a birthday party or something as significant as setting up a refinery. The video case studies were taken from episodes of the popular reality show 'Grand Designs' where people with paltry experience undertake bizarre, seemingly impossible construction projects and their whole journey is documented.

II. CASE STUDY-I

A. Background

London is one of the world's greatest cities. It has a growing population of over 9 million people. The city's growth springs from the energy and creativity of people living here and Joe had challenged himself to design a house for himself and his Swedish partner, Lina. It was a chance to own a property in the cutthroat housing market of London. Joe and Lina both work full time and spend a huge amount on rent. After a painstaking search, they managed to buy an old workshop in East London, just three miles from the skyscrapers of Canary Wharf. Though suitable for a makeover, the plot was tiny. Just 9.5 * 4 metres in area, it was originally used by undertakers as a coffin workshop.

Joe had thought of a unique way to maximize the utilisation of this limited area. He drew up an ambitious plan for a two bedroom house, a third of which would be built underground. He wanted a three-meter deep basement, the exact size of the site, poured in reinforced waterproof concrete, which required a high level of engineering accuracy. Joe had even designed his own insulated brackets, which would support the two floating concrete floors. The top two floors of the building would be made from insulated timber panels, made offsite and precisely assembled in East London. The structure would have another layer of insulation on the outside before it would have been covered with a layer of cladding. Inside this highly engineered and insulated building was a very smart layout. Basement storage, a workshop, two bedrooms, two bathrooms, and a study which lead out to a full-length kitchen living room are squeezed onto three floors and three half floors. The top floor would be a single kitchen -living room, crowned with a full width slanted window to wash this space in light, and provide access to a small roof terrace. This house was expected to be a new exciting model of building in tight small spaces in one of the most expensive places in the world. The budget for this entire project was estimated to be nearly £160,000 including the basement construction as Joe planned on doing most of the work by taking on the roles of being the project manager, contractor, designer, client and sponsor. The duration of this project was 12 months. The key sponsors in this project were Joe's parents, Lina and Joe himself. Joe was the designer, the sponsor, the manager as well as the client. On top of that, he was still working at his day job. In most cases, this was a recipe for disaster. The most difficult part of this project was the construction of the basement in London, which involved several risks. The risks of damaging neighbouring properties and the uncertainty of what lies beneath the surface being chief among them. This job was initially outsourced to the basement contractor, Phil Sacre. Many challenges were faced and several difficult decisions were made. The external factors such as weather and soil conditions also caused problems. Besides, the personnel changes which were made last minute caused huge delays. Focusing on sustainability was also an important factor for Joe and Lina, which limited the use of conventional building techniques. This young, trendy and sustainable housing was completed, but not on the initial baseline plan. Eventually, the budget shot up to £250,000 from the initial estimated £160,000, and it was completed around 6 months past the deadline.

B. Use as a case study

The video of this episode was provided to the students as a case study of project management, especially on risk management. The other concepts that were covered were scope creep and sustainability. The students were provided with the following questionnaire along with the link to the video. It needs to be emphasized that the students were already exposed to these concepts in the regular class.

- ***a)*** *Why was project undertaken? Who was the project manager and who were the project sponsors?*
- ***b)*** *Identify the constraints faced by the project manager and how he plans to overcome them by innovation.*
- ***c)*** *Risks (unforeseen) which materialized during the project execution, how where they dealt with?*
- ***d)*** *How did the project manager save money?*
- ***f)*** *Was there any scope creep (slow widening of the scope of the project)?*
- ***g)*** *Was the project finished on time and on budget? Was the project a success?*
- ***h)*** *How was sustainability incorporated in the design?*

A discussion in class regarding these questions followed which brought to light the various views of the students. The discussion was led and the right aspects were brought to light.

C. Discussions

1) ***Constraints faced by the project manager:***

Apart from the budget, the main constraint was the size of the plot. In order to overcome this constraint, a third of the house was built within the basement, in order to increase the living area.

There was a confusion among the students as to whether the size of the plot was a risk or a constraint. It was made clear that the constraints act as a boundary to a project and as it can identified well in advance where it affects the project throughout. Risk on the other hand is an uncertain event which may or may not take place. The focus on sustainability also acted as a constraint for the entire project.

2) Risks occurred during this project:

There were quite a few risks involved in this project.

- Usually, the digging process involves reinforcing the walls of the digging site in order to prevent its collapse. Here, the project manager and the excavation site contractor did not use the steel shuttering while digging the basement, expecting the dry land to be self-sustaining based on the soil testing conducted. It was observed that 2 weeks down the line, the walls of the site started weakening and falling apart. It was also observed that 3-meter layer of dry earth was sitting on a layer of wet silt and clay which was the reason for the collapse. Initially the project manager, Joe, accepted the risk. The new contractor had to develop an impromptu contingency plan where steel mesh and wooden framework were put up. The upper part of the wooden framework, of the concrete wall construction for the basement, wasn't given any support to prevent tilting forward. The wooden framework holding the concrete wall moved by 250 millimetres.

- Bad weather. During the construction of the concrete basement of the site, bad weather was a harsh blow to the site. The pace of work was increased in order to get things done faster.
- The above risks together costed the project above £30,000 and 3 months delay.
- The structurally insulated panels were been made in another country 444 miles away. These panels were to be fitted at the construction site. There could have been several risks involved with this. In order to minimise these risks, Joe learned the installation of this structure on site by the manufacturers. This phase went smoothly.

3) Strategies to save money:

- Joe took up several roles in this project. He acted as the project manager, the main contractor, designer, client.
- He gave up his current house and moved closer to the construction site in order to save money on their rent.
- He took help from his engineer friends and did most of the work himself, instead of hiring engineers.
- Due to his goodwill, he was allowed to borrowed power from his neighbour.

4) Scope Creep:

There was definite scope creep in this project. It started off as a straightforward and simple home but slowly new requirements and innovations were added. During the later phase, Joe wanted his window panes to be quadruple glazed. He wanted the entire house to be insulated. He revised his cladding design which was initially of a uniform design but later he changed it to varying widths and lengths. This took a toll on the budget and the time frame.

5) Sustainability and innovation:

- Use of specially designed brackets, which connect the concrete walls of the basement to the walls of the floors.
- Structurally insulated panels.
- Quadruple glazed window panels
- Walls were insulated with cladding which helps save power on heating.

3. CASE STUDY-II

A. Background

This project involved the construction of an 'Earthship' deep in the heart of the Coromandel Rainforest for New Zealand's Gus and Sarah’s family. An Earthship is a house built out of natural and recycled materials. It’s a house that can make its own energy, grow food and recycle its own water out of materials that the society throws away. Earthships are regarded as the epitome of sustainable construction. Usually, Earthships are built on drylands, but the one in the discussion was built in a rainforest in a valley that is usually very wet. This project was managed by Gus. The house was going to be protected from moisture by custom made waterproof membrane. Broken mussel shells would provide insulation under a concrete floor. 1300 recycled tyres rammed with mud would form the exterior walls. These would be packed with earth cobb and coated in clay. Mud bricks would form the internal walls of this 4 bedroom home incorporating glass bottles to create some pretty natural light. There would be an internal greenhouse. Windows would be designed to allow for maximum sun rays to enter. Insulated roofs and solar panels would be present on the roof. Sustainability was a key aspect of this project. Using recycled products would imply saving material costs. The construction of this Earthship was undertaken by a team of enthusiasts who were interested to learn the construction of Earthships. These enthusiasts were the main manpower involved in the construction. They lived on site as tenants of Gus and Sarah. The process of construction of this Earthship faced several hurdles and the project was completed in a span of 9 months which was nearly 5 months more than what they had optimistically estimated and the budget for this project also went over the estimate of $340,000. At times, the couple had to compromise on sustainability by using conventional material while sometimes having to work overtime in order to avoid project failure.

B. Use as a case study

A detailed discussion of this project was held focusing on the topics below.

The email to the students, guiding them to what to look for during watching video was as follows:

After watching the video

a) *Enumerate all the risks in the project. What were their mitigation strategies and contingency plans?*

b) *There are instances when the project manager took some decisions to complete the project early (project crashing). Identify those and the options taken to crash the project.*

c) *Again, appreciate the sustainability incorporated in the project. What features of sustainability did you like the most?*

d) *Think about the personality traits of the project manager. What were his positive traits and where could he have improved.*

The discussion held in class was an interesting one where students had various ideas, sometimes contradicting, which were clarified and explained.

C. Discussions

1) Risks and response:

Occurrence of cyclone, uncertainty in getting the approval for the roof, bad weather and growing of mould were identified and agreed upon as the risks.

A lot of students argued that the inexperience of the workers was also a risk, but it was clarified to them that it couldn’t be a declared as risk as they were aware of that information beforehand and as there was no uncertainty it wasn't a risk, but was a constraint.

The various ways of dealing with the risks were identified to be the following:

The crew worked for an extra day on one of the Saturdays in order to prepare for the storm by laying down waterproof membrane and a boat sail over it to prevent the construction area from getting completely wet.

It was suggested by the students that the risk of delay in getting permission wasn't handled by the project manager at all. It was explained to the students that by using his influence, Gus managed to invite the city's Mayor to the site in order to promote goodwill which would ease the task of getting an approval. Here the importance of a project manager's influence was discussed.

In order to deal with the risk of bad weather in the winters and rainy season, Gus crashed the project duration by hiring back the resources who had left after their initial contract duration.

In order to avoid growing of mould, the mitigation response adopted was to get heavy duty lamps to dry the walls faster.

2) ***Project Crashing:***

The project manager decided to use Aluminium sheets instead of natural materials, to be placed over the timber logs for the construction of the roof. This decision was taken by the project manager because the installation of aluminium sheets would take only 2 days. This was an example of project crashing by compromising with the quality.

The construction crew enthusiasts were required to stay for a duration of 3-4 months as the project was estimated to be completed within that time span. But the project got extended into the rainy season and this led to increase in the timeline. In order to finish the project as a faster pace, the project manager, this time, hired the crew back. This is an example of project crashing by putting in extra resources.

3) ***Personality traits of project manager:***

Negatives: The project Manager, Gus was very optimistic, almost unrealistically. He was not prepared for many important risks and their effects during the project.

Positives: The project manager has a lot of influence which helped him sail smoothly through a lot of hurdles. He was calm and co-operative. He was motivational and resorted to means to keep the crew excited during the construction process.

4. RESULTS

A completely anonymous survey was performed to obtain students' feedback to understand the effectiveness of using case studies in teaching some of the key project management concepts. The survey was conducted using Survey Monkey and kept completely anonymous to allow students to provide an authentic feedback.

The following results were obtained from the students:

Total number of students that answered the survey was 37.

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree	Wtd Avg
I found them enjoyable	45%17	45% 17	5% 2	2% 1	0% 0	4.35
I found them relevant	59% 22	37% 14	0% 0	0% 0	2% 1	4.51
They helped me understand theory concepts better	45% 17	43% 16	5% 2	5% 2	0% 0	4.30
They were defined well by the instructor in advance and later discussed in the class	59% 22	35% 13	2% 1	0% 0	2.% 1	4.49
They were a good learning experience	43% 16	51% 19	2% 1	2% 1	0% 0	4.35
They should be continued to be used in the course	62% 23	32% 12	5% 2	0% 0	0% 0	4.57
The number of case studies were sufficient	16% 6	59% 22	8% 3	13% 5	2% 1	3.37

The following score was assigned to the various options available.

Strongly agree = 5
Agree = 4
Neither agree nor disagree = 3
Disagree = 2
Strongly disagree = 1

Based on these scores and the number of people opting for an option a weighted average was calculated for each task.

The student survey showed really good results with the weighted average of almost all parameters above 4. This shows that the students found the case studies to be helpful in strengthening the understanding of the fundamental project management principles. In fact, the students' feedback suggested inclusion of more such case studies in the curriculum to make the classes more realistic and enlivening.

References

Kavan, H. and Burne, J. (2009) Using film to Teach Communication Concepts at University, The International Journal of Learning, 16(10), 429-440.

Imbibing the Core Engineering Concepts through Pedagogy of Teaching- Learning Methodologies

Purnima Ahirao[1], Deepti Patole[2], Yogita Borse[3]

[1,2,3]Departmet of Information Technology, K. J. Somaiya College of Engineering, Mumbai 400077, India
[1]purnimaahirao@somaiya.edu
[2]deeptipatole@somaiya.edu
[3]yogitaborse@somaiya.edu
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: With the advent of availability of online course material there is a steep decline in the the importance of classroom teaching. The students have resourceful access to all the contents of the courses under the umbrella of academics. This is the story will all the students including Engineering Students as well. The knowledge acquired by the student through online course may be half baked. And they may not realize this until the actual application of the concepts are needed. Whereas the Faculty who teaches in offline mode always tries to inculcate the knowledge in a way that the concepts are clear with respect to its application. The faculty has to create an environment wherein the students are equally involved in the teaching learning process. The pedagogy of Teaching Learning plays a very important role in providing an Interactive classroom teaching-learning activity. The different Teaching Learning methods such as Think Pair Share, Flipped Classroom, Group Discussion, debates etc provides a very interactive and responsive classroom environment. The use of these methods provides a perfect blend of what concepts students already know and what knowledge is to be added from the application point of view. Hence different pedagogical teaching learning methods were used for imparting the concepts and knowledge in various core and application oriented subjects of IT Engineering such as Cloud Computing. Information Theory and coding, Web Programming etc.

Keywords: Debate, Group discussion, flipped classroom, Think Pair Share, peer review.

1. INTRODUCTION

Teaching is a spiritual entity where Teacher also can be called as Guru is involved in transferring all his knowledge to his disciple and tries his level best to make the learner understand the concepts and gain atmost knowledge about any subject. The teacher also tries to guide his pupil in such a way so that the pupil emerges in gaining higher level of knowledge then what the teacher himself has. The teacher gets overwhelmed if the pupil reaches a greater height in the subject or domain. The teacher sometimes also looks for some learning from his pupil. So the Teaching Learning process should be two way communication between two person involved in learning and understanding the subject as well as may be evolving through the process. The conventional methods of Teaching using blackboard or projector leads to one way traffic where the teacher is totally engrossed in delivering the content of the topic and is not sure whether the understanding of the student is achieved or not. Technology has always acted as a two way sword. For example Internet Technology has become a necessity for today's generation, without which the generation cannot go ahead. So when it gives the advantage of information being easily available, on the other hand it also diverts the inclination of the learner from the conceptual understanding. Nowadays the students are more attracted and fascinated by online information flowing freely in the digital world. These students have somewhere lost the interest in classroom learning where they are bound to sit at one place according to timetable and be in the listening mode. The time has come to change the classroom environment by including various Teaching learning pedagogical techniques such as flipped classroom, Think Pair share, debate, case study, group discussion, role play and so on. This paper focuses on using various well proven and well tested methods of Teaching Learning for various core engineering courses and also summarizes the effect of applying these techniques by providing feedback analysis of the students.

2. TEACHING TECHNIQUES

The switching of classroom teaching from teacher centric to learner centric has evolved over the period of years as per the need of the generation [1]. The Paper provides a model of flipped classroom where the fundamental concepts to be learnt by learners as self-paced lectures as per their convenience, and then the concepts can be discussed in the classroom face to face and in an interactive manner. Here the Faculty can spare more time on designing the lecture from the application point of view. Micro-lectures are usually used for distance learning [4] Here these micro-lectures play a vital role of bringing the class on right note, redirecting the discussion towards right direction and reinforcing the students to make the discussion fruitful. These micro-lectures are typically one to three minutes in length and are incorporated when needed on the basis of classroom dynamics where the students are learning on their own devices via video lectures and assignments. The conventional 45 minutes lecture does not serve good as the attention span , when studying in distance mode is pretty less. Also in actual class where the instructor and students are co-located, the best attention span of students is Not more than 10 minutes [5]. Hence micro-lecture within a flip-classroom plays a vital role of keeping the lecture on right track. According to the study, involving students in the form of a group or team and then giving them a case study makes their learning perceptions more clear as compared to Textbook Reading. The paper suggests that use of case study method of content delivery is significantly more effective than any other method. This can be justified by comparing Students performance in examinations with the topics taught using case study and their performance with any other methodology. Presenting content in the form of stories and narrations increase the Bloom's taxonomy level of cognitive learning as suggested in the study [6].

3. USE OF TEACHING TECHNIQUES IN DIFFERENT COURSES

3.1 Think Pair Share for Web Programming

Web Programming is a practical oriented course and includes learning of various server side scripting languages. The learning is mostly syntactical but the students need to understand the importance of different languages to be used to develop web application. The development of a web application depends on the requirement provided by the owner and it also needs to consider the usability feature from the web user point of view. Here the students should be able t select language to be used for the development of the website. The comparison of the various languages and their understanding helps students to select the appropriate language for the development of the good website application. The think pair share method was used for the understanding of the students about the features of the different languages from their application point of view.

The students were able to compare and contrast the advantages as well as lacunas of the server side scripting languages which made them more confident for choosing the right set of web development tools for creating a website. The technique also lead to an interactive environment for the teaching learning process and helped students to exchange ideas, concepts with their peers thereby bridging the gap arising out of understanding from the individual perspective. Positive Feedback given by the students for this activity shows the willingness of the students to continue use of this learner centric technique for the conduction of web programming course which strengthens their conceptual understanding about the course.

3.2 Flipped classroom for Information Theory and coding

The Information Theory and coding course includes theoretical as well as mathematical concepts applicable for coding of information over the communication channel. The application of this course is important from the perspective of encoding, compressing and securing information to be transferred through the electronic medium. The flipped classroom activity was very useful for the conceptual understanding of this course. Source coding and compression topic material was shared with the students two days prior to the actual commencement of the lecture. The motive was to make student go through the concept before coming to the class and then the topic was discusses during the lecture. The discussion helped students to understand the actual mathematics involved in the concept and also its application in the real world. Since students were aware about the theoretical part of the topic , the discussion became interactive and hence proved fruitful in overall dissemination of the concept from the application point of view. The Students gave positive response to this activity even since the students were equally involved in the discussion thus increasing the interaction in the classroom.

3.3 Think Pair Share and Flipped classroom activity for Cyber Security Awareness

Cyber Security Awareness is an interdisciplinary course which includes topics about the various cybercrime and cyber-attacks taking place around the globe. It also makes students aware about the countermeasures for the different cyber-attacks. The course helps students understand the ill effects of online activities and what precautionary steps to be taken to remain safe online. It also provides knowledge of all types of financial frauds taking place over the internet and informs about the measures to avoid falling prey to victim of financial fraud or any other type of cyber-attack. The think pair share and flipped classroom activity was used for most of the topic since this course required equal engagement and interaction of the students. The topics were explained with the help of daily news articles on cybercrime available through online resources or newspaper article. These two teaching learning activities provided a better platform for delivering the course in an contemporary manner. Students were more than happy with the use of these techniques wherein they were equally responsible for sharing the real life cybercrime cases and understanding the measures for avoiding these attacks. The feedback of the student provided the reason for increased use of these techniques throughout the course conduction.

3.4 Group Discussion for cloud computing

Cloud computing is a very important course as it provides knowledge about the Cloud technology and its architecture. The course includes topics about the benefits of cloud over the traditional servers from the perspective of use as per demand. More and more business organizations are using cloud services for increasing the popularity of their business and at the same time reducing the cost incurred in maintaining the Infastrucute for their system. The facilities provides by different cloud service providers is also discusses at length in the course. The use of Group discussion activity in this course helped students to explore different views and ideas about cloud computing and learn from their peers.

4. RESULTS and DISCUSSION

After conduction of each activity feedback was taken from students, Following are the graphical analysis of student response for all the activities.

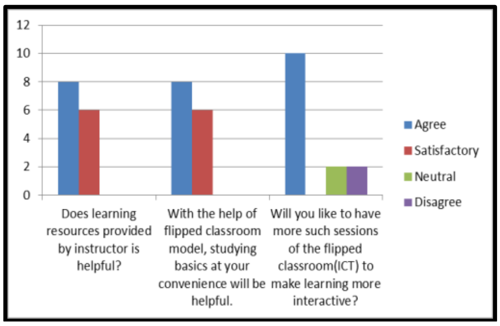


Fig 1. Graph based analysis of Flipped Classroom

The graph of figure 1 shows positive effect of using flipped classroom activity for understanding of the concepts.

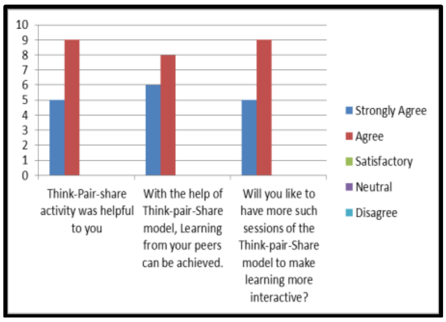


Fig 2 Graph based analysis of Think Pair Share

The graph shown in Figure 2 depicts the positive response of the students about the used of Think Pair share activity for classroom teaching.

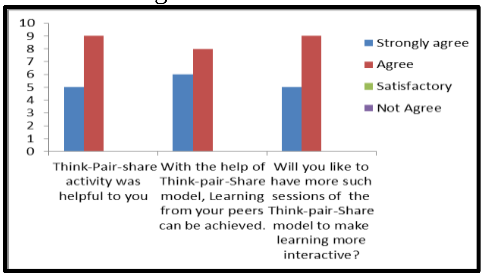


Fig 3. Graph based analysis of Think Pair share activity used in IDC

The graph shown in Figure 3 depicts the positive response of the students about the use of Think pair share activity in conduction of interdisciplinary course Cyber Security Awareness.

5. CONCLUSION

With the current generation and technological involvement, the teaching learning pedagogy is indeed useful for the overall engagement of the student present in classroom. The teacher gets satisfactory result of delivering the content as well as the students grasping the concepts at the same level. The students learn more enthusiastically as if they are involved in the teaching. The learner centric environment created with the use of different teaching learning pedagogical methods provides a two way communication between the teacher and his pupil which is an integral part of any Teaching Learning process. The think pair share, flipped classroom, group discussion activities used for the core and advanced courses of IT Engineering focussed on an interactive and responsive classroom learning for laying the basic foundation and also able to outreach the application perspective of the concepts From the graphical analysis we can conclude that, all the activities are well accepted and appreciated by students thereby increasing teachers satisfaction level of dissemination of the knowledge to his pupil in an more enriched way.

REFERENCES

[1] Jacqueline E. McLaughlin, PhD, MS, Mary T. Roth, PharmD, MHS, Dylan M. Glatt, Nastaran Gharkholonarehe, PharmD, Christopher A. Davidson, ME, LaToya M. Griffin, PhD, Denise A. Esserman, PhD, and Russell J. Mumper, PhD , The Flipped Classroom: A Course Redesign to Foster Learning and Engagement in a Health Professions School , Academic Medicine, Vol. 89, No. 2 / February 2014

[2] Sarah J. DeLozier1 and Matthew G. Rhodes1 Flipped Classrooms: a Review of Key Ideas and Recommendations for Practice, Published online: 6 January 2016 Springer Science+Business Media New York 2016, Educ Psychol Rev (2017) 29:141–151, DOI 10.1007/s10648-015-9356-9.

[3] Kee T P. The one minute lecture. Educ Chem. 1995;32:100–101.

[4] Yang, Ying and Zhang, Xiaohui and Tian, Dan. (2017). Micro-Lecture Design and Practice In The Internet Plus Era. 10.2991/iccia-17.2017.120.

[5] Attention span during lectures: 8 seconds, 10 minutes, or more? Neil A. Bradbury, Advances in Physiology Education 2016 40:4, 509-513, doi:10.1152/advan.00109.2016.

[6] Anderson LW, Krathwohl D. A taxonomy for learning, teaching, and assessing: a revision of bloom's taxonomy of educational objectives, complete edition. Longman Publishing Group; White Plains, New York: 2000

[7] Nadezhda O. Yakovleva, Evgeny V. Yakovlev, Interactive teaching methods in contemporary higher education, Pacific Science Review, Volume 16, Issue 2, 2014, Pages 75-80, ISSN 1229-5450, https://doi.org/10.1016/j.pscr.2014.08.016.

[8] Ian Cull inane, Catherine Huang, Thomas Sharkey, and Shamsi Moussavi. 2015. Cyber security education through gaming cybersecurity games can be interactive, fun, educational and engaging. *J. Comput. Sci. Coll.* 30, 6 (June 2015), 75-81.

[9] Herreid, Clyde Freeman, and Nancy A. Schiller. "Case Studies and the Flipped Classroom." Journal of College Science Teaching, vol. 42, no. 5, 2013, pp. 62–66. JSTOR, JSTOR, www.jstor.org/stable/43631584.

Blended Learning for Design, Delivery and Assessment of Course

Manisha Rajput[1], Sayali Mane[2], Dr. Mrs. P. Malathi[3]

[1,2]*Assistant Professor, D.Y.P.C.O.E, Akurdi, Pune, Maharashtra.*
[3]*Professor, D.Y.P.C.O.E, Akurdi, Pune, Maharashtra.*
Email [1] – rajputrmanisha@gmail.com
[2] - sayalimane@rediffmail.com
Track No: 1
Track Name: Different dimensions of Teaching-Learning

ABSTRACT

Blended courses also known as hybrid or mixed-mode courses are classes where a part of the traditional face-to-face (F2F) instruction is replaced by Information and communications technology (ICT) supported learning including both offline learning and online learning. It has scope for collaborative learning; constructive learning and computer assisted learning (CAI). Blended learning needs rigorous efforts, right attitude, handsome budget and highly motivated teachers and students for its successful implementation [2]. Three phases are Course design through proper planning; Deliver within a stipulated time and Assess to get desired learning outcomes. Universities are fast adapting to in their education system. The main aim of adapting this digital technologies and tools is to enhance student learning. This paper explore and discuss the support of blended learning through Massive Open Online Courses (MOOCs), Moodle, websites for better learning, reform and innovation.

Keywords: Blended learning, Information and communications technology (ICT), face-to-face (F2F), Massive Open Online Courses (MOOCs),

I-INTRODUCTION

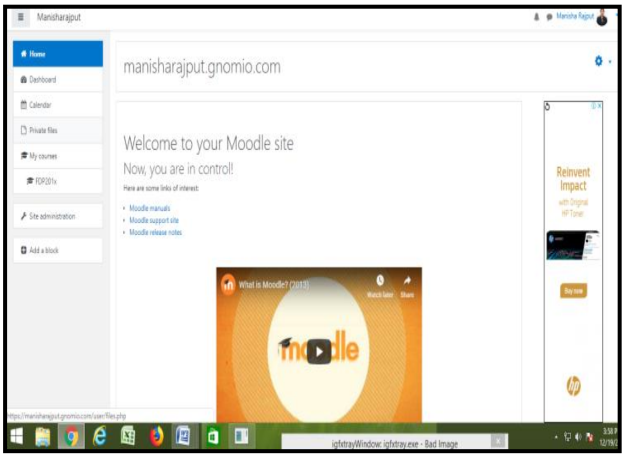
Blended teaching-learning technology is a powerful tool for transforming learning. It will help affirm and advance relationships between educators and students reinvent approaches to learning and collaboration and adapt learning experiences to meet the needs of all learners. Community colleges, adult learning centers and universities should be incubators of exploration and invention. Educators should be collaborators in learning, seeking new knowledge and constantly acquiring new skills alongside their students. Education leaders should set a vision for creating learning experiences that provide the right tools and supports for all learners to thrive. [5] Blended teaching-learning technology in education system provide authentic learning experiences and educators need to use Blended course technology effectively in practice.

Blended learning refers to a variety of practices and strategies in which students learn in part online, with some element of control over the time, place, path, or pace of their learning and the modalities along a student's learning path are connected to provide an integrated learning experience. [2] Simply it is the thoughtful fusion of F2F and online learning experiences. The basic principle is that F2F oral communication and online written communication are optimally integrated such that the strengths of each are blended into a unique learning experience congruent with the context and intended educational purpose.

II-METHODOLOGY

Blended teaching-learning implementation process is divided into three main phases: **Blended course Design**, **Blended course Delivery and Assessment.**

There is a need for teachers to be trained in blended learning pedagogies and experience blended learning instruction [4]. After receiving professional training, teacher has do proper course planning, using a blended delivery model. One can use Moodle LMS, MOOCs, website to design a course where part of traditional class room teaching is converted/ supported by online learning. Following figure 1 shows the design of Moodle for own subject through Gnomio. Here number of topics can be added as shown in figure and in each topic activities can be added.



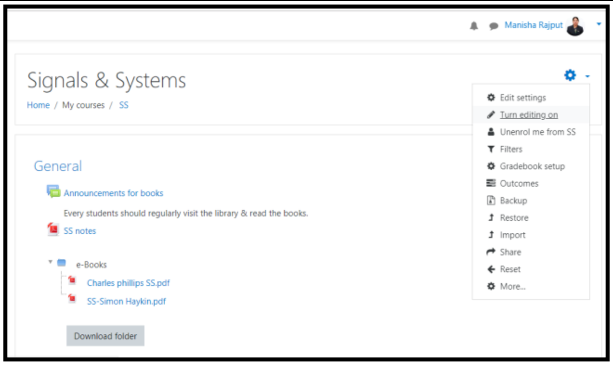


Fig 1. Moodle on Gnomio platform with Turn edit ON

Delivery may includes Pedagogy of Active Learning like Think-Pair-Share (TPS), Peer Instruction (PI), Flipped Classroom, conducting quiz, test and many more active learning activities. In the blended design, the course hours were distributed using a 2/3 to 1/3 format per two-week module [3].

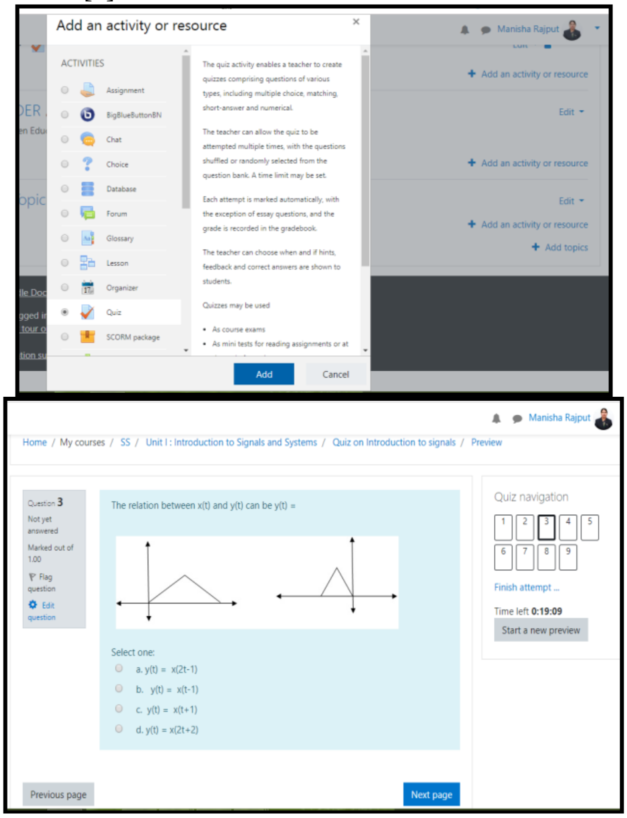


Fig 2. Add activity as quiz for MCQ and Preview of Quiz

Two-thirds of the course was delivered online and one-third was delivered face-to-face. The class met on campus for the 2-hour face-to-face session once every two weeks. Figure 2 shows the addition of quiz activity and preview of quiz added.

All online modules were designed to follow a standard format and progression. The online component of each module was scheduled 1-2 week and then they met face-to-face as a group. The on-campus meetings were designed to enrich, clarify, demonstrate, and reinforce the content learned online. Face-to-face engagement activities were planned to flow directly from the online content and consisted of an activity. Discussions ranged from whole class conversations, to peer feedback and critique of assignments, to structured dialogues between small groups of students. It also helped students feel part of the course learning community and encouraged socialization, an important part of the learning process.

Due dates for all assignments and activities were routine from week to week so students knew when things were due and could plan their engagement time accordingly. Scoring guides and samples were included as appropriate, and all work was submitted or linked through the LMS to ensure a uniform learning environment. All grades, feedback and course announcements were housed in the LMS for consistency and support.[4]

III- RESULTS AND DISCUSSION

A Students survey was done to know the response of the student towards blended learning and flipped class room approach. The students consider were from third semester Electronics engineering. They were exposed to this blended learning first time. Resources are uploaded on gnomio moodle course and then simple quiz are conducted.

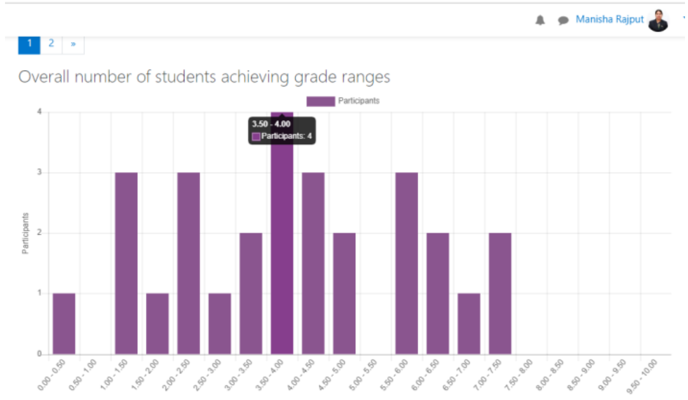


Fig.3 Assessment of the quiz

Students were graded moderately. Then some activity has given, quiz was conducted and for assessment rubrics were given. Figure 3 shows the assessment of the quiz conducted as soon as the time finish. Assessment is in the form of excel file as well as graphical form as shown.

It is found that student academic performance and engagement towards course was improved. Students also like the explanation why their answers were wrong/right. They also like the pattern in forming the questionnaire. Students are motivated to give feedback and involved in the discussion forum. They had posted innovative ideas and query they faced during the course.

IV- CONCLUSIONS

With a Professional training and practice, Teachers can be trained to design their blended course with the help of website, MOOCs, Moodle, online repository. Students are able to make a use of online LMS and can be used it effectively.

It is also observed that communication between parent-teacher, student-student, and teacher-teacher was the same or better after the use of blended learning. Equally important, teachers reported their ability to monitor student learning was either "better" or "much better" with blended learning. Still it depends on particular teacher how effectively the blended course can be design, deliver and assess to meet the requirements. Initially it takes lot of time and patience to design and deliver a course but assessment is very easy and done fast.

V- ACKNOWLEDGEMENTS

I thank the Course coordinator of "IITBombayX: FDP201x Pedagogy for Online and Blended Teaching-Learning Process" who has given me a chance to go through all this activity. I also thanks our institute head for starting a IIT Bombay Remote center and providing all the facility.

REFERENCES

[1] Rianne Conijn, Chris Snijders, Ad Kleingeld, and Uwe Matzat, "Predicting Student Performance from LMS Data: A Comparison of 17 Blended Courses Using Moodle LMS", IEEE Transactions On Learning Technologies, Vol. 10, No. 1, January-March 2017, Pp. 17-29.

[2] Gururaja H.S., K. Mallikharjuna Babu, "Blended Moocs: Impacting The Future of Higher Education", Journal of Engineering Education Transformations, Volume 29, No.3, January 2016, pp.45-48.

[3] Lalima, Kiran Lata Dangwal, "Blended Learning: An Innovative Approach", Universal Journal of Educational Research 5(1): 129-136, 2017

[4] Kristen Shand, Susan Glassett Farrelly, "Using Blended Teaching to Teach Blended Learning:Lessons Learned from Pre-Service Teachers in an Instructional Methods Course", California State University Fullerton, United States, Journal of Online Learning Research (2017) 3(1), 5-30

[5] Ronghuai Huang1, Ding Ma1, 2, and Haisen Zhang, "Towards a Design Theory of Blended Learning Curriculum", Beijing Normal University, Beijing, 100875, China

Impact of Practicing Active Learning Techniques

[1]Bharati Dixit, [2]Mangesh Bedekar, [3]Ranjana Agrawal, [4]Neha sathe

[1,2,3,4] School of Computer Engineering and Technology, MIT World Peace University, Pune, India
[1]bharati.dixit@mitwpu.edu.in
[2]mangesh.bedekar@mitwpu.edu.in
[3]ranjana.agrawal@mitwpu.edu.in
[4]neha.sathe@mitwpu.edu.in
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: To enrich the teaching learning process, it is essential to enhance the involvement of learner in the process. This emphasizes the need of adopting and practicing active learning techniques in the process of content delivery. Blooms Taxonomy gives guidelines to incorporate six cognitive skill levels while content delivery. The active learning techniques propose the 'knowledge transfer' to take place outside the classroom and 'assimilation of knowledge' during classroom session. This helps the learner to practice 'low order thinking skills' outside the classroom and 'high order thinking skills' within classroom in the presence of teacher so that teacher can contribute effectively to nurture problem solving skills, application of concepts, improvement in design skills etc. Practicing active learning is also in line to change of role of teacher from 'teaching to facilitation' in the changing environment of knowledge world.

The need and rigor of practicing active learning techniques is more for the courses which are theoretical in nature. The paper discusses some of the active learning techniques like TPS - Think Pair Share, PI - Peer Instructions, Mind Mapping, problem solving through Jigsaw puzzles practiced for one of the course which is theorectical in nature.

The impact of practicing these techniques is observed through feedback from learners. Important feedback parameters are improvement in 'clarity in understanding', 'confidence in application of concepts' and 'satisfaction level of learner'. These active learning techniques are practiced in the class of 65 students. During practicing these techniques, it is observed that around 80-85% students were willingly involved in the process whereas remaining students are required to be motivated to participate in the activities. In the sample population of 60 students 97.27% participants have shown improved satisfaction in learning.

Students have appreciated and well received the idea of practicing active learning techniques and asked more such sessions. These techniques have also an added advantage that weak learners are benefited a lot. Some of the challenges in implementing these techniques are prior planning, class control while practicing, time management within the term.

Keywords: Active Learning, Think-Pair-Share, Peer Instruction, Bloom's Taxonomy, Learning Process.

1 INTRODUCTION

In the changing era of knowledge world, information is available at the tip. Enormous sources of information making the required information available in different formats like text, audio, video, animation etc. This has brought the paradigm shift in the role of faculty from teacher to facilitator. Teachers shoulder the responsibility to convert information to knowledge in effective manner.

Student centric processes and learner centric approaches are becoming integral part of outcome based education. To inculcate the graduate attributes and nurture the skills of learners, Blooms taxonomy is recommended to be followed which suggest nurturing six cognitive levels or skills. These skills are called as understand, comprehend, apply, analyse, synthesize and evaluate. The first three are called as LOTs - Lower Order Thinking skills and later three are called as HOTs- Higher Order Thinking Skills.

Studies have shown that concentration span of learner at a stretch is reducing with time. So it is more challenging to involve learners with content delivered in the class room session of one hour. This challenge becomes more tough when the topic under discussion/delivery is theoretical in nature. Here it becomes essential to use innovative teaching methods to involve the learner with content. The active learning techniques not only engage the learner with the content but if designed appropriately help the learner to explore and practice the higher level cognitive skills in the class room in the presence of teacher.

The study is further developed under the literature survey as section 2, implementation methodology is discussed in section 3, result analysis and conclusion are part of section 4 and 5 respectively. Acknowledgement and references are also part of paper.

2 LITERATURE SURVEY

Papers and articles on Teaching pedagogy, IUCEE and other renowned journals are studied. Some of the facts and findings are as discussed below.

Margaret Fitzsimons (2014) have carried out the study for more than 2 years with the objectives to engage in active learning by having students work on a consulting project in groups for a real life business and to improve student learning. The author wished that on successful completion of this module the participants will have better understanding to conduct the business with enhanced core skills such as innovation, critical thinking, problem solving and decision making.

Justin L. Hess1, Jonathan B., Carla B. Zoltowski, and Lorraine Kisselburgh (2019) have highlighted the need to incorporate development of ethical reasoning into engineering professional preparation which was identified more than a decade ago by NAE - National Academy of Engineering. Authors have proposed SIRA framework to achieve the objectives.

Susan M. Lord, Matthew W. Ohland, Richard A. Layton and Michelle M. Camacho (2019) have presented how pathway becomes narrow as we proceed towards focused study from school education towards higher education. Author also discusses how the harmony, reduction in dropouts can be achieved in the education ecosystem.

K. Y. Tshai, J.-H. Ho, E.H. Yap and H.K. Ng (2014) have performed targeted study on formulation of PEOs, assessment criterion for PEOs by integrating the stakeholder's inputs, methodology for an unbiased measurement of graduates' long-term attainment rate, as well as analysis and identification of a set of strategies for continuous quality improvement (CQI).

The literature studied emphasizes the need of active learning, inculcation of professional ethics in students, necessity of outcome based education and its effective implementation. The study carried out further explores the active learning methods in details.

3 IMPLEMENTATION METHODOLOY

Most of the teachers at school of computer Engineering and Technology, MIT World Peace University, Pune, have undergone the AICTE approved faculty development FDP101x and FDP202x conducted by IIT Powai Mumbai India on Teaching pedagogy, blended learning and effective use of ICT tools. We, the teachers have understood and experienced the importance of the active learning techniques and have practiced some of these techniques in the class room sessions.

Majorly we have practiced Flipped classroom, TPS - Think Pair and Share activity, Mind Mapping, problem solving through Jigsaw puzzles etc. Brief description about the technique and how they are practiced is as follows.

A. Flipped Classroom

This techniques is based on the philosophy that let the knowledge transfer takes place outside the classroom and assimilation of knowledge takes place inside the class room. For knowledge transfer, teachers can share information in the form of any document, Pdf file, power point presentation, any book chapter, manual, research paper etc. Students are suppose to read and understand the content and should be able to comprehend the information. In class room session quiz, question answer session, group discussion etc. can be conducted for sharing the knowledge and clarity of concept. Teacher can add on in the knowledge during the session to make the topic clearly understood by learners. Learner should be able to explore higher levels of cognitive skills. We have explored this method by sharing the PPTs and NPTEL video link on the topic floating point unit of Microprocessor and conducted quiz in the class after summarization of the topic.

B. TPS - Think Pair and Share activity

This learning activity is very interesting and appreciated by most of the students. The activity is divided in three phases. A problem(s) is given by the teacher and the activity starts with think phase for 3/5 minutes at individual learner level. After this phase the pairs are formed to discuss the problem in depth and complete the missing link, incomplete solution if any. The second phase of pair is again 2/4 minutes. In third and final phase the pairs are converted into groups of manageable size and solution is discussed within the group. If teacher has designed to post same problem to two groups then they can discuss the solution across the group (s) and along with joyful and engaged learning, students may come across diverse solution of the same problem, different approaches of dealing with same problem depending upon the problem. Later teacher can display all possible solutions to class and the session concludes. This activity may take 30/45 minutes. We have exercised this for pipeline concept in the course Microprocessors where the set of instructions were given as a problem and students were suppose to illustrate the pipeline stall by depicting the timeline diagram and calculate the degradation in efficiency of processor. Multiple sets of instructions were distributed as problem statement in the class.

C. Mind Map

Mind map is an activity wherein the learner expresses his/her thought process in the form of illustrations/charts/ role play/ creation of animated PPTs etc. These are discussed with teacher and timely inputs are obtained for the concept under demonstration so that students are enabled to apply the concept as per the need of application. Instead of giving home assignment, we have conducted this activity in classroom session. The concepts of segmentation and Paging which are part of the course Microprocessors are explored by students in joyful manner. Most of the students preferred to draw charts and animated PPTs for this activity. This was conducted as group activity.

D. Problem solving through Jigsaw puzzles

For the same course Microprocessor, we have taught the architecture of processor and then the whole block diagram is given to the students in the form of pieces of puzzle. Students connected the pieces to get the complete architectural view of the processor and then explained each building block for the whole class.

Some more activities like PI - peer instruction and PBL - problem based learning is explored for different topics. Feedback of students was taken for all the activities individually and also for each active learning approach at broad level from the whole group. Analysis of the feedback is done in the section result analysis.

4 RESULT ANALYSIS

Feedback is taken from students at individual level or at group level depending upon the active learning method practiced in the class. The class strength is 60 and depending upon the no of students present on the day of activity in the range around 48 to 60 have participated in feedback process. The common and general parameters parameters applicable for all the methods are improvement in 'clarity in understanding', 'confidence in application of concepts' and 'satisfaction level of learner'. The feedback taken on these parameters is as shown inTable 1 and graphically shown in Fig. 1.

Table 1 Feedback on active learning approaches

Active learning Approach	Clarity in understanding (Figures indicate number of students agree/disagree)		Confidence in application of concepts (Figures indicate number of students present)		Satisfaction level of learner (Figures indicate number of students present)	
	Improves	No Impact	Improves	No Impact	Improves	No Impact
Flip Classroom	52	03	52	03	55	0
TPS	56	0	52	4	56	0
Mind Map	55	05	53	07	57	03
Problem solving through Jigsaw Pule	49	0	47	02	46	03

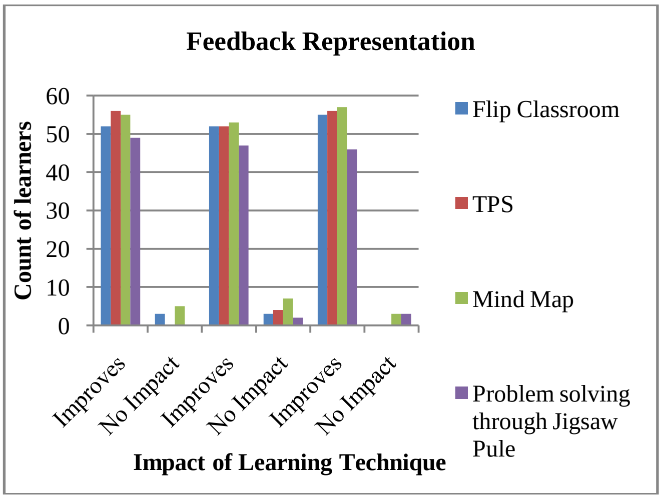


Fig. 1 Graphical representation of learners feedback

The individual feedback parameters like clarity in understanding, confidence in applicavtion and learner satisfaction are represented graphically in Fig. 2 to Fig. 4 respectively.

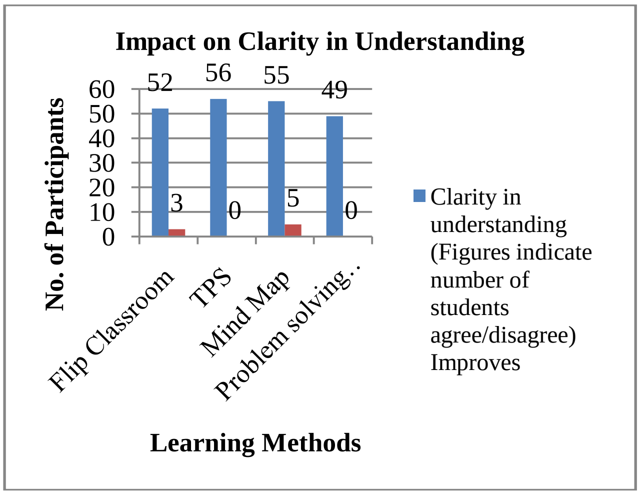


Fig. 2 Representation of the feedback parameter Clarity in understanding

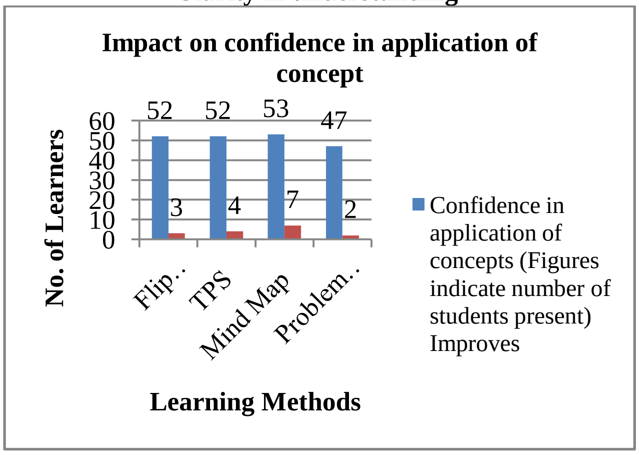


Fig. 3 Representation of the feedback parameter confidence in application of concepts

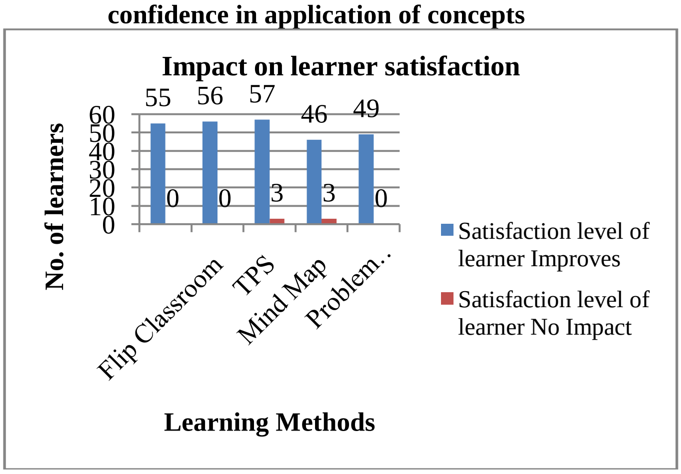


Fig. 4 Representation of the feedback parameter learner satisfaction

The feedback analysis reveals that satisfaction level of learners improves with practicing active learning techniques along with the most sought benefits like better understanding and enhanced confidence in application of concepts. The weak learners are also benefitted as they start involving with litter delay but better learn from peers.

5. CONCLUSION AND FUTURE SCOPE

The experiments carried out to teach concepts through some of the well-known active learning approaches are discussed and analysed in the study. The impact of practicing these techniques is very positive and the associated academic benefits are noteworthy. The consolidated feedback analysis for all the active learning techniques practiced show that the 96% learners have agreed for clarity of understanding, 92.72% learners have shown confidence in application of concepts and 97.27% participants have shown improved satisfaction in learning.

The challenges and issues attached with practicing active learning techniques are class control, better time management which can be addressed to a large extent with the support of Co-teacher. Better planning can lead to smooth conduction on activity and effective delivery of contents.

More such innovative approaches can be practiced in future for varied topics with more frequency. There is unbounded scope to design the activities more creatively.

ACKNOWLEDGEMENT

We are thankful to all the students for their whole hearted participation, conscious feedback and desire to contribute more for such activities in future. We are also thankful to school of computer Engineering and Technology, MIT World Peace University, Pune, India to encourage us to explore these active learning techniques to a large extent and provide necessary support for the same.

REFERENCES

Margaret Fitzsimons (2014) Engaging Students' Learning Through Active Learning, Irish Journal of Academic Practice Volume 3 (1), 1-26.

Justin L. Hess1, Jonathan B., Carla B. Zoltowski, and Lorraine Kisselburgh (2019)Enhancing engineering students' ethical reasoning: Situating reflexive principlism within the SIRA framework, Journal of Engineering education, 108, 82-102.

Susan M. Lord, Matthew W. Ohland, | Richard A. Layton and Michelle M. Camacho (2019), Beyond pipeline and pathways: Ecosystem metrics, Journal of Engineering education, 108, 32-56.

K.Y. Tshai, J.-H. Ho, E.H. Yap and H.K. Ng (2014) Outcome-based Education – The Assessment of Programme Educational Objectives for an Engineering Undergraduate Degree, Engineering Education a Journal of the Higher Education Academy, 9(1), 74-85.

The Effect of Think-Group-Share on Student's Worthwhile Learning

R. M. Kurane[1*], S. N. Yadav[2]

[1,2]Department of Sciences and Humanities, Rajarambapu Institute of Technology,
Rajaramnagar, (Islampur) – 415414 (M. S.) India.
Email: [1]rajanikant.kurane@ritindia.edu,
[2]sunil.yadav@ritindia.edu

Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract
This study addresses the effect of Think-Group-Share accommodating learning strategy in the Engineering Chemistry course and its consequences for student's determination in their abilities to conceptualize and visualization of Chemistry and their energy to share in class talk. The study showed that student's involvement in the classroom was increased, the extent of long demonstrations given by students unfolded, and students comfort and sureness when adding to class communication also developed. It was well entrenched that this technique contributes to the students substantial learning.

Keywords: Think-Group-Share, Engineering Chemistry, visualization of Chemistry, substantial learning.

I. Introduction

Teaching learning attitude in many folds has been tremendosouly developed by many experts using numerous approaches.[1] These approaches are set of considerations which deal with teaching learning activities.[2] It is also the basic foundation in designing strategy and method. Therefore, approach has a critical role in teaching. Cooperative learning is one of the teaching models which are utilized by educator to improve student's capacity in numerous abilities, particularly better student learning results, more prominent student maintenance, and more comprehensive class situations than lectures alone.[3] Co-operative learning is progressed in group or pair of team. It is a kind of methodology by using which each student in a team having different levels of capacity can improve their understanding of subject.[4] In a cooperative learning environment, students may work in pairs, in small groups, or in a combination of both give each other immediate feedback, support, and reinforcement. Every individual from a group is capable for realizing what is educated as well as for helping partners learn, so this make an atmosphere of accomplishment. Students work through the task until all group members effectively comprehend and complete it. The cooperative learning models developed by Lyman (1985) and his colleagues [5] at the University of Maryland and was created to accomplish at least three significant instructional objectives: scholastic accomplishment, tolerance and acknowledgment of decent variety, and social skill improvement. Albeit helpful learning incorporates an assortment of social objectives, it also goes for improving student execution on significant scholarly tasks.[6] Among a number of cooperative learning strategies, Think Group Share (TGS) is applied in the engineering classroom to improve student's understanding in 'Engineering Chemistry' course. It is straightforward addressing system that keeps all students are included in class discussion and gives an opportunity to each student to examine by enabling them to ponder their answer and discussion about their solution with group members before they are approached to react. Thus, it is a powerful reason to employ TGS in order to structure student's thinking and their discussion. It is one of the best technique in cooperative learning.

Vital protocol of TGS is to offers a few questions to the class about what has been clarified about the action or an issue or a task and after that approaches the students to think for a moment about this problem alone with the counteractive action of talk or walk around in the lecture room at the time of thinking. Then the teacher asks students to splitting up into groups to discuss and think together about a question or posed activity for a period of five minutes. Finally, each group should represent their logical and final answer in front of all class and discuss about their responses. In this discussion other group can also annex their remarks in the solution to make it final and acceptable verdict.

II. Purpose of the activity

In this section, we give purpose of the proposed activity:
TGS breaks the lecture to empower students to time to consider challenging content. It is intended to urge students to share and talk about thoughts around a specific topic, issue or problem. It makes a solid stage for students to cooperate and team up transparently with other students and with instructors as well as talk about the most ideal approaches to understand the idea clearly. This technique can be utilized to evaluate a calculated comprehension, filter data, make determinations and empower peer learning among students. This is especially significant for slow learner students who may think that it's difficult to talk in front of the entire class. This method additionally empowers students to build legitimate thinking, basic reasoning and better portrayal.

III. Strategic steps of Think – Group – Share

The algorithmic approaches of Think–Group–Share strategy are given below:

A. The thinking step

This Strategy initiates when the instructor is putting forth a question energizing to think or an issue identified with the subject of the exercise to search for a solution. At that juncture, the teacher instructed that the students think alone to determine the issue and gives them a specific time to think. This time interval is decided based on individual reflection, based on student's information, the idea of the problem and the level of complexity of the problem.[7]

B. The grouping step

The teacher asks students to splitting up into group of four students (if uneven numbers allowed 5). To discuss their answers 2-5 minutes are allocated. Generally it has been observed that, they discuss what they think about it with each student in group and convinced to exchange views and ideas to reach a common answer .[8]

C. The Sharing step

Expand the discussion to the entire class by calling upon students to share their proposed solutions and any difficulties they had. The teacher can participate each group of students to think together and this will save time and effort of the teacher.[9]

This strategy is most sophisticated teaching strategy which it aims to provide students achievement, stimulate their energies, and develop their abilities. Moreover, it is suitable for students of all ages and for teachers community who are engaging in cooperative learning for the first time.[10]

IV. Methodology

In order to study TGS and the effect it has on students, we gave to the students a pre-survey to measure how often they believe, they participate in class, how they feel about participating in class discussion, and their confidence in their Engineering Chemistry abilities. We also gave the same survey as a post-survey. We have conducted this strategy for F.Y. B. Tech students in Engineering Chemistry course. This activity was conducted during teaching and learning of **"Corrosion and its Prevention"** unit.

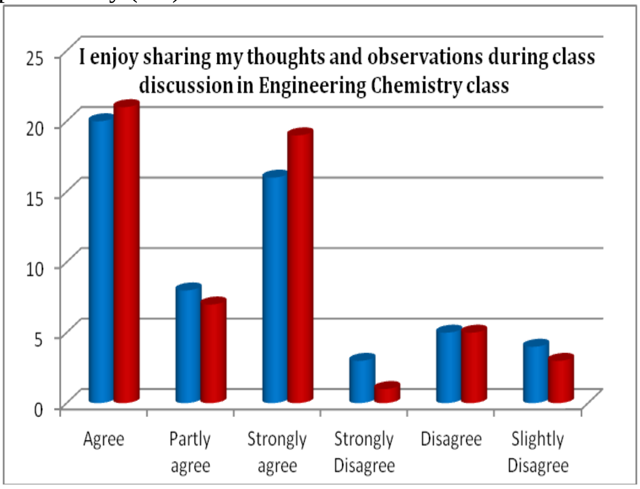
After notifying all the instructions to the whole class, the following questions were raised in the class;

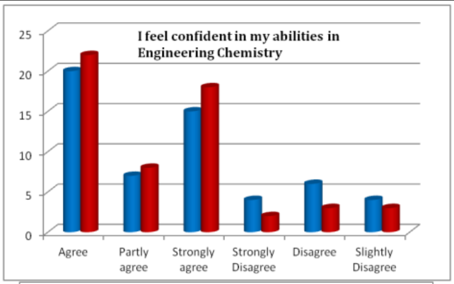
1. How you can define rusting?
2. Comment on oxidation corrosion in details.
3. How oxidation corrosion is destructive in case of alkali metals?
4. Which oxide layer is most destructive? Justify your answer with suitable example.
5. Which oxide layer is most protective? Justify your answer with proper example.
6. Would corrosion take place if Aluminum and dil. HCl are put in contact with each other in a dry container? Justify your answer.
7. Comment on hydrogen evolution mechanism with suitable example.
8. Comment on oxygen absorption mechanism with suitable example.
9. Explain how following factors would affect the rate of corrosion of iron plate; a) Moisture b) Temperature c) pH d) Concentration.
10. Explain how following factors would affect the rate of corrosion of copper plate**; a)** Conductivity of medium **b)** position in the EMF series **c)** Solubility of corrosion product d) Nature of oxide layer.
11. How metallic goods which generally utilized for storage of foods are protected from corrosion?
12. Give reason why Zn is added in galvanizing process.
13. Explain how proper design can be helpful in prevention of corrosion?
14. Explain how 25% ship structure is protected from corrosion using cathodic protection?
15. Why lowering pH increases the rates of corrosion?
16. Explain how to measure the rate of corrosion of Aluminum metal by weight loss method?
17. Explain how metal spraying is most appropriate method for fabricated metallic structures in protection against corrosion?
18. If corrosion product is soluble, it increases the rate of corrosion. Give reason with appropriate example.

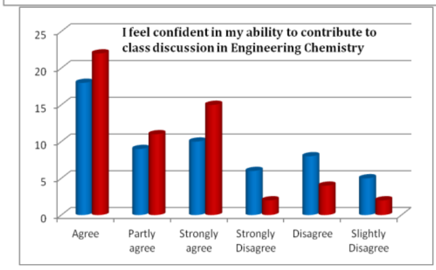
This gave us an idea of how students felt about their Engineering Chemistry capacities and participating in Engineering Chemistry discussion in **"Corrosion and its Prevention"** unit. This helped to see if TGS has an effect on their confidence and willingness to participate in discussion. The observations before using TGS gave a base-line of the student participation in the particular class. This was helpful to see who dominates in sharing of above questions answers, who avoids participation, and what type of comments and questions were raised during the activity. This was very useful to compare class discussion before and after the use of TGS.

V. Analysis of Data

The survey has been taken from the students about their class participation and confidence at the beginning and at the end of the activity. Below are charts comparing the answers given by students in the pre survey (blue) and post-survey (red).







The results of the pre-survey and post-survey suggest that TGS had a positive impact on students' views about participating in discussion in Engineering Chemistry class. Every question showed an improvement in the post-survey compared to the pre-survey. The outcomes of the study recommend that students think utilizing the TGS method adds to more cooperation. Students also indicated that they enjoyed participating more in class discussion when using the TGS technique. Student's solace when adding to class sharing was likewise improved. Student's trust in their Engineering Chemistry capacities and their trust in their capacity to add to discussion were emphatically influenced.

VI. Conclusion

From this activity, it is observed that utilizing TGS in targeted class increase the number of student's involved in classroom discussion and enable students to give long clarifications with increase in their in sharing their thoughts and ideas. To list, this has some of the following benefits:

1. Builds up a learning culture of elevated requirements where all student's are tested, engaged and bolstered to accomplish their maximum capacity.
2. It gives the chance to student's to gain from one another, work on utilizing and building up their Chemistry vocabulary, work on utilizing scientific thinking abilities, and furnishing with a type of developmental appraisal.
3. It upgraded the student's own learning potential by giving chance to take responsibility.
4. Utilizing this procedure also appeared to enable a couple of student's to expand their trust in their Engineering Chemistry and capacity to contribute in class sharing.

These results reinforced our decision to use TGS in teaching. We have got very positive results, as we have used TGS technique as a part of teaching. Many students communicated that the content we completed while we were not utilizing TGS was more challenging for them to understand. While not using TGS, the class was studying how to simplify electrochemical reactions involved in corrosion. The students studied electrochemical reactions and were able to explain the process of corrosion by using electrochemical reactions. Many students were delighted to experience TGS method and even gave the feedback that they felt the content taught using TGS was easy to understand and apply. It was well entrenched that this technique substantially contributed in the students learning process.

References

1. Waite S. (2011), eaching and learning outside the classroom: personal values, alternative pedagogies and standards, Education 3–13, 39:1, 65-82, DOI:10.1080/03004270903206141.
2. Sumarsono P. (2014), Implementation of Think-Pair-Share Model to Improve Students' Ability in Reading Narrative Texts, International Journal of English and Education, 3(2), 206-215.
3. Bidabadi N. S., Isfahini A. N., Rouhollahi A., (2016), Effective teaching methods in higher education: requirements and barriers, J Adv Med Educ Prof., 4 (4)
4. Le H., Janssen J., and Wubbels T., (2018), Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration, 48(1), 103-122 https://doi.org/10.1080/0305764X.2016.1259389
5. Foyle, H. C., Lyman, L. R., Tompkins, L., Perne, S., and Foyle, D. (1993). Homework and cooperative learning: A classroom field experiment. Illinois School Research and Development, 29(3), 25-27.
6. Arends R. I. (2009). Learning to Teach. New York: Mc. Grow Hill Companies, 367.
7. Susan, L. (2001), Using think-pair-share in collage classroom, center for learning and teaching excellence, Arizona state university.
8. Ahmed, samah abd al-hameed Salman. (2006). the effect of using (Think – Pair – Share) strategy in the development of critical thinking in math and in the attitudes of life for the students of the preparatory stage.
9. Saleh H. Y. and Ibrahim H. S. (2015). the Effect of (think, pair, share) strategy on the students of Biology achievement in Algas and their attitude toward it. Diyala Journal of Human Research, 66.1- 19.
10. Christine, S. (2001), using think-pair-share team up to learning from each other, the johns hopking university, Baltimore, Maryland.

Designing Learner Centric MOOC

Umesh A. Kamerikar[1]

[1]ETC Department, RIT Islampur

[1]umesh.kamerikar@ritindia.edu

Track No: 1

Track Name: Different dimensions of Teaching-Learning

Abstract: Massive Open Online Courses (MOOCs) have become popular for diverse learners to upgrade their knowledge and skills. New Instructors are creating MOOCs which focus on the use of technology features to create space of their classroom actions. It is necessary to be aware of the technology affordances at diversity level but it is more important to focus on the pedagogy of how to use the MOOC features effectively to promote student engagement and learning. Hence MOOC instructors need a set of design principles and guidelines to create a learner-centric MOOC. In this paper, we will discuss the Learner-Centric MOOC
(LCM) model, and how to apply it to create effective MOOCs.

Keywords: LeD, LbD, LxI, LxT, AQ, RQ

1. Introduction

MOOCs or Massive Open Online Courses are one way to make quality educational content accessible to a large number of learners. Many of us may have completed MOOC or may have been teaching assistants, while others may have created our own MOOCs but completion rate is low[1] and there is lack of engagement by learners, discussion is scattered in forums[2]. New Instructors to MOOCs try to focus on using the technology affordances of the platform in order to create scene of their classroom actions. While it is necessary to be aware of the technology affordances, that only is not sufficient. It is important to concentrate on the pedagogy to exploit the technology features in order to promote student engagement and learning. A learner-centric approach is broad pedagogic principle which is effective for student engagement and learning in various settings [3]. It incorporates principles of Active learning, Peer learning, Formative assessment and so on.

We will discuss how to embed learner-centric principles in a MOOC development and create a Learner-Centric MOOC for the course. MOOC should be instead of simply having videos for watching, there are activities that need to be done, there are discussions that need to be engaged in and so on.

Arrival of internet in the 1990s had brought in the opportunity for increasing access of education through online learning. The Alliance for Lifelong Learning, a non- profit initiative started by Oxford, Yale and Stanford University in 2000 is one of the earlier initiatives that tried to offer courses at scale through the online medium. The most widely talked about experiment in the massive open online course was the course 'Connectivism and Connective knowledge' offered by Stephen Downes and George Siemens in 2008 in which 2200 participants worldwide.

The next big revolution in the online offerings came in the year 2011, when the Stanford University offered three courses online. One of it was the course 'Introduction to Artificial Intelligence' offered by Professor Sebastian Thrun along with Peter Norvig. This attracted 160,000 learners with around 20,000 of them completing this course.

Professor Thrun went on to create a MOOC platform Udacity in the year 2012, a year that also saw the birth of the most popular MOOC platforms like Coursera, edX, Future Learn, Open HPI, Eli Academy etc. India had also witnessed scaling up initiatives in the field of education during these years. With the Train 10,000 Teachers coming up with blended course offerings using its synchronous remote center model for content delivery and the National program on technology enhanced learning coming up with video repositories from professors of the premier institutes like IITs and IISc. Thus, MOOCs had become a common word by 2012 and the advantages of these courses in terms of access and flexibility that it provides for learners along with the scales that it can reach were widely appreciated by everyone.

2. Why LCM

Many of us are familiar with learner centric in the classroom. We are used to hearing terms like active learning, group discussions, peer-learning and are aware of the benefits of incorporating such techniques in the classroom. We need to make learners go beyond simply listening to the lectures, taking notes, and executing prescribe procedures to immediate practice, figure things out, express their thinking and learn from peers. It needs to change from how well am I explaining the concept to how well be learners learning the concept.

Normally MOOC contains set of videos, a set of practice question, set of resources and a place for discussion. In this opportunities for micro-application are missing, formative assessment and customized feedbacks are missing for attention to learner and motivation. Also, if you just make a discussion forum available there are no explicit activities to foster peer-learning and there is no connection of the instructor to the learner.

Hense instructor has to design mechanisms which encourage students to go through all the resources provided, guide their directions in which they want to carry their learning and ensure that they have actually benefited

in learning from looking at those resources in a meaningful manner. Also the instructor has to ensure that students learn from peers reviews.

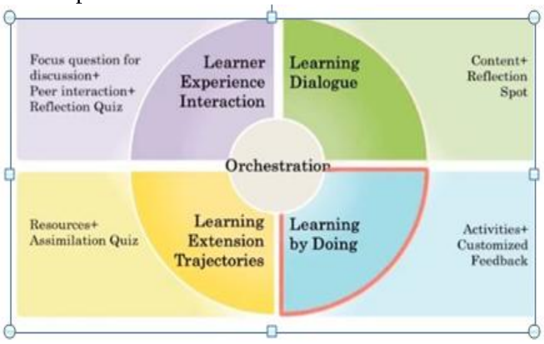


Fig 1. LCM Model

To achieve this Learner-Centric MOOC model, which has Learning Dialogues(LeD), Learning by Doing(LbD), Learning Extension Trajectories(LxT), Learner Experience Interactions(LxI), all of which are connected through appropriate orchestration between the course team and the learners, to ensure that the learners are not simply watching the information but are able to assimilate them in a meaningful manner.

The LCM model mainly consists of Learning Dialogues which advance concept understanding through learner interaction, Learning by Doing is formative assessment activity, Learning Extension Trajectories advance learners learning along diverse paths, Learning Experience Interactions cultivates peer-learning through focused discussion. In addition to these elements, it is important to keep in mind the orchestration, i.e., the process by which the course team designs the interactions for the learners as well as assists and guides the learners through the MOOC.

3. Learning Dialogues (LeD)

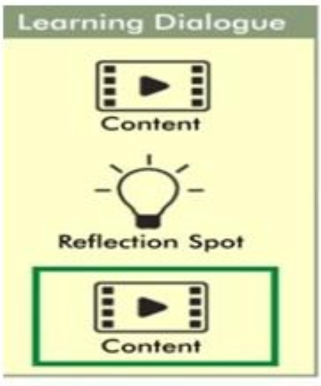


Fig 2. LeD Structure

- LeD consists of content which could be a short video explanation, or it could be some text which the instructor wants the learner to read, or it could be an animation.
- The reflection spot in a LeD is a logical point where instructor provides the learner with opportunities for micro-practice, to assimilate what they have just learned as well as to express their opinion or interact with the content in some way. It's a structural point where the learners may get disengaged. Learner can respond to multiple-choice question, or a fill in the blanks, or as a short answer question
- Content may be a summary of what were the expected answers in the reflection spot, or it may be continuing further from the reflection spot.

The goal of a learning dialogue is to provide this conceptual knowledge along with explicit spots for learners to express their conceptions, do micro-practice and reflect on what they have learnt. Learning dialogue promotes concept acquisition through learner interaction.

Making a LeD

If it is video following way are taken

1. Talking head video, which is the instructor speaking to the camera. It is useful where we have some narrative to tell.
2. Slides can be used for takeaways and there is emphasis on the content using the textual features. Use 6x6 rule i.e. e slide will not have more than six bullets, at the same time every bullet will not have more than six words.
3. Picture in picture
4. Writing on paper or a digital tablet or even a blackboard or a whiteboard and is being captured by some gadget, it could be a camera or a screen capture mechanism.
5. Screen capture, Graphics, Animation etc.

For creation of Led, identify the pause points in a lecture in order to identify the topics and the chunks that constitute an LeD, and then to identify the points in an LeD, where we want to provide learner engagement, and connect by introducing reflection spots. In some cases, you may have the reflection spot may be in the beginning/middle /towards the end of the LeD. One point to keep in mind is that it is necessary to close the loop for the learner by providing a commentary on what could be the different responses that the learners have given in the content that follows the reflection spot. This ensures that a LeD is truly a dialogue between the instructor and a learner, and not simply a one- way transmission of information.

4. Learning by Doing (LbD)

It is a formative assessment activity designed by an instructor for students to self-check their level of concept attainment[4], or for them to immediately apply the concepts that they have seen and learnt in the LeD, or for integration of various concepts and various parts of the module in the MOOC. LbDs can be in the form of multiple choice questions or they can require longer responses in the form of a text box or so on. The main goal of an LbD is formative assessment.

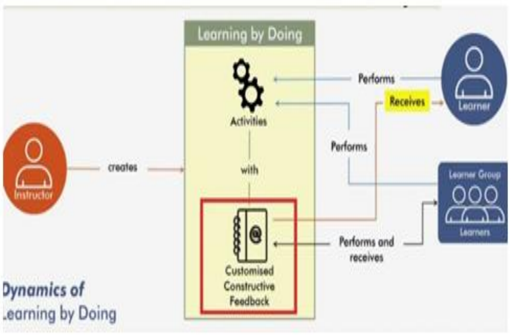


Fig 3. LbD Structure

Learners perform an LbD activity right after which, they receive rapid, specific, and constructive feedback not right or wrong but telling the learner what they can do, what are the resources they can access, what they should revise and so on, so that they can get their reasoning and their response correct. Each option has its own specific constructive feedback that helps the learner figure out exactly what went wrong and how to fix it. Formative assessment primary goal is not to grade the learner but to provide feedback to the learners so that they can improve their learning.

An LbD provides an immediate application of concepts seen. LbDs appear right after the content LeDs, not only at the end of the module. LbDs or Learning by Doing can be in the format of multiple choice questions, but they can even go beyond. As we saw they can be longer assignments or problems. The feedback in such LbDs is provided via peer review, so Learning by Doing activities are learner- centric in the sense they exploit the power of peer learning. The process of peer review helps both the giver of the feedback and the receiver of the feedback.
Each LeD should be followed by LbD activities with customized constructive feedback for each Learning by Doing activity.

LbD activities

1. MCQ, True/ False
2. Long answer
3. Problem solving
4. Pair matching and many more

While creating an LbD activity, we need to start with the learning goal, "is it concept attainment, application, integration of knowledge". We can use our teaching experience to decide the pedagogical goal and the pedagogical type and we need to explore the platform to decide the format of the question and then combine all this using our creativity.

5. Learning Extension Trajectories (LxT)

Fig 4. LxT Structure

In the Learner Centric MOOC model, the element of Learning Extension Trajectories, that is LxT, is one way to aid a MOOC instructor in addressing the challenge of diversity. The Learning Extension Trajectories is about providing learners with a wide variety of learning resources immediately followed by an assimilation activity [2].
The resources can be used to support the learner to ensure prerequisites or advance their learning, or support in the direction of their inherent motivation, or support the needs of learners with varying experiences along with taking care of their language or regional context needs. A learning extension resource could be videos, it could be links to various web pages or documents that are already available, or it could also be even research papers that have been written about the topic being discussed.
The learners can access these resources of their choice based on their needs and interest. Following that, learners are required to answer the Assimilation Quiz (AQ) activity which ensures that they have gone through the content in the provided resources. The purpose of an Assimilation Quiz is only to give incentive for access to these resources. The purpose of an Assimilation Quiz is only to give incentive for access to these resources. Hence the level of questions should be such that anybody who accesses these resources should be able to immediately answer it.
Learning Extension Trajectories enable the learner to increase the depth or increase the breadth of their existing knowledge or understanding, but in addition they cater to diverse type of learners and diverse levels of learning and is followed by a short activity to ensure that learners assimilate the key concept or knowledge intended from the resource[5].
Creating LxT
In creation of LxT, scope of diversity, addressing diversity (resources provision) and how to incentivise required to be thought of. Consider

- **a.** Regular student and experienced learner I.e. diversity of expertize
- **b.** Curious learner i.e. diversity in motivation
- **c.** Young and old learner i.e. diversity in age
- **d.** Language diversity

Hence decide the priority and address all categories.

LxT helps instructor in requirement and support to decide lower level, depth that can be achieved and variety of topics can be exposed in MOOC

Once scoped for diversity is fixed, and then get the resources to address the most important diversity. Resources may be books. YouTube video, OERs and websites but use Creative Commons licensing terms. Also if required take permissions from the resource creator.

Creating Assimilation Quiz

Following are guidelines for creating assimilation quiz.

1. Each learning extension trajectory should have an assimilation quiz associated with it

2. Quiz should not be too complex that a person has to spend additional time in finding out the answer.

3. Assimilation quizzes have a minor grade associated with it. Marks should not be too high nor it should be too low.

6. Learner Experience Interaction (LxI)

MOOC learner has discussion forum to interact with the peers as well as the instructors but low participation in the forums because not many people would like to visit that. It leads to non-availability of any peer connection. This makes the discussion forum a utility which is not used to the fullest potential.

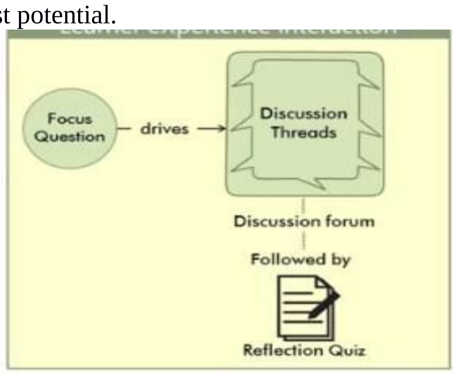


Fig 5. LxI Structure

There are three elements of LxI: a focus question, the discussion and the reflection quiz (RQ).

The focus question anchors the discussion. It avoids the scatter which can happen otherwise, meaning that the learners are forced to point their discussion posts to the question which is asked, and thereby it sets a very clear deliverable. The discussion thread exposes the learners to the versatile viewpoints. It steers the discussion along the productive channels, because you can find all the related threads at one point now. This encourages participation in the threads of that particular interest for every learner who is trying to access the discussion forum.

The reflection quiz provides a perfect closure to this activity. It also incentivizes the engagement of the learners by making them visit the discussion and answering the quiz questions. In short, an LxI cultivates peer learning via focused discussion. LxI helps the learner not only in participating in the discussion, but also confirming that knowledge by answering the questions in the reflection quiz.

7. Orchestrating MOOC

Once the elements of a MOOC are created, it’s time to offer it. Orchestration of a MOOC is an important stage in making your MOOC learner-centric. This is because instructor can establish learner connect, get feedback from the learners, act upon it, and adopt your strategies accordingly in a live setup.

8. Assessment

Before going ahead with the orchestration, how you would access your students in the MOOC is required to be decided out of LeD, LbD, LxI, and LxT which will be used for assessment. Any or all can be used for this purpose.

One goal of conducting assessment is for students to practice their skills and apply their knowledge. So that, we can continuously analyse their progress and this can be used to improve learning as well as improve teaching. Such assessment is ongoing and frequent and a key element of such assessment is feedback to the learner and feedback to the teacher that helps them improve this teaching and learning process. Assessment for such a purpose is called assessment for learning or formative assessment.

Another reason we do assessment as instructors so that students can demonstrate the achievement of their knowledge and skills. Such assessments describe what a student is able to do and what we value in a course? Assessment for such a purpose is called assessment of learning or summative assessment.

LCM model components can be used for assessment as LeD-Formative assessment

LbD-Summative assessment LxI-Summative assessment LxT-Summative assessment

Various elements in a Learner-Centric MOOC model, LeDs, LbDs, LxIs and LxTs can be used for assessment, both formative and summative. These elements can be used to design assessment in different formats, both short or multiple choice type of questions as well as longer questions. As a Learner-Centric MOOC instructor, identify assessment functionalities provided by the MOOC platform and leverage these functionalities to design both formative and summative assessment. Use c certain known techniques to provide effective customized feedback to shorter multiple choice questions. Exploit the power of peer learning and use peer review as a mechanism to tackle scale, while assessing longer questions such as problems.

9. Conclusions

LCM model focuses on learner-centric pedagogy in MOOCs. It is not sufficient for instructor to make their content available and some end assessment to the learner. To ensure learner engagement in a MOOC till end, it is necessary for creators to ensure that learner-centric techniques are followed. The LCM model guides the instructors to create learner-centric MOOCs.

The LCM model consists of LeD, LbD, LxI and LxT. This model if followed will definitely address diversity of society to enrol, complete the MOOC course till end and process of teaching learning will be fulfilled.

References

[1] K. Jordan. Massive open online course completion rates revisited: Assessment, length and attrition. The International Review of Research in Open and Distributed Learning, 16, 341-358, June 2015.

[2] S. Mak, R. Williams and J. Mackness. Blogs and forums as communication and learning tools in a MOOC. In Proceedings of the 7th International Conference of Networked Learning, 275–285, 2010

[3] Sahana Murthy, Jayakrishnan Warriem, Sameer Sahasrabudhe, Sridhar Iyer. "LCM: A Model for Planning, Designing and Conducting Learner-Centric MOOCs", 2018 IEEE Tenth International Conference on Technology for Education (T4E), 2018

[4] Veenita Shah, Gargi Banerjee, Sahana Murthy, Sridhar Iyer. "Learner-Centric MOOC for Teachers on Effective ICT Integration: Perceptions and Experiences", 2018 IEEE Tenth International Conference on Technology for Education (T4E), 2018

[5] www.emmrccalicut.org

[6] Atul M Kulkarni, Gowrisankar P, K. Madhavi, Johny P Joseph. "Learning and Reflection of Technology Based Collaborative MOOC Design and Its Evaluation, Validation and Results", 2018 IEEE Tenth International Conference on Technology for Education (T4E),

[7] R. Ubell, “How the Pioneers of the MOOC got it wrong,” IEEE Spectrum, January 2017.

[8] National Research Council. How people learn: Brain, mind, experience, and school: Expanded edition. National Academies Press. 2000.

[9] H. M. Huang. Toward constructivism for adult learners in online learning environments. British Journal of Educational Technology, 33(1), 27-37, 2002.

[10] G. Salmon. E-tivities: the key to active online learning. 2nd edition. Routledge, London, UK. 2013.

[11] G. Siemens. Connectivism: A learning theory for the digital age. International Journal of Instructional Technology and Distance Learning, 2(1), 3-10.. 2005.

[12] I-C. Hung, Kinshuk and N-S. Chen. Embodied interactive video lectures for improving learning comprehension and retention. Computers and Education, 117, 116 -131 (2018)

[13] K. R. Koedinger, J. Kim, J. Z. Jia, E. A. McLaughlin and N. L. Bier. Learning is not a spectator sport: Doing is better than watching for learning from a MOOC. In Proceedings of the second ACM conference on learning@ scale (pp. 111-120). 2015.

[14] K. F. Hew. Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS. British Journal of Educational Technology, 47(2), 320-341, 2016.

[15] M. Bali. MOOC pedagogy: gleaning good practice from existing MOOCs. Journal of Online Learning and Teaching, 10(1), 44. 2013.

Enhancement in Teaching Learning Process of Engineering Geology through Project Based Learning for an Effective Outcome-Based Approach

Prabha Joshi

Civil Engineering Department, Anjuman-I-Islam's Kalsekar Technical Campus,
School of Engineering and Technology, Panvel, Navi Mumbai, 410206
prabha.joshi@aiktc.ac.in
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Engineering Geologist plays a very important role in Civil Engineering by interpretation of landforms and dynamic processes of earth to identify potential geologic and related man-made hazards that may considerably affect the stability and cost of structures. There is a need to invoke interest of learners towards geology and address its importance in civil engineering. Engineering geology course is a part of Civil Engineering curriculum, generally, for the Second Year Undergraduate learners and the content of the course is mostly confined to level 3 (application) of Bloom's Taxonomy. The challenge with the Engineering Geology course is that it is very vast to be taught in one semester and is full with new terminologies for the learners to be familiar with. It is observed that the vastness of the subject with limitation of time is not allowing the learners to get the real implication of the subject in the field of Civil Engineering. There is an urgent and dire need to make learners pragmatically aware of the implication of the theoretical knowledge at the actual site. One of the methods to achieve outcome based education in this case is by project based learning. It can enhance the level of learning from 3 (application) to 5 (evaluation) or even 6 (design). One such attempt was made through a small project on "Geological Investigation and Landslide Risk Assessment in the Kharpada Village along the Mumbai-Goa Highway", wherein the learners identified the geological causes amounting to the potential cause for landslide, analyzed the data and provided the possible solutions. This paper attempts to bring it to the light the way in which the whole exercise carried out by the learners as a part of their project work inadvertently facilitated to improve their learning levels, thereby leading to an effective outcome-based approach.

Keywords: Engineering Geology, Geological Investigation, Slope failure, Discontinuities, Weathering

1. Introduction

Engineering Geology is an integral part of Civil Engineering and uses application of geology for construction of safe, stable and economic structures. Geological Investigations were made mandatory after the failure of St. Francis Dam in California in 1928[1]. Despite the best design, many structures were reported to have failed or developed an anomaly due to underlying geological conditions. In some other cases, geology, to a large extent, provided advantageous conditions and contributed towards the strength of the structure. Nearly all the failures of the structures can be prevented through proper field investigation and incorporating the observation in to the design of structure. Engineering Geology is an essential course in Civil Engineering curriculum and mostly taught in the second year. The course offers an attempt to make learners familiar with the dynamics of the earth and its association with geological hazards such as earthquakes, volcanoes, landslides, etc. In addition to this, learners are provided with knowledge of the processes which are responsible for formation of a huge variety of the rock types, their characteristics and the structures present within them, which is very essential for the safety and stability of structures. Actual insight of the problem can be understood and solved by mini projects and site visits which help the learners to understand that not only the intricacies of design but the underlying geological conditions are equally responsible for safety of the structure. Outcome Based Education (OBE) focuses on measuring student performance through outcomes and that can be very well achieved through project based learning. Bloom's Taxonomy is the most widely used classification system of learning outcomes; it is a hierarchical ordering of cognitive skills created by Benjamin Bloom in 1956 [2] and revised in 2001 by Anderson, Krathwohl and Bloom [3]. It helps course owners (teachers) to think in different ways through which significant learning is assured. In the present study the learners applied their understanding (level 2) of discontinuities present in the rock to determine (level 3) its effect on the strength of the rock. Analysis of the collected data helped learners to evaluate (level 5) the susceptibility of the rock mass to slope failure and provide solutions (level 6) and thus resulted in to an enhancement in the learning levels. It also provoked a thought about the vitality of life-long learning among the minds of the learners.

2. Project Based Learning

Learners enrolled for the Undergraduate Civil Engineering course come across the subject "Engineering Geology" which is a branch of Geology usually in their second year.

Through the course, the learners are expected to carry out engineering geological evaluation (level 5) of major structures and identify unfavourable geological conditions to provide a design which is safe, economical and stable. But, this objective is hardly achieved through the conventional teaching in the classroom.

The project based study taken up to enhance the learning by applying the theoretically gained knowledge has helped students to upgrade the learning up to level 6 which is rarely achieved through conventional methods . The learners identified the rock type based on the physical properties and were able to differentiate the lithology susceptible to slope failure. This work was followed by identification and characterization of the factors which make the hard and compact rock mass vulnerable to failure. Collection of data pertaining to a number of parameters which can affect slope stability and its analysis led to the identification of 3 sets of discontinuities which is prying the hard and compact Basalt to blocks. Water is entering through these joints and the rock is subjected to physical and chemical weathering. Analysis of orientation of discontinuities with the help of software program helped in evaluation of susceptibility of rock mass to slope failure at the site. Organization and coordination of various parameters helped in evaluating the cause of failure of rock mass and subsequently facilitated the solutions to the problem. The learning levels achieved through the study are presented in the table 1-

Table. 1Cognitive Task and Associated Learning Outcome Through the Project Based Study

Cognitive Task	Learning outcomes (L)
Identification of rock type on the basis of physical properties (inferring something from what is known).	The rock type is compact basalt (L1, L2).
Identification of discontinuities present in the rock potential for weakness of the rock	Three sets of joints J1, J2 and J3 are identified on the basis of orientation (L3).
Organization and differentiation of discontinuities in to various sets and characterization on the basis of certain parameters such as orientation, frequency, spacing, openness, continuation etc.	The spots with high frequency, openness and continuity of joints and less spacing are vulnerable to weathering (L4).
Coordination of various parameters of discontinuities for evaluation of strength and potential for slope failure of the rock.	Continuity of joints has allowed water to move along the joints and exposed rock to weathering thus reducing compressive strength of the rock along the discontinuity and making it more vulnerable to failure (L5).
Use of software program to calculate the risk and evaluate the mode of slope failure using orientation of discontinuities.	Despite the fact that same rock is exposed in the area the spots 1-7 are most vulnerable to fail by wedge failure, spot no 17-20 moderately vulnerable and spot no 8-16 are least vulnerable to fail by wedge failure due to variation in the slope angle (L5).
Providing solution to prevent slope failure by modification in the slope design.	Failure occurs when the sliding surface daylight (i.e. the sliding surface has dip angle greater than the dip angle of the slope face) in the slope face. If the orientation of the discontinuities is indicating conditions favourable for slope failure, the slope angle can be modified to make it safe (L6). Grouting of highly jointed rocks along the highway can reduce the vulnerability of the rock to weathering and hence can contribute to increase the strength of rock mass.

3. Result and Discussion

The project based study in this case has invoked critical thinking, among the learners, about the incorporation of geological studies before designing a slope, especially along the road cuts. Field work at the actual site helped learners to observe the features of the rock potential for slope failure. While studying the subject at semester 3, learners can only theoretically understand the discontinuities present in the rock, their actual effect on the stability and strength of the rock is difficult to understand without observing the features in the field. Learners identified 3 sets of joints which are breaking the rock into blocks, this is very clear in the field and learners could actually measure the size of the blocks. Learners could clearly observe that the high openness of joints has allowed more water to move through rock and hence resulted in high degree of weathering and less strength of rock. Comparison of observed parameters at different locations within the site has allowed the learners to think that despite the same rock present over the area, the structures present within the rock have played an important role towards strength and stability of rock. They had a very clear idea that it is not only the type of rock but the various geological factors which play a very important role in deciding the stability of the rock slopes. Collecting the data using various equipments in the field and its subsequent analysis using software allowed the learners to imply the theoretical knowledge at actual site. Once the understanding of the causative factors of problem were clear to learners, it was very easy for them to provide solutions which manifested in the form of modification of slope angle and grouting of highly jointed rocks along the highways. The objective of this project based learning was to communicate to the learners the importance of geological studies in Civil engineering works and to make them aware of the consequences of negligence in such study.

4. Conclusion

- This project based study inadvertently compelled the learners to apply the theoretical knowledge, gained through a small topic of the Engineering Geology course learnt at the 3rd semester, for actual implication along the Mumbai-Pune Highway which is highly vulnerable to slope failure due to presence of compact basalt along the road cuts.
- A clear idea of the geological factors responsible for slope failure provoked learners to think critically and rationally to provide solution which is the real outcome of the study and enhanced their learning level from level 3(apply) to level 6 (design).
- Learners were clear about the fact that negligence in the geological investigation can lead to disastrous results as it is not only the Civil Engineering design but the underlying geology which plays an equally important role. This fact has also instilled ethical responsibility in learners which is an additional outcome of the study.
- The most important outcome of the study is that naturally occurring geological features are known to exist and if properly incorporated in the design, potential consequences of these conditions can be mitigated and the role of civil engineers towards the societal development can be achieved.
- The study has proven that the real time implication of theoretical knowledge has far-reaching effect than the conventional classroom teaching and encouraged the course owner to take up more such studies to make the learners realize the importance of the Engineering Geology course for its effective results.

References

[1] David J. Rogers (2007) Impacts of the 1928 St. Francis Dam Failure on Geology, Civil Engineering, and America: Program with Abstracts 2007 Annual Meeting of the Association of Environmental and Engineering Geologists, Los Angles, AEG News, v.50 (July), p.115.

[2] *Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain. New York: David McKay Company.*

[3] Anderson L. W., Krathwohl, D. R. and Bloom B. S. (2001) A taxonomy for learning, teaching, and assessing: A revision of Bloom’s taxonomy of educational objectives. Allyn and Bacon. Boston, MA (Pearson Education Group)

ICT for Technical Education in India-A Review

Leonardo Souza [1], Purnanand Savoikar[2]

[1]Research Scholar, Department of Civil Engineering, Goa Engineering College, Farmagudi, Goa – 403 401,
[2]Professor , Department of Civil Engineering, Goa Engineering College, Farmagudi, Goa – 403 401
[1]lrdcs@rediffmail.com
[2]psavoikar@gmail.com
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Technical education systems in India have grown exponentially in the past fifty years to satisfy the demands of quality education for all. This has gained additional momentum due to swift advancements in Information and Communication Technology (ICT). ICT can be effectively utilized for the technical education sector in India. ICT Education includes online, part time and distance education. This paper examines certain important issues related with the effective implementation of ICTs in technical education including the advantages and drawbacks of the implementation of ICTs in technical education while simultaneously increasing Quality of such education.

Keywords: Information and Communication Technology, ICT, Technical Education.

1. Introduction

In the contemporary globalised society there is an ever increasing demand for skilled and competent labour. In today's economic backdrop, access to quality in Technical education for all has emerged as an influential factor of economic growth and development of the country. Contribution of open and distance learning facilities is increasing in order to augment the access to technical education and improving its outreach to the remotest parts of India.

The rapid boom in Information Technology in India has transformed the way how knowledge is disseminated today (Pegu, 2014). In addition, Technical Education is catering to life-long learning aspirations and that too at affordable cost. The Information and Communication Technology (ICT) is an umbrella term that includes all communication devices and application. It includes computer, and network hardware and software, radio, television, satellite systems, cellular phones, and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning (Mondal and Mete, 2012). Teachers of Technical educational institutions need to constantly develop and use in their teaching activities a variety of electronic educational resources to improve the quality of educational services: presentations, video lectures, video conferences, electronic textbooks, multimedia courses, educational portals, educational resources with remote access and others (Nakaznyi et al., 2015). Information is exponentially growing in a variety of formats, especially the digital media (Kamal and Banu, 2010). There are unlimited applications of ICT in the real world. IT has become a buzzword while talking about technology and its applications (Agrawal and Mittal, 2018). ICT has become integral to today's teaching learning process. Effective use of information technology can motivate students, make our classes more dynamic and interesting while renewing teachers enthusiasm with the use of new skills and techniques (Habib, 2017). In recent times, moves to adopt ICTs into classrooms and learning settings have been strengthened and encouraged (Oliver, 2002).

The demand of computer based technology in technical education and training has enhanced the ability of quality education across all training institutes and educational organizations. In the past twenty years, the use of ICT has fundamentally changed the practices and procedures of nearly all forms of education.

2. Page Style

ICT can be considered as a sub-field of Educational Technology. Such technologies are used for educational purposes, namely to develop learning environments and to support and improve the learning of students. Today ICTs have become accessible, affordable and integrated in large sections of the society throughout the world. These include laptops wirelessly connected to the Internet, personal digital assistants, low cost video cameras, and cell phones. A large number of ICT tools are available in the modern world that can be used to generate and disseminate knowledge. Tools include radio, TV, internet, mobile phones, computers, laptops, tablets and many other hardware and software applications. Certain ICT tools, such as laptops, PCs, mobile phones and PDAs, have great implications for education. Goa government regularly distributes laptops and PCs to XII students in cyber-age schemes to build-up this experience. The rationale to do so is given in table 1 below.

Table 1: The Four Rationales for Introducing ICT in Education

Rationale	Basis
Social	Technology plays a perceived a role in society which needs familiarizing students with it.
Catalytic	Use of technology is a catalyst to improve the performance and effectiveness of teaching, management and many other associated social activities.
Vocational	It prepares students for jobs that require skills in technology.
Pedagogical	Technology utilization in enhancing learning by introducing efficiency and flexibility in curriculum delivery.

Traditionally, educational institutions have provided a modest choice for students in terms of the method and manner in which programs were delivered. Students were typically forced to accept what has been delivered. Teachers and institutions have tended to be quite dull and conventional while delivering their programs. ICT applications have provided many options by which many institutions are now capable of creating competitive edges for themselves through the choices they are offering students. The main directions of improvements for the ICT development in Technical education to run smoothly can be summed up as follows:

1. A systemic vision of the role of ICT in the context of providing information in education;
2. Use telecommunications and modern technologies as part of supporting learning;
3. Upgrading academic staff's computer literacy to use such new information technologies in the educational process;
4. Designing and development of sufficient and relevant information resources for educational purposes.
5. Monitoring the development of such information and enhancing the educational environment of Technical Educational Institutions;
6. The expansion in ICT facilities of Technical educational institutions;

The Ministry of Human Resource Development of India realising the importance of ICT has prepared a Mission Document. ICT will be the tool in education available to enhance the current enrolment rate in Higher Education. The Ministry also launched a web portal, a 'One Stop Education Portal' named "SAKSHAT". To leverage the potential of ICT, the National Mission on Education is using ICT as a Centrally Sponsored Scheme. It has, under its auspices, created Virtual Labs, Open Source and Access Tools, Virtual Conference Tools, Talk to Teacher programs, and much more. AICTE is partnering with top institutes in India like IIT and NIT to prepare web content like NPTEL courses. Digital libraries and online journals have increases the power of ITC in technical education.

3. Main categories of ICT

Today all information is availed the click of a mouse or the press of a button. ICT applications have become an indispensable part of modern culture that is spreading throughout the world overcoming traditional and vocational education. ICT also allows for the creation of digital resources like digital libraries where students, teachers and professionals can access research material and course material from any place at any time. This avoids duplication of work. In view of this ICT education can be classified into three main categories:

A) E-Learning or Electronic learning

It is a general term referring to computer-enhanced learning commonly associated with the field of advanced learning technology (ALT). It deals with both the technologies and associated methodologies in learning using networked and/or multimedia technologies. This is commonly called as online learning.

B) Blended Learning

The combination or blending of multiple approaches to learning is another category. It is when different delivery methods are pooled together to deliver a particular course. These methods include a mix of face-to-face learning, online classrooms and self-paced learning.

C) Distance Learning

This is a very popular type of learning. It is a type of education, where students work on their own at home or at the office and communicate with faculty and other students via e-mail, electronic forums, videoconferencing, chat rooms, instant messaging and other forms of computer-based communication. It is also known as open learning. IEI and IGNOU are some providers of such a method.

4. Benefits of ICT in Technical Education

ICTs allow for the design and creation of limitless digital resources. These are a boon in technical education where emerging technologies can't be kept at pace with using traditional teaching learning methods. Such facilities allow the free or paid networking of researchers and academics and hence sharing of scholarly material digitally, which in turn leads to quality enhancement in teaching and learning. The benefits of ICT to different stake holders in technical education are listed in table 2 below

Table 2 : Benefits of ICT in education to the main stakeholders

Stakeholder	Benefits
Governments	Increase capacity and cost effectiveness in education and training systems, Enhance quality and support the relevance of existing educational structures, Reach target groups who have limited access to conventional education and training, Promote innovation and create opportunity for lifelong learning. Ensure the connection of educational

	institutions to the emerging networks and information resources, Improve curricula to International Standards
Employers	Cost effective, increase in quality and professional development, Develop a new learning culture in the workplace, Increase portability of workplace training Upgrade of employee skills hence increase productivity, Share costs and of training time with the employees,
Students	High self-motivation Learner-centred approach, Increased access to high quality resources, Combination of work with when needed education, Flexibility of content and delivery, with endless repeatability Extremely high quality of education using new-modes of interaction.

5. ICT and teacher training

One of the main obstacles in ICT in technical is the lack of skilled teachers who can use IT skilfully. Sadly in many cases due to management apathy and related reasons teachers have insufficient qualifications and education and curricula used in technical universities are often outdated or inadequate. Progressive and blended learning through ICT can largely solve this problem. There is decentralization of knowledge in the modern ICT world. Technology is an influential tool which can be used to remove obstacles and problems existing in existing systems. The use of ICT for teacher training has been recognized by most governments and teacher training programs are widely used in India. The training batch period can be done every week or every two weeks by ICT using training implementation specialists. Instead of inviting teachers to school, you can ask every teacher to get a basic knowledge of ICT and its application in the curriculum. Effective use of ICT starts with well trained and motivated teachers. It is of course easier to train fresh teachers as they have greater exposure to modern technology.

6. Drawbacks-cum-Challenges to Using ICT in Education

There are many challenges for ICT-based education and learning. ICT available in India is not sufficient in the technical education sector. There is a growing need to develop top class, relevant, high-utility content. Although ICT offers a huge assortment of benefits there are some risks of utilizing ICT in Technical education which have to be mitigated by using proper mechanisms.

1. It can create a digital divide within a class. Students who are more affluent and more familiar with ICT will stand to learn faster hence reap more benefits than those who are not as technology savvy.
2. It could shift the attention from the learning process which is the primary goal of education, to blindly developing ICT skills, which is the secondary goal. Addiction to social media instead of utilization of educational media is one such example.
3. It seriously affects the bonding process between the teacher and the student, and student and student as ICT rather than face to face conversation becomes the communication tool. This increases the transactional distance needed for effective communication.
4. As all teachers are not ICT experts, they may be lax in updating the course content online which can severely affect the learning among students.
5. The potential of plagiarism increases as student prefer to copy information rather than learn and develop their own skills.
6. All stakeholders in ICT must be trained for delivery and reception of ICT content.
7. The additional cost of hardware and software involved are very high.

Consequently, it is necessary to find answers to these existing problems, especially:

1. Why is the process of introduction of modern affordable information technologies so difficult and slow in India?
2. What is the motivation or desire provided to increase the willingness of teachers to use ICT in their professional activities?
3. What problems should be solved to enhance teachers' effectiveness in the use of ICTs?

   To address this significantly, every certification body such as NAAC, NBA, AICTE, CBSE and similar organizations, must jointly distribute a set of standard parameters to determine the quality of ITC education.

7. Conclusion

Today the challenge is to develop a technical education system that is flexible and dynamic and which holistically integrates modern technology in the management and delivery of learning programmes. ICT has enhanced this daunting distance learning scenario. Teaching is able to penetrate remote areas and learners are capable of accessing high quality learning from anywhere and at anytime. ICT enabled education ultimately leads to the democratization in technical education. From the above we can draw a general conclusion that for the practical use, implementation, and development of e-learning system in Indian technical colleges directions for further advances should be identified. The acceptance of ICT by the technical teaching community can help solve problems in shortfall of quality teachers and the perennial problem of student attendance. Good quality content is however the most important issues which has a direct impact on ICT training standards. Conventional teaching emphasizes content, but ICT acts as a powerful agent to alter many such familiar educational practices. There are advantages and drawbacks but these can be overcome. Furthermore, a wider availability of course material in technical education through ICT, fosters better teaching and excellence in Technical Education..

References

Nadira A.R., Kamal B. and Banu A. T. (2010) ICT in Technical Education – A Study,Canadian Journal on Data, Information and Knowledge Engineering Vol. 1, No. 1, April 2010

Mondal A., Mete J., (2012) ICT in Technical Education: Opportunities and Challenges,Bhatter College Journal of Multidisciplinary Studies, (ISSN 2249-3301), Vol. II, 2012.

Ankur Kumar Agrawal, Girish Kumar Mittal (2018) The Role of ICT in Technical Education for the 21st Century: ICT as A Change Agent Swaranjali Publication, 2018

Habib H., (2017) Role of ICT in Technical Education, 2017 IJCRT | Volume 5, Issue 4 December 2017 | ISSN: 2320-2882

Nakaznyi M., Sorokina L., Romaniukha M., (2015) ICT in Technical Education Teaching: Advantages, Problems, and Motives, International Journal of Research in E-learning Vol.1(1),2015, pp. 49-61

Oliver R.(2002)The role of ICT in Technical education for the 21st century: ICT as a change agent for education,HE21 Conference

Pegu U. K. (2014) Information and Communication Technology in Technical Education in India: Challenges and Opportunities, International Journal of Information and Computation Technology. ISSN 0974-2239 Volume 4, Number 5 (2014), pp. 513-518

Blended Learning for Effective Teaching and Learning for a Course in an Engineering Program

Dr. Vishaldatt V Kohir[1]

[1]Mechnaical Engineering Department,
Faculty of Engineering and Technology, Khaja Bandanawaz University, Kalaburagi (Karnataka)
[1]*vishalkohir@gmail.com*

Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract:
In twenty first century students have to use educational technologies to apply knowledge for problem solving and self-learning. The information communication technology (ICT) is providing new opportunities for educators to design and deliver their courses effectively. Blended learning mixes face to face and e-learning methods for creating the most efficient learning environment where each mode complements each other. The present study integrates on line learning/e- learning, video lecturers, flipped class room and face-to-face instruction methods. The survey was conducted to know the influence of blended learning on learning process. The results of survey show that blended learning is beneficial to all students.

Keywords: Blended learning, OBE, ICT

1. Introduction

The higher education system contributes enormously strengthening the economy of India [1, 2]. The twenty first century is referred as "knowledge economy" era [3]. The Liberalization Privatization and Globalization along with changing demography and technological growth are the driving forces of the future economy hence the higher education system. To meet the global challenges students should have certain critical core competencies such as collaboration, digital literacy, critical thinking, problem-solving abilities and self- learning [4]. It helps them to apply acquired knowledge to new situations, analyze information, collaborate, solve problems and make decisions. These can be achieved adopting Outcome Based Education (OBE) system that empowers students with higher order thinking skills, multiple intelligences and self-learning methodology along with scientific assessments and evaluation [4]. Outcome Based Education adopts student centric teaching and learning method to impart knowledge and skills to students to make them "Industry Ready". The above mentioned goals can be achieved by paradigm shift in education system from teacher centric method to student centric method as per the commendations of the National Knowledge Commission (NKC) [5]. Blended learning is one of the student centric methods. Bath and Bourke (2010) found that the blended learning leads to more efficient teaching and course management practices. The present paper discusses the issues of implementation of blended learning for the Mechanical Engineering subject.

2. Blended Learning

Blended learning involves employing a variety of multimedia technologies for teaching methods, learning styles and most often a mix of face-to-face and e-learning, with the aim of each mode complementing the other and creating the most efficient learning environment [6]. According to Michael Geoffrey Brown the blended learning is the integration of face to face and on line instruction through purposeful instructional design. He says it yields better results compare to simply posting the syllabi to the learning management system would not be engaging in blended instruction [7]. As per AICTE, Blended Learning refers to a mixing of different learning environments. The phrase has many specific meanings based upon the context in which it is used [8]. Blended learning must provide learners and teachers a potential environment to learn and teach more effectively. The present study integrates on line learning / e- learning, video lecturers, flipped class room and face-to-face instruction methods (Figure 1).

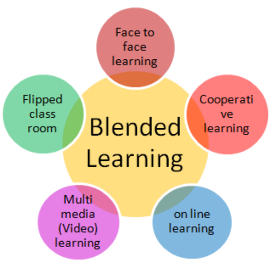


Fig 1. Blended Learning

3. Objectives of Blended Learning

Recent report of NITI Aayog (The National Institution for Transforming India) says higher education is great contributor in nation's economic growth [9]. It means nation building is strongly correlated with quality of higher education. To harness the country's present demography, young Indian population is to be fueled with the knowledge and skill. It can be an asset only if their potential employability is brought to fruition. Therefore there is need to revamp the engineering education without watering down the merit. National Board of Accreditation (NBA), India has become the permanent signatory member of the Washington Accord on 13th June 2014.The Accord outlines the mutual recognition, between the participating bodies, of accredited engineering degree programmes. It also establishes and benchmarks the standard for professional engineering education across those bodies. The NBA has made it mandatory to follow the Outcome Based Education (OBE) model for engineering colleges. In OBE model, the required knowledge and skill sets for a particular engineering degree is predetermined and the students are evaluated for all the required parameters (Outcomes) during the course of the program The blended learning provides right kind of environment to achieve the targeted outcomes of a program.

The introduction of information communication technology (ICT) in education has provided new opportunities for educators to design and deliver their courses in ways that facilitate, support and enhance teachers' roles, students' individual cognitive experiences, as well as the social environment [10].

Based on the above discussion the following objectives are laid down for the present study.

- To involve students in active learning.
- To develop critical levels of thinking i.e. higher order cognitive learning skill as per Bloom's taxonomy.
- To expose students to modern technology its practical application.
- To accomplish course outcomes.
- To expose to alternative learning methods
- To promote cooperative learning
- To promote self -learning
- To promote lifelong learning

4. Phases Implementation of Blended Learning

a) Beforehand activities

The blended learning is implemented in the even semester from February 2019 to May 2019 for the 4 semester (Second year) students for the subject: Mechanical Measurements and Metrology. Before implementing the blended learning it is essential to students to know the recent developments in higher education policies of the Government of India particular in engineering education. The students should know significance and benefits of adaptation of Choice Based Credit system, Outcome Based Education in engineering education implemented in engineering colleges recently. They should also be aware of paybacks of accreditation of program (NBA) and accreditation of Institute (NAAC). Therefore, at the beginning of the semester two hours of comprehensive lecturer was delivered on CBCS, OBE and NBA using Chalk and board method. Then the two videos are shared to the students through department website. The first video tiled "Engineering Program 2018" provides information about the landmarks policies of engineering education. It discusses expectation of twenty-first century engineer and how the implementation of OBE, CBCS and NBA and NAAC fulfils the expectations of the major stake holder of the engineering education viz Industry, Students and institution respectively (Figure2). Second video Titled "Outcome Based Education" describes the meaning of outcome, course outcome (CO), program outcome (PO), Program specific Outcome (PSO) and Program Educational Objectives (PEO) and relation between them. It also discusses role of faculty and students in outcome based education system. It also informs about the Bloom's taxonomy.

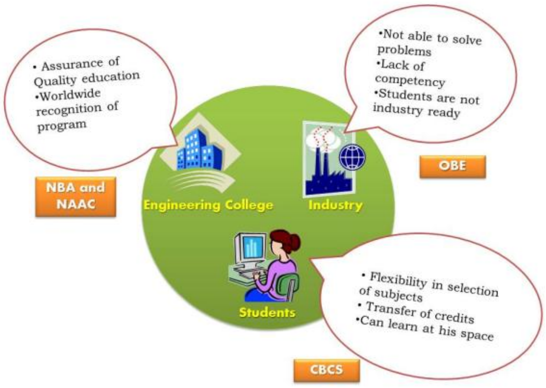


Fig 2. Expectations and fulfilment of stake holder of engineering education

Another three videos titled as "Student Centric Method 1, 2,3" are shared regarding the student centric method first video explains how student centric approach differs from the traditional teacher centric approach and benefits of student centric method, second one explains the different student centric methods such as flipped classroom, cooperative learning, Jigsaw, think-pair-share e.t.c, third video explains about cooperative learning in detail. All above videos are created by the author and published on YouTube channel and its link was shared with WhatsApp group of the particular semester students. An online quiz is conducted to assess the understanding about OBE and student centric approach.

b) Pre class activities

The topics which require visual /simulation aid for better understanding are short listed from the prescribed syllabus. The published videos are sorted and short list as per the topic to be covered in the next class room. The same is shared with students in advance. The criteria adopted for selection of the video is closeness of the content/concept to be covered in face to face session of classroom, duration, latest technology /technique/principle and applications. For example for the topic on measurement of major, minor an defective diameter of screw three videos were shared one was explaining the traditional construction details of bench micrometer another one explanation the procedure to be followed for the measurement and last one was showing the use of digital instrumentation replacing the traditional mechanical mechanisms.

c) In class activities

The class is opened with asking open ended questions on the relevant topic covered in shared videos. The students are asked to play it in the class room at 1.5X speed to review it. To measure the effective diameter we should know constitutional features floating micrometre. Flipped class room method is adopted. The students become familiar with operation of floating micrometre through video shared to them before class [see appendix]. In class its features are discussed and with aid of schematic diagram two wire/three wire are explained using traditional chalk and black board method. The schematic diagram is drawn on the black board to understand the principle of working as in case of autocollimator and its application for checking straightness and flatness is better understood by viewing the actual autocollimator in work. In this way the multimedia and face to face are blended to increase higher cognitive levels of students (Level 2: Understanding and Level 3: Apply). It drives the students towards deep learning and achieving the course outcomes.

To solve numerical the cooperative learning is used. The students made into small group consisting of three students asked to solve different problems in the class room. The steps involved in the design of GO and NO Go gauges for work shop, inspection, general purpose is shared with students by the video created by the author before class[see appendix]. It is found that this technique increased the participation students in the course.

d) Post class activities

A on line quiz is conducted after the completion of module. The questions are framed based on the content from video and traditional class room teaching. Students are asked to share additional information in group. Students asked to complete the assignments individually.

8. Survey

In order to evaluate the student perception on the flipped classroom technique, an anonymous survey was distributed to the students towards the end of the semester [11]. The survey was carried out by using Google form. The students asked remind about the paradigm shift from teacher centre to learner centred method and the role of ICT in modern education system. The approach of blended learning was explained. To ensure students have read they have to click the check box to proceed in survey. Students are reminded that the survey was anonymous and that their feedback is very important for improving the teaching method. The survey included 10 questions with possible answers rated with 1 to 4 points from strongly agree, agree. disagree and strongly disagree. Table 1 shows all those 10 questions.

Table 1. Summary of the survey questions.

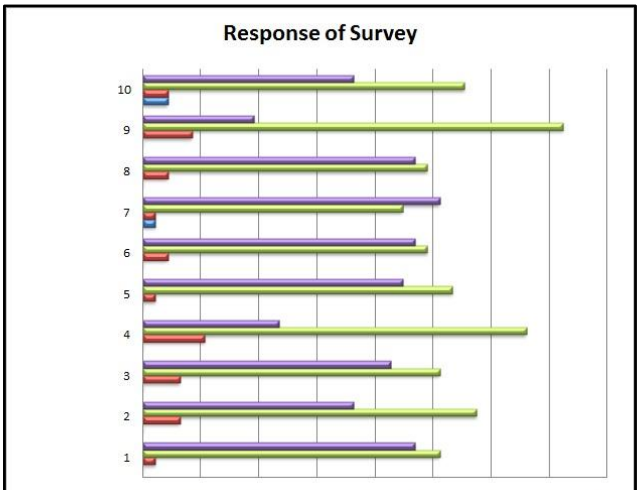
Q1	Learning with video clips (Blended learning) on the topic improves my understanding of concepts and the course content
Q2	Blended learning help me to learn how to apply concepts to practice
Q3	Videos prepared by the professor for your batch and course help me in solving the numerical.
Q4	Blended learning encourages me to attend the more classes.
Q5	Blended learning helped me to prepare better for quizzes and tests.
Q6	Quizzes conducted help me to keep in touch with course content continuously.
Q7	Combination of blackboard and chalk teaching and blended learning helps to learn the course at higher levels of thinking (Understand L2, Apply L3, AnalyzeL4, EvaluateL4,Creat L5).
Q8	Involving students by asking questions (Active learning) promotes participation of students in class.
Q9	Information about OBE and Bloom's taxonomy helps in overall learning process of engineering course.
Q10	Blended learning should be adopted for other courses.

9. Results

The result of survey is depicted in Figure 3 in the form of horizontal bar chart. The overall impact of implementation of blended learning has brought positive results. The survey conducted for the fourth semester mechanical engineering. The fifty one students participated in the survey. The questions in the survey targeted different aspects of students' opinion and an analysis of the question set is presented next. A set of questions (Q1, Q2 and Q6) addressed the students' opinion on whether blended learning helped them with the academic content. The response of the survey shows 96% of students believe the blended learning has contribute positively in improving their academic content. The question Q5 and Q6 are formulated to analyze the impact of the implementation of blended learning on student motivation and engagement. The survey shows majority of the students are motivated towards deep learning and always linked with the course content.

The questions Q7and Q9 are formulated to address another aspect of the analysis of the survey and they are related to the students' opinion on how blended learning classroom helped them during the different stages of learning as per Bloom's taxonomy and OBE approach. We found more agreement on the improvement in learning levels but it not the overall engineering course. Students' critical thinking was also surveyed through questions Q1, Q3 and Q8 show positive answers, indicating a correlation between the overall perception of the class and positive impact on critical thinking. The strong disagreement was observed for the Q10. The authors see it as normally people resist any change from routine. Another reason may be blended learning demands more time and commitment from the students. The highest disagreement was observed for the Q4 it means blended learning alone cannot attract students to attend the classes.

Another question was included in the survey is about the regularity of viewing the videos. The question was: "I watched the videos shared and created by professor". The response is provided in Figure 4. It shows nearly 75% of the students have watched videos. That shows the blended



	1	2	3	4	5	6	7	8	9	10
Strongly disagree	46.80%	36.20%	42.60%	23.40%	44.70%	46.80%	51.10%	46.80%	19.10%	36.20%
Agree	51.10%	57.40%	51.10%	66%	53.20%	48.90%	44.70%	48.90%	72.30%	55.30%
Disagree	2.10%	6.40%	6.40%	10.60%	2.10%	4.30%	2.10%	4.30%	8.50%	4.30%
Strongly agree	0%	0%	0%	0%	0%	0%	2.10%	0%	0%	4.30%

Fig 3. Survey response

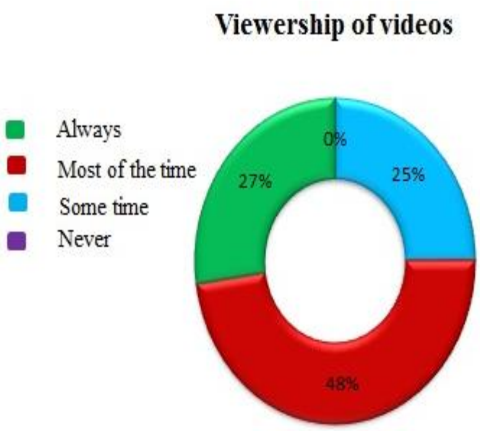


Fig 4. Viewership of videos

learning is well accepted by the students. If it is implemented over a period of time we may reach hundred percent. The some of the positive comments shared by the students were "Better understanding of concept from this method of learning", "It is helpful for students to learn on their own level. It helps to know more details". The comment was: 'some students won't understand easily because of the language problem and I think we can't do this to all courses".

10. Conclusions

This paper studied the implementation of the blended learning method for creating the efficient learning environment for learners and teachers which allows them to work to their full potential. The students were more engaged in class room and connected with the academic activity outside the class room also. The 51% of students strongly agreed that the blended learning elevated students learning level. Thus majority of objectives of the blended learning are achieved.

The questioner of the survey has addressed different aspects like student's opinion, critical thinking, and engagement. The results of the survey are discussed and found that over all students accepted the blended learning method. The 66 % of the students agreed that Blended learning encourages me to attend the more classes. The 53% of students agree that Blended learning helped me to prepare better for quizzes and tests.It is evident from the survey results that the blended learning is beneficial to all students.

Reference

1) Singh, JD. (2011). Higher Education in India – Issues, Challenges and Suggestions.

2) Yeravdekar, Vidya and Tiwari, Gauri, (2012) "The Higher Education System in India and Its Impact on the Economy" (September 1, 2012). Electronic copy available at : http://ssrn.com/abstract=2139894 or http://dx.doi.org/10.2139/ssrn.2139894NKC report 2006-2009

3) Deepti Gupta, Navneet Gupta,(2012),"Higher Education in India: Structure, Statistics and Challenges", Journal of Education and Practice www.iiste.org ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol 3, No 2, 2012,17

4) S K DasMandal et al," Outcome based pedagogic principles for effective teaching" https://onlinecourses-archive.nptel.ac.in/noc18_ge15/preview

5) National Knowledge commission report, https://www.aicte-india.org/downloads/nkc.pdf

6) Richie Moalosi, Gaborone, Botswana, JacekUziak, University of Botswana ET.al. (2016), 'Using Blended Learning Approach to Deliver Courses in An Engineering Programme" *International Journal of Quality Assurance in Engineering and Technology Education Volume 5 • Issue 1 • January-March 2016.*

7) Michael Geoffrey Brown, University of Michigan,"Mapping the study of blended learning in engineering education",

8) AICTE, "Blended Learning", http://www.old.aicte-india.org/mobileblended.php.

9) India Today Web Desk, (2019), "NITI Aayog's report suggests grim situation of higher education and issues in STEM", https://www.indiatoday.in/education-today/news/story/niti-aayog-s-report-suggests-grim-situation-of-higher-education-and-issues-in-stem-1508873-2019

10) Bath, D., and Bourke, J. (2010). *Getting started with blended learning.* Retrieved from https://www.griffith.edu.au/__data/assets/pdf_file/0004/267178/Getting_started_with_blended_learning_guide.pdf

11) Orlando M, Ayala, Old Dominion University; Otilia Popescu et.al. (2017), 'Flipped Classroom as Blended Learning in a Fluid Mechanics Course in Engineering Technology", ASEE Peer, https://peer.asee.org/28367

Appendix

Video links created by author

Induction program
https://www.youtube.com/watch?v=HNvt8-SThX0andt=122s

OBE
https://www.youtube.com/watch?v=S

Student centric learning 1
https://www.youtube.com/watch?v=gu6fOd7LLVEandt=10s

Student centric learning 2
https://www.youtube.com/watch?v=f9yoe7KF5SMandt=146s

Student centric learning 3
https://www.youtube.com/watch?v=3oifK_2QD9gandt=9s

Design of Go –NO GO gauge 1
https://www.youtube.com/watch?v=uB8-7vUgi68andt=29s

Design of Go –NO GO gauge 2
https://www.youtube.com/watch?v=iGVnCug1F4Eandt=2s

Shared video link for floating micro meter https://www.youtube.com/watch?v=bcxdKa37taMandt=5s

Shared video link for floating micro meter with digital outputhttps://www.youtube.com/watch?v=3ev-SH3J6Qwandt=185s

Shared video link for application of autocollimator https://www.youtube.com/watch?v=igGzU1ZpIaoandt=153s

Effective Teaching of Finite Element Method for Undergraduate and Post Graduate Students

Lokesh R. Patil[1], Shailesh S. Shirguppikar[2]

[1,2]Mechanical Engineering, Rajarambapu Institute of Technology, Rajaramnagar
[1]lokesh.patil@ritindia.edu
[2]shailesh.shirguppikar@ritindia.edu

Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Finite element analysis (FEA) is one of the important subjects for undergraduate and postgraduate students. Teaching FEA is a challenging task for students as it is full of numerical techniques and computation. This paper presents the technique of effective teaching of subjects like FEM to students. It is important for the student to understand the mathematics behind solving FEA problems. Through the experience of teaching of this subject, it is observed that students can learn subject like FEA through collaborative learning. But during collaborative learning, the mindset of students is always to copy the steps during solution finding. The technique presented in this paper is effective for students to learn problems in finite element method in the area of structures, heat transfer, vibration, etc. In this technique, assignments are given to students where a single problem is divided into the total present number of students and final solution of finite element problem depends on individual problem solving of each student and its correctness. The problem can only be successfully solved it every student is collaboratively involved in the finding solution process with great accuracy of the solution. The answers are validated using a software package like ANSYS. The feedback from the students showed that this technique is effective for the understanding of complex and mathematically oriented subjects like finite element method.

Keywords: Finite element method, collaborative learning

11. Introduction

The current state of engineering education needs to change due to continuously developing technology. Industry needs highly skilled freshers which must be technically competent and fundamentally stronger in each domain of engineering. Teaching engineering education has to be improved to meet the expectation from students by industries. It is needed to teach subjects differently where each student will pay attention, understand, analyse and solve the problem on time. Research says during teaching hour, students have an attention period of only 10 minutes. It is a challenging job for a faculty to pay all students in attention through whole lecture hour. Therefore different active learning techniques need to be incorporated which will create interest of students. Considerable research has been conducted on collaborative learning. It is found that students better learn the subject matter through discussion with colleagues. Each student has a different way of grasping the concept. The concepts generally get crystal clear only after hands-on experience collaboratively. Through collaborative learning, students understand, retain the knowledge, find own ways of solution. This paper explains techniques of active and collaborative teaching of subjects like finite element method which is mathematically oriented. It is needed to teach such subjects at a very conceptual level. Students have a tendency to remember the steps involved in solution finding and taking it granted without understanding the general fundamentals of the problems. The technique used in this paper is designed in such a way that each student has his/her own unique problem and solution method which avoids coping among students. Student experiences hands-on experience through collaborative learning.

12. About Finite Element Method

Finite Element Method is one of the numerical methods used by researchers, industrial people, students and faculties for different analysis purpose. The method includes the solution of any differential equation using a numerical way of solving. It has a wide application in mechanical engineering in the area of structures, vibration, thermal and fluid mechanics, etc. It is used to find field variables like deflection, stain, and stress in structures, temperature and heat flux in thermal and modal frequency, dynamic analysis in vibration fields. Due to the capability to consider complex geometry, material, consideration of nonlinearity, transient problem solving capability made finite element method one of the versatile numerical techniques in the engineering applications. Many commercial software are developed based on FEA theory and has a strong graphical user interface and have multi-physics solution capability. As this subject has been taught to undergraduate and postgraduate students, the responsibility of a faculty plays an important role. A clear understanding of this subject leads to an understanding of popular commercial software like ANSYS, ABAQUS, Nastran, etc. The steps performed in these software like pre-processing, solution finding and post processing are related to theoretical concepts. Therefore the way by which boundary conditions are given and solution mythologies need to be understood at a conceptual level.

The boundary value problems are solved using the finite element method in which a differential equation which holds the physical nature of the problem is numerically solved to bring linear simultaneous equations. The equations are solved for finding unknown primary field variables and hence secondary and tertiary variables. The steps involved in the FEA process are as follows:

1. Discretization (meshing) of a given geometry
2. Identification of primary field variable Ex. Displacement, temperature, fluid velocity, etc.
3. Defining the interpolation function by knowing the nature of the problem and its mathematic equation. (Mostly through the order of differential equation)
4. Derivation of element equation using Galarkin method or Rayleigh Ritz method of the form $\{f\} = [K]\{\emptyset\}$where, $\{f\}$ is a force vector, $[K]$ is the element stiffness matrix and $\{\emptyset\}$ is a field variable.$\{\emptyset\}$can be displacement vector for structural problem and temperature in case of heat transfer problems.
5. Derivation of overall stiffness matrix also called a global stiffness matrix.
6. Solve for finding primary field variable
7. Solve for secondary and tertiary field variable
8. Display and interpretation of results.

All popular commercial software solves boundary value problems in the same manner with the GUI given for better user friendliness. The problem solved by students manually can be validated using FEA software.

13. Educational Learning Objective

The objective and outcome before teaching should be very clear. Complex boundary value problems are solved using today's computers by the help of FEA software and not by hand calculations. Here in this technique, the main objective is to learn how finite element software works and how the input given to FEA software is processed to get the correct desired answer. Any FEA software calculates and gives results for any kind of input. The true results depend on correct input given to software. For a better interpretation of the results, it is vital to know the way FEA software works. As the big problems cannot be solved by a single student hence such a problem is divided into the number of students present in the class.

Another expected outcome is to check understanding of the course content and develop problem-solving capacity in students.

14. Hands-on Problem

Before the application of active learning tool, while teaching, few of the observations are seen. Depending upon the last experience of teaching few rules are formed. The expectation from the students by the teacher is as follows-

1) At the initial level student should use his own thinking process to solve the problem and should not copy methods used by others.
2) Later, the student should collaboratively discuss and solve problems.
3) The student should solve the problem within the stipulated timeframe. Time of completion is considered as a part of the evaluation process.

The objective of this technique is to allow students to solve a problem collaboratively. The accuracy of the final answer depends on the accuracy of each student's answer. The student by default solves it till he/she gets the correct answer. The technique is successfully applied to postgraduate students. The total number of students was 10.

The steps involved in the collaborative active learning tool are as follows:

A. Problem Definition

A finite element problem is framed based on the heat transfer area and given to students. All the students were taught to solve the problem within timeframe of 1 day only.

The problem given was: A plate of overall dimensions as 1mx0.2mx0.002m is with the left end at 200℃ and right and at 80℃. The plate is exposed to an atmosphere with h=$10W/m^2k$ and the ambient temperature of 25℃. $K_x = K_y = 100W/mk$. Find the nodal temperature of the plate for an element only using finite element method.

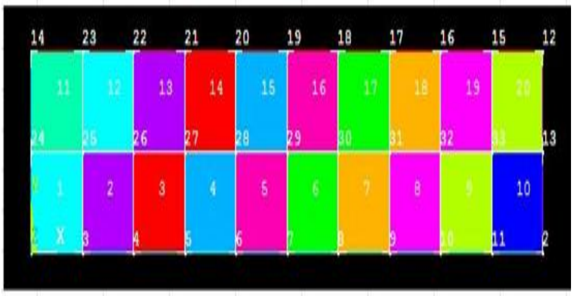


Fig. 1 Discretised model of a plate exposed to temperature

B. Distribution of Element to Student

As there are 10 PG students, an element is assigned to each student from element number 1 to 10 as shown in Table 1.

Even though there are 20 elements, 11 to 20 elements will have the same results as of 1 to 10 due to symmetry effect and equal physical condition. Table 1 shows the element and its node numbers assigned to each student. As the plate is discretized by equal elements in length and width direction, students can find easily the coordinates of the element assigned to him/her.

Table 1.Distribution of Element to Each Student

Element No.	Node Numbers				Roll No. of Student
1	1	3	25	24	1
2	3	4	26	25	2
3	4	5	27	26	3
4	5	6	28	27	4
5	6	7	29	28	5

6	7	8	30	29	6
7	8	9	31	30	7
8	9	10	32	31	8
9	10	11	33	32	9
10	11	2	13	33	10

C. Finding Stiffness Matrix by Each Student

Each student is told to calculate element stiffness matrix$[K]$ using hand calculation of his/her own element. Student needs to consider proper boundary conditions associated with the element assigned.

D. Evaluation of Each Student

After the successful completion of the task, the assignments are collected for evaluation. Faculty has to develop a general code to calculate the stiffness matrix for such a problem in MATLAB. The results of each student are validated using results got through MATLAB software. The evaluation is done for each student for depending upon correctness, the accuracy of results and time taken to solve the problem. If any solved problem found to be wrong, the concerned student is told to correct the solution till correct answers are meeting.

E. Derivation of Global Stiffness Matrix

The entire element stiffness matrix is then assembled to form the global stiffness matrix depending upon the location of the element. As the global stiffness matric becomes of the order 33x33, it is very difficult to solve it further manually. Hence final global stiffness matrix is formed in MATLAB for further computations.

F. Solving for Finding Nodal Temperature

This global stiffness matrix then given to each student and told to find the nodal temperature. The results are checked with each other. Faculty has to monitor the results of each student personally and marks were given to each student.

G. Validation of Answers with ANSYS Results

The same problem is then modeled in ANSYS software. All the boundary conditions were given to it and solved for getting each nodal temperature.

The answers of all students are validated using ANSYS results. If found wrong, is corrected again till final validation is achieved.

H. Results and Discussion

All the comparative results are shown to students and discussion is taken on the convergence of the answer, accuracy and correctness.

15. Assessment and Feedback

For this activity, the assessment 70% weightage is given to manual problem solving and 30% to the validation of results through MATLAB and ANSYS.

Feedback is taken to check the effeteness of the application of the technique. Student feedback was positive. The desired outcomes of teaching-learning were achieved. It was observed that student better learns through collaborative method than individual learning. This activity is repeated for structural and fluid problems.

16. Conclusions

As a conclusion part, students enjoyed learning the subject. As the student collaboratively learns by asking doughts to collages, their critical thinking level seems to be increased. Students could able to trust on their way of solving the problem and also on finite element software. Throughout the activity, as they were involved in actual solution steps till the final answer, they could able to understand how to bring accuracy, the convergence of solution in time.

Acknowledgment

The author wishes to acknowledge to Director of Rajarambapu Institute of Technology, Rajaramnagar, in the effort to increase effective teaching-learning activity in engineering education.

References

Lancioni, R. A. and Chandran, R. (2009) Managing knowledge in industrial markets: New dimensions and challenges, Industrial Marketing Management, 38(2), 148-151.

Saeid Zahedi Vahidet. al, (2013), Hands-on Teaching in Finite Element Analysis to Undergraduate and Postgraduate Students, EET-30

Anastasia Rynearson, (2015), Collaborative learning of engineering and English: a new approach, Interactive Collaborative Learning: Proceedings of the 19th ICL Conference - Volume 1

Olga V. Sumtsovaet. al, (2011) Collaborative Learning at Engineering Universities: Benefits and Challenges, V13i01.7811

Book :

Devid V, Hutton, M. R. (2004), Fundamentals of finite element analysis, 1th Edition, McGraw-Hill Publication, North America

Application of Active and Cooperative Learning Techniques to Increase Students' Learning during Classroom Sessions

Sandeep R. Desai

K.E.S.'s Rajarambapu Institute of Technology, Sakrale
sandeep.desai@ritindia.edu
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract
Active involvement of the students during class room sessions is becoming a tough task for those teaching to higher classes and to some extent to those teaching in the schools. The reason is the change in learning styles of the students which ultimately call for the change in teaching styles too. The increased use of active and cooperative learning techniques by many professors in engineering institutes is the result of the steps taken by engineering institutes to satisfy their students in the world of competition today. This helps to increase quality of technical education imparted by the institutes making them distinguished due to enhanced index of students' learning, which can be mapped to their performance in various ways. The present study reports the application of some of the active and cooperative learning techniques that include Jigsaw technique, Muddiest point technique, Concept mapping, Case Study and Team based learning. The different techniques are used for different segments of the 'Hydraulics and Pneumatics' course delivered to final year Automobile Engineering students studying in the final semester. The course contents, methodology of application of techniques, the students' responses and outcomes of application of the active learning techniques are discussed in the paper. It is concluded that proper planning, availability of resources and students' cooperation make it easier to apply the modern day teaching techniques. The remarkable change in students' learning level, their graduate attributes, passing percentage and average marks is noticed by doing the above mentioned experiments during the class room sessions.

Keywords: Active learning, Cooperative learning, Students' learning level, Class room sessions, Students' responses

1. Introduction
The engineering education has now shifted its focus from output based education to outcome based education. The achievement of graduate attributes matters a lot for passing out graduates as it speaks about the abilities of the graduates such as communication, team work, self-learning, problem solving ability, subject knowledge etc. This necessitates that students learn every course curiously and achieve the expected outcomes. The essential elements of engineering education that involves curriculum design, delivery of instruction and assessment methods, are affecting the attainment of outcomes of a particular course and in turn attainment of outcomes of any program. The effectiveness of delivery of instructions decides success of teaching-learning process that contribute in improving the student learning index. The activity based learning is needed to attract the students to classes and make them experience joyful learning. This is the reason that active and cooperative learning techniques are widely used these days in engineering education to enhance students' attendance and participation during class room sessions.

2. Literature Review
Though the implementation of active and cooperative learning techniques has become popular in the recent times, the research outcomes can be found from research work carried out over the years. This section presents some of the research findings on active and cooperative learning methods. Nastasi and Clements (1991) carrying out a research found to find the answers with regard to formation and implementation of cooperative learning groups. The factors affecting efficacy of the approach are discussed in the work. Patrick and Anderson (2000) presented the results of the experiments to compare role playing and collaborative exercises to traditional style of teaching and found positive outcomes. Amburgh et al. (2007) developed active learning inventory tool and found it valid and reliable to measure active learning in the class room. Barroso (2010) used cooperative learning and problem and project-based learning for teaching an undergraduate course and found that the techniques help to expose the students to alternate solution strategies for solving the same problem. Stowe (2010) has presented the experiments with a writing activity; one minute paper, and highlighted its importance due to its ability to enable the students to stop, focus their thoughts and address their questions before leaving a class. Jain and Dwivedi (2014) critically examined core elements of active, collaborative, cooperative and problem based learning methods in order to find evidence for effectiveness of active learning. The study helps to understand the assessment of active learning methods to see if they work. Gillies (2016) reviewed developments in the research on cooperative learning and studied the factors on which its effectiveness depends.
The literature review shows that researchers have experimented different active learning techniques and

assessed their effectiveness. The pace of experimentation with the use of such techniques has been considerably increased in the recent past. With the time there has been continuous addition of number of techniques to the list of active and cooperative techniques. The development of understanding of implementation of such techniques needs more experiments to gather data for different courses and under different conditions, and asses their effectiveness. The research work presents application of active and cooperative learning techniques including muddiest point technique, case study, jigsaw technique, concept mapping and team based learning to deliver the course contents of 'Hydraulics and Pneumatics' course at the final year B.Tech. level. The objective is to study the effect of change in learning environment on the students' attendance, participation and course results.

3. Active Learning Techniques and Methodology

The 'Hydraulics and Pneumatics' course is offered as an elective course to final year B.Tech. (Automobile Engineering) students of Rajarambapu Institute of Technology, Rajaramnagar. The course delivery was planned to use different active and collaborative learning techniques during the semester long period. The different techniques used were Jigsaw technique, Concept mapping, Case study, Muddiest point technique and Team based learning. The methodology of application of different techniques and the outcomes are discussed below.

3.1 Jigsaw Technique

It is cooperative technique in which students were divided into groups of 4 to 5 and each of the students in a group (first group) were given a topic to study independently. The students from each group with the same topic were then asked to form an expert group. The students discussed and shared their learning with each other on the same topic. In this way, a common understanding on the topic of interest was reached through cooperative learning in a group. The students were again asked to join their original group to finally share their knowledge about the topic in the group where every individual has different topic to study. In this way, all the students shared expertise about their topics with each other and thus enabled a class to thoroughly understand different topics. Fig.1 shows first groups (Phase I) while Fig. 2 shows students working in the expert groups (Phase II).

3.2 Case Study

The students were asked to visit an industry or a workshop where hydraulic systems have been used in real life application. They were expected to submit the report including the photograph of the application where hydraulic system is used, specifications of the system, working of the system and learning outcomes. Every student could realize real life systems using hydraulic power and could see different components of hydraulic system with their detailed specifications.

Fig. 1. Jigsaw technique (firstgroup)

Fig. 2. Jigsaw technique (Expert group)

The students after interaction with each other could list number of applications and learn how hydraulic systems are used to meet demands of different applications. Fig. 3 shows a student observing a hydraulic system during his visit to a workshop.

3.3 Muddiest point technique

The technique was used after the course content was delivered in the class and the students were expected to write on a page about the concept that they felt most difficult to understand. It helped the teacher to know the learning of the concepts by the students and thus helped to identify the gap and further to take appropriate action to bridge the gap. Fig. 4 shows the students independently writing the muddiest point while seating one on each bench.

3.4 Concept mapping

The technique involves listing different concepts / terms related to given topic, categorizing them into different groups and then arranging different concepts from top to bottom based on their relation with each other. This helped the students to list and define concepts from the given topic of interest. The Hydraulic Systems was the topic given to the students to prepare a concept map using different conceptsrelated to it. Fig. 5 shows group of the students who are working together to develop a concept map.

Fig. 3. Student observing hydraulic lifting system in a workshop

Fig. 4. Students engaged during muddiest point technique

Fig. 5. Team working for concept mapping

3.5 Team based learning

In this technique the student groups with 5 to 7 members in a group were formed and were asked to develop different pneumatic circuits using pneumatic trainer kit. Every group prepared different circuits including sequencing circuit, speed control circuit, circuit to control double acting cylinder etc. and drawn the same circuit on the paper. The students worked as a team to prepare and draw a circuit to solve different problems involving sequence of operations, speed control of the cylinders during extend or return stroke etc. Fig. 6 shows a team of students discussing to prepare a circuit for given application while Fig. 7 shows a pneumatic circuit developed by the student teams.

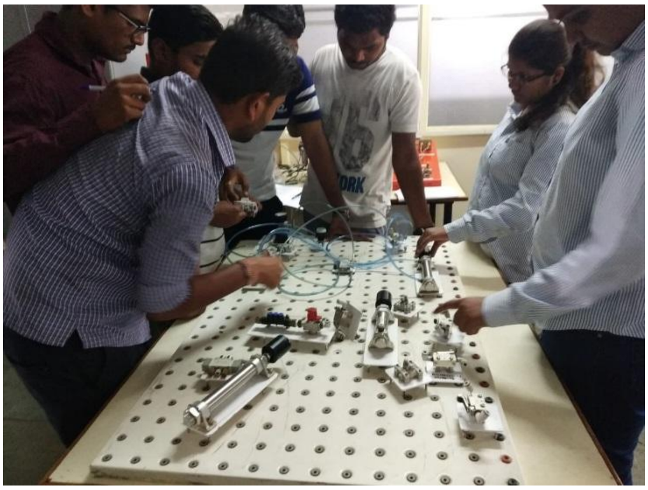


Fig. 6. Team of students working to prepare a pneumatic circuit

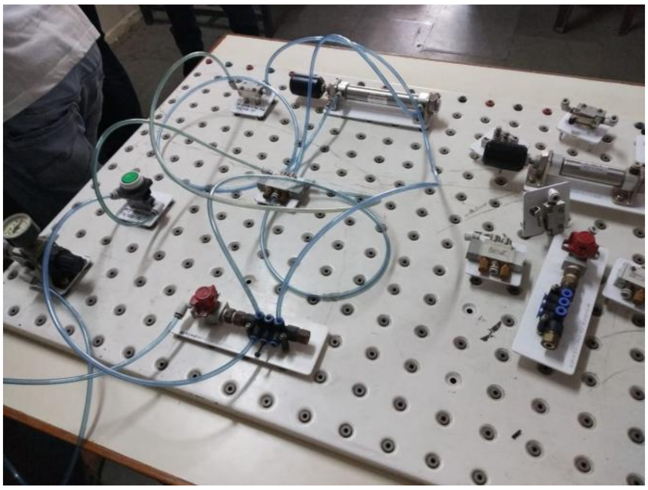


Fig. 7. Pneumatic circuit prepared at the end of the activity

4. Results and Discussion

The impact analysis of the use of active and cooperative learning techniques during class room sessions has been done using following tools.

1. Comparison of the course results with that of previous year results.
2. Analysis of students' responses to an active learning survey.

4.1 Improvement in course results

Table 1 shows comparison of results for 'Hydraulics and Pneumatics' course for the academic years 2017-18 and 2018-19.

Table 1. Comparison of results for Hydraulics and Pneumatics course

Parameters	Academic Year	
	2017-18	2018-19
Average marks in ISE (out of 20)	15.09	17
Average marks in UT 1 and UT 2 (out of 30)	18.57	16
Average marks in ESE (Out of 100)	48.54	59.8
Result of ESE(passing %)	78.79	95

The assessment of the course is done throughout the semester (continuous assessment) and the modes of assessment used are; In-Semester Evaluation (ISE), Unit Test-1 (UT 1), Unit Test-2 (UT-2) and End Semester Examination (ESE). The results show that there is little improvement in the average ISE marks from 15.09 to 17. There is little fall in the average marks in UT 1 + UT 2 from 18.57 to 16. This is probably because the Bloom's taxonomy level of questions was comparatively high and the impact of all the techniques together was yet to be seen at the mid of the semester. In spite of questions with higher level of Bloom's taxonomy and 100 marks question paper (50 marks question paper in previous year) in ESE, there is remarkable improvement in the average marks in ESE from 48.54 to 59.8. The course results of ESE are also considerably improved from 78.79 % to 95 % due to cumulative effect of number of techniques implemented throughout the semester.

4.2 Analysis of students' responses to active learning survey

In order to measure the effectiveness of the active and cooperative learning methods used during delivery of course contents, an active learning survey was conducted using Google forms. The survey template is shown in Table 2 below. The summary of findings of the students' responses to the statements/questions is presented below.

- 90.5 % of the students are of the opinion that the techniques have helped them to be involved during the classes.
- 90.4 % of the students feel that they could better prepare for the end semester examination because of the clarity about complex concepts in the course.
- Among different techniques, the concept mapping and Jigsaw technique were most liked by the students (28.6 % for each technique)
- 95.2 % of the students expressed that the use of active learning techniques have given them exposure to real life problems where Hydraulic and Pneumatic systems are actually used.

Table 2 Active Learning Survey (Template) Sr. No.	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	The techniques have helped to keep you engaged during the classes and have helped from the lectures becoming monotonous and boring.					
2	The techniques have assisted you to better prepare for the end semester examination due to thorough understanding of the complex concepts in the course.					
3	The technique such as 'Case Study' has given you an opportunity of exposure to real life problems where Hydraulics and Pneumatics systems are used to get the necessary power to exert the load in the application of interest.					
4	The activity based teaching gave you chances to interact with your peers and learn from them.					
5	The learning environment during class room sessions has given you an opportunity work in teams and improve your communication.					
6	The motivation to and promotion of interactive learning in the class rooms has improved your problem solving ability.					
7	Overall, you feel that an ability has been developed in you to design hydraulic and pneumatic circuit for any industrial					

	application.					
8	Which of the following techniques did you find most useful and interesting? (i) Jigsaw Technique (ii) Muddiest Point Technique (iii) Concept Mapping (iv) Case Study (v) Team Learning (vi) All of These					
9	Please express your experience of attending the 'Hydraulics and Pneumatics' lectures during the semester long period.					

- 95.2 % of the students feel that it gave an opportunity to interact with their peers and learn from them.
- 90.4 % of the students feel that the class room environment gave an opportunity to work in teams and improve their communication.
- 95.2 % of the students are of the opinion that active involvement during classes has helped them to improve their problem solving ability.
- 90.4 % of the students agreed that they are able to design hydraulic and pneumatic circuits for any industrial application.
- Finally, the students while expressing their experience have said that they have understood basic concepts and understood the industrial applications of hydraulic and pneumatic systems. They said that the activities helped them to develop the interest in the course and they are now able to prepare and draw the circuits.
- Few students have given suggestions and expected additional efforts to implement the suggestions received through muddiest point technique.

The analysis of both the course results and students responses to the survey questionnaire indicates that the use of number of techniques has made available a platform for learning where students are actively involved during the class room sessions. The implementation of active and cooperative learning techniques has helped to create an environment and support system for self-learning by the students. It has helped to create a confidence among the students that cooperative learning makes the understanding and application of the difficult concepts easier.

Conclusions

The experiments were done in the class room to use number of active and cooperative learning methods to study the effect on students' learning and graduate attributes. The course considered was 'Hydraulics and Pneumatics' delivered to the students of final year B.Tech. Automobile Engineering. The activities were conducted after regular interval of time during the semester. Following are the conclusions derived.

- The comparison of the course results with previous year results has shown that passing % is increased by 16 % while the average marks are increased by 11 %.
- It was experienced that the students' participation in the class room was increased and it resulted into development of abilities such as communication, working in teams and problem solving ability.
- It thus concludes that active participation of the students avoids the lectures from becoming monotonous and leads to develop interest in the course under consideration.

Acknowledgement

The authors acknowledge the cooperation and support of the Final Year Automobile Engineering students who played a key role in implementation of the active learning techniques in the class room. The authors also express their sincere thanks to the Director and management of the institute for creating conducive atmosphere for implementation of such techniques and for providing necessary support and facilities.

References

1. Bonnie Nastasi and Douglas H. Clements (1991) Research on Cooperative Learning: Implications for Practice, Scholl Psychology Review, 20 (1), 130-131
2. J. Patrick McCarthy and Liam Anderson (2000) Active Learning Techniques Versus Traditional Teaching Styles: Two Experiments from History and Political Science, Innovative Higher Education, 24(4),279-294
3. Jenny A. Van Amburgh, John W. Devlin, Jennifer L. Kirwin and Donna M. Qualters. (2007) A tool for measuring active learning in the class room, American Journal of Pharmaceutical Education, 71(5), 1-8
4. Luciana Barroso (2010) Active Learning Strategies to Enhance Learning in a Civil Engineering Graduate Vibrations Course, American Society for Engineering Education, 15.120.1-15.120.10
5. Kristin Stowe (2010) A Quick Argument for Active Learning: The Effectiveness of One-Minute Papers, Journal for Economic Educators, 10 (1), 33-39
6. Anurag Jain and Pravesh Kumar Dwivedi (2014) The Evidence for the Effectiveness of Active Learning, Oriental Journal of Computer Science and Technology, 7(3), 401-405
7. Robin M. Gillies. (2016) Cooperative Learning: Review of Research and Practice, Australian Journal of Teacher Education, 41(3), 39-54

Innovative Teaching and Learning Techniques for Core Theoretical Subjects

Sunayana V Jadhav[1], PurnimaAhirao[2], ManjitsingValvi[3]
[1,2,3]Departmet of Information Technology
K. J Somaiya College of Engineering, Mumbai 400077, India
[1]sunayanavj@somaiya.ed
[2]purnimaahirao@somaiya.edu
[3]manjitsingvalvi@somaiya.edu
Track No: 01
Track Name: Different dimensions of Teaching-Learning

Abstract: There are different categories of engineering subjects, out of which the documentation based subjects like software engineering (or the similar course which we have in our curriculum is object oriented software engineering)Where stress is on importance of the clear understanding of the course while working in industry.
While teaching this kind of subjects teachers face difficulty to maintain attention of students using the conventional teaching method, which is quite natural as the students' maturity level is less in students age group. A lot of theoretical concepts cannot be absorbed by learner effectively if taught in monotonous manner.
Thus to make the course engaging for the students and maintain their attention level throughout the lecture period to overcome above problems in this paper an case study of different technique namely story telling based understanding of topic, video flipped, role play, discussion and peer review is proposed. These techniques have been carried out in the class to improve the performance of student, teacher as well as subject.
Student gave mixed feedback on all of these techniques, 70 % students react very positive on mentioned technique. Students are able to understand the concept in conceptual manner instead of theoretical learning. Because of use of these techniques there were difference in evaluation and performance of the student. Thus we have successfully achieved Learning, Engagement, Effectiveness constructs of teaching and evaluation.

Keywords: Documenting, role play, storytelling, video flipped, peer review, conceptual, theoretical learning, Engagement.

1. INTRODUCTION

There are many pedagogy technique which are available for effective teaching learning process but can't be applicable to respective subject directly some additional and extra effort need to be administered in order to suit to the subject which is being taught by the teacher. Similarly in the same context while conducting a core theoretical subject like software engineering, the different innovation which can be made intraditional methods while teaching is proposed in this paper.

2. LITERATURE SUREVY

1 Innovative methods of teaching and learning By P.C. Naga Subramani, V. Iyappan.
Technology is being so advanced in these days, so why not to make use of it in teaching and learning. This is the concept which is explain in above paper, where author has used screen cast, and social media based tools to enhance the teaching learning process.

2 Interactive teaching methods in contemporary higher education By Nadezhd O. Yakovlevaa,*, Evgeny V. Yakovlevba.
Modern education techniques are mainly focus on student independent activity, self-learning environment, experimental and practical training. In above paper technique are mentioned with the discussion of few of such technique such as media based tools to enhance the teaching learning processes

3. TEACHING TECHNIQUES

A. Story Telling Based Understanding

Concept

Story Telling based understanding can be used by teacher to explain any kind of process for example how technical review is carried out, how CMM process works in software engineering etc. In story telling based understanding, topic related story can be prepared by a teacher that will be told to the class during a lecture without giving idea of syllabus topic and later content related to topic can be shared with students. Student will relate the story with topic and can have better understanding, later on the treacher can ask the students to prepare or submit the abstract about how much they have understood. A short quiz can also be conducted by the teacher based on topic taken in above manner.

Case study carried out in class

Here the topic which is to be delivered to student was 'how CMM level process works in industry from software engineering subject. Story related to the different level of CMM level formation was prepared giving some lived examples of small software firms and companies which student can relate easily, here teacher also consider a real incidents which happened related to the topic and prepare a story. After finishing the lecture, topic related PPT was mailed to student and some questions have been asked in order to determine how much they have understood.

B. Story Telling Based Understanding

If pure core theoretical base topics are there then video related to the same can be given to student prior to the lecture to get importance of that particular topic. They will get familiar with the topic more quickly with visualised tool than normal theory concepts.

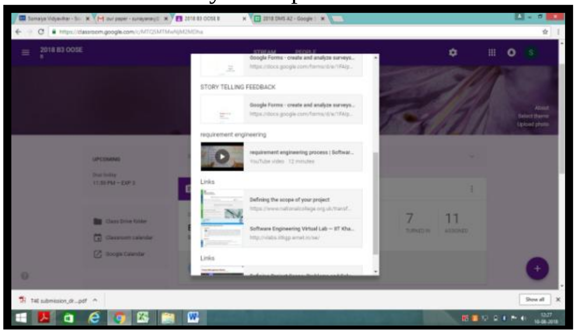


Fig 1. Shared video for video flipped technique.

In software engineering 'Requirement Engineering 'is one of the core and tricky concept so instead of teaching it directly, one related video was shared with student, which has covered the topic in brief and easy manner, when student came later for the lecture with some prior knowledge then it was easy for them to grasp the concept. Feedback has been taken for the same.

C. Role Play

In discussion based topics of software engineering such as how software audit is carried out in industry, technical review process, quality assurance process etc. where dialog and communication happening between the stakeholders who are involved is better to understand rather than just explaining the theoretical concept of process of each topic. So on same line how exactly these kind of process happens in industry based on that some small skit kind of thing or a demo with a proper dialog can be presented to students. so that class attention will be achieved for such big and important topics.

In requirement finalisation process many stockholders are involved, each one having different view but working on a same project. For understanding of this topic, a small dialog delivery session from each stakeholder's view on finalising and gathering the requirement in terms of role play was conducted. Here the teacher had performed different roles but different students also can be involved in this activity in order to make the concepts more interesting and presentable.

D. Discussions and peer reviews

As mentioned earlier different type of stakeholders who are involved in particular project have different viewpoint on each development stage of the project. Sometimes lower subordinates come up with best solution than any of the senior person or project manager. So to incorporate such kind of suggestion by different stakeholders or people who are involved directly or indirectly discussions and peer review is the best technique.

In defining scope and problem definition of particular project we have discussed each groups scope and requirement finalization .here each the group who is giving presentation is delivering the contents about what exactly they are doing in particular project along with project requirements and other group were acting as a peer, after presentation or in-between presentation these peer can give their view and suggestions to the group who is presenting. This approach leads to knowledge sharing between the groups.

4. RESULTS

After conduction of each activity feedback is taken from students, Following are the graphical analysis of student response for each activity.

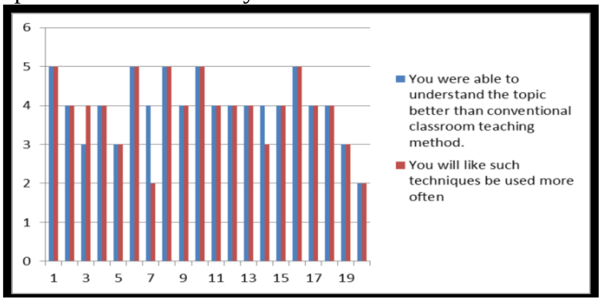


Fig 2. Graph based analysis of Story Telling.

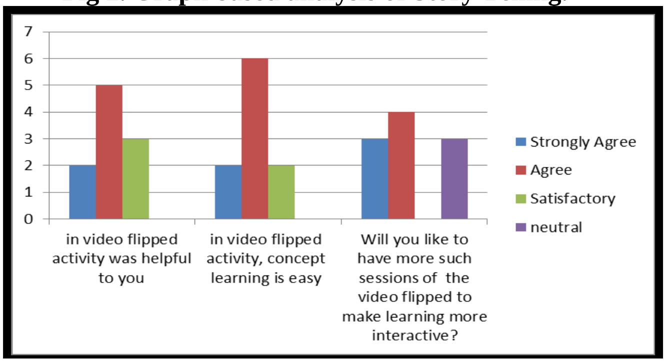


Fig 3. Graph based analysis of Video flipped

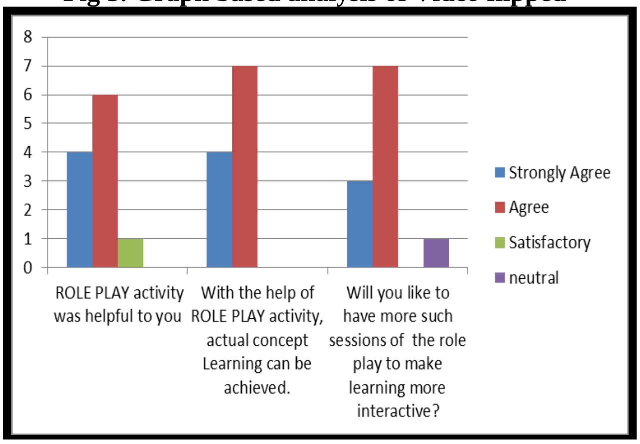


Fig 4. Graph based analysis of Role play.

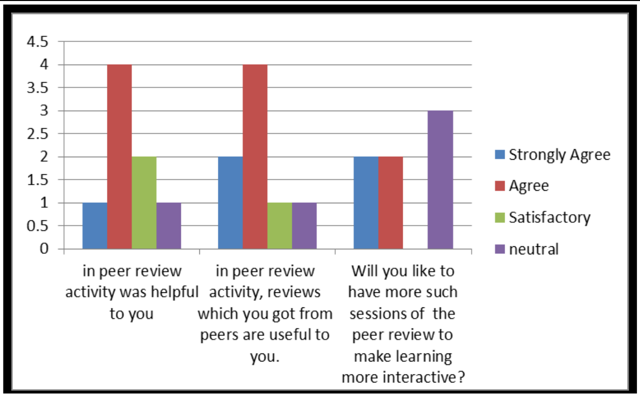


Fig 5.Graph based analysis of Peer review and Discussions

Techniques	**% of student appreciated technique**
Story telling	75%
Video flipped	60%
Role play	70%
Peer review and discussions	80%

Fig 6 .Student responses on all techniques table.

5. ACKNOWLEDGEMENT

"Authors would like to acknowledge the management of K J Somaiya College of Engineering, for supporting this Research Work"

6. CONCLUSION

After each technique few questions were asked to the students based on the topics delivered, also some assignments are given to students in their lab sessions based on the topic taken using four techniques. The graphs based on feedback presented in the Results and discussion part implies very positive response of the students in terms of core and conceptual understanding of the topics covered under the curriculum.

From the graphical analysis we can conclude that, all the four activities are appreciated by students and they want increase use of these kinds of sessions as a part of their theory lectures ,because of which the lecture become more interactive and informative.

7. REFERENCES

P.C. Naga Subramani*, V. Iyappan, Journal of Applied and Advanced Research, 2018: 3(Suppl. 1) S20S22 https://dx.doi.org/10.21839/jaar.2018.v3S1.161 ISSN 2519-9412 / © 2018 Phoenix Research Publishers

Interactive teaching methods in contemporary higher education Nadezhda O. Yakovlevaa,*, Evgeny V. Yakovlevba Department Pedagogy and Psychology, Chelyabinsk State Pedagogical University, Russiab Russian-British Institute of Management, Russia

A. Kothiyal, S. Murthy, S. Iyer, "Think-pair-share in a large CS 1 class: does learning really happen?", Proceedings of the 2014 conference on Innovation and technology in computer science education. ACM, 2014.

"The learnloop project", Online-Learning-Communities IT University in Gothenburg, Vol. 2003.

I V.T. Lokare and P.M. Jadhav, "Course Outcomes Attainment for Data Structure Course Using Direct and Indirect Methods", in Journal of Engineering Education Transformations, 2016.

Prakash M. Jadhav Varsha T. Lokare," A Holistic Approach for Teaching Data Structure Course in the Department of Information Technology" Journal of Engineering Education Transformations, 2017.

Taichi Nkamaura National Institute of Informatics, Tokyo, Japan Y. Requirements engineering education using role-play training 2016 IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE)

Employing Google Classroom for Under Graduate Students (with Special Reference to Commerce Students)

Dr. Karuna Deepak Kushare

Associate Professor,
LBRD Arts and Commerce
Mahila Mahavidalaya, Nashik Road.
Email- karunakushare@yahoo.Com

Track No: 01
Track Name: Different dimensions of Teaching-Learning

Abstract
In the modern world the technology is used in anywhere and everywhere. Technology is used in every sector of economy. The most interesting aspects of trends are that education sector are adapting to technology at rapid pace. ICT has become an integral part of today's teaching learning process. Effective use of technology can provide to the students for developing their dynamic personality and also the renew teacher enthusiasm. The role of ICT in the education sector is becoming more and more important. It will continue to grow and develop in 21st century. Google has provided various platforms for education sector there the classroom teaching can do wonderful with the implementation of and usages of technology. In the modern world everything is available on the screen therefore it the current trend is to learn online. With the help of various Apps teacher impart the curriculum with theoretical and practical knowledge. With the use of ICT in teaching learning for the enhancement of students knowledge teacher has takes assignments rather than time schedule allotted by the university for every subject. This study has been carried out to assess the uses of Google classroom for Advance Accountancy students of commerce faculty at undergraduate level. For this study the researcher has prepared questionnaire. The questionnaire collected from 30 students. After using the Google classroom the motivation of the students about updated study is increased. It is very user friendly. The students has been completed their given assignments in time. The study provides the effectiveness for enhancing academic performance. Also the students did the detail study of theoretical parts which is not done before using the Google classroom.

Keywords : ICT, Google Classroom,

Introduction
Technology is integral part of the 21st generation. ICT has become an integral part of today's teaching learning process. Effective use of technology can provide to the students for developing their dynamic personality and also the renew teacher enthusiasm. The widespread use of technology has generated interested in many researcher and academicians to explore the ways teacher can use that technology prowess to enhance the learning of students. (Kaukab Abid Azhar, Nayab IQBAL 2018) Google has provided Google suite for Educational purpose. In 2014 the Google launched the Google Classroom. From March 2017 Google classroom was available for Google personal Accounts and particularly for standard Gmail Accounts. The popularity of Google classroom is increasing day by day however there are limited use but it is very useful for enhancement of teaching-learning performance. The blended learning style of teaching provides various advantages over traditional method of teaching. The most important advantage is student centric, its accessibility, scheduling flexibility and adaptability for working.

Google Classroom
Google classroom is a free educational blended learning platform provided by Google company. Google Suite for Education includes Google App tools like Drive, Gmail and Docs [8], Forms, Sheets and Slides that can be collaborated with apps like Google Classroom and YouTube which provide a vast variety of knowledge and information for students and teachers alike. A teacher can create Google classroom for every subject comprising of all the students of specific class and can also include other teacher of the same subject. Through this class the teacher can provide the additional knowledge and reference material rather than classroom teaching. The teacher has not provided only subject knowledge but the teacher has provided knowledge about extracurricular activities. It will be beneficial for student for their overall personality development and enhance the learning performance. According to Sathyendra Bhat, Ragesh Raju, Athokpam, Bikramjit, Rio D'Souza (2018). Due to industrial standards and requirements the curriculum is increasing so it cannot competed given schedule. Accounting subject is practical orientated so it is not completed in given schedule of university. For solve these inherent problems the researcher use the Google classroom for the revision of the whole syllabus. For this study the researcher has share the experience of Google class room which is created for last year students of commerce faculty for the subject of

Advance Accounting its created at the time of revision. After three months the experiences are analyzed.

Advantages of Google classroom

- Connect with students in a controlled, secure environment.
- Conduct discussions and chats (where/if allowed).
- Moderate responses to discussions to ensure safety and appropriateness.
- Post links and questions quickly and easily.
- Use a medium in which students feel comfortable and familiar.
- Provide teachable moments on netiquette (professional language vs. Facebook language) in context.
- Demonstrate real world applications with networking.
- Teacher and students won't have required huge amount of paper for uploading and submission of assignment.
- Time saver of teacher and students.
- Accessible at anywhere and with any tool.

Objective of research paper

The purpose of the study is to use of Google classroom for undergraduate students. (with Special Reference to T.Y.B.Com Students)

Hypothesis:

1. There is correlation between motivation of study and Use of Google classroom.
2. User friendliness positively influences on behavioral intention to use Google Classroom.
3. The Use of Google classroom positively influences on improves the academic performance.

Literature Review.

The researcher have gone through the previous studies related Google Classroom. In globalization and technology era use of ICT is vital instrument in educational sector for teaching learning However, some previous study shows the Google Classroom is very useful for teaching-learning.

Shaharanee, Jamil, and Rodzi (2016) analyzed Google classroom's active learning activities after using TAM (Technology Acceptance Model) to study the effectiveness of the activities posted on the platform. Results of study that comparative performance of Google classroom was far better in the areas of communication, interaction, perceived usefulness, ease of use and overall students' satisfaction.

Espinosa, Estira, and Ventayen (2017) conducted a research to evaluate the functionality of Google classroom as a Learning Management System (LMS). The study found that cost was the primary reason for the adoption. Collaborative learning through assignments was viewed as an extremely effective tool for enhancing student engagement.

K. M. Dicicco (2016) has shown in its study that Google classroom can have an effective role in developing the learning abilities with learning disabilities and he has proposed that studies can improve vocabulary development and unit test.

S. Hemrungrote, P. Jakkaew, and S. Assawaboonmee (2017) have studied the domain of self learning and self development. This study has emphasis on the role of Google classroom as self directed learning tool for chosen course. It has found that self satisfaction on the student's behalf is evident when it comes to the usage of classroom due to its usefulness, easy to use and its practicality in accomplishing the intended task.

Shampa Iftakhar (2018) has analyzed that for a successful implementation of Google Classroom both teacher and learners must have positive attitude towards technology for instructional purposes.

The analysis of the results of questionnaire indicate that this study can be effective in understanding and evaluating teachers and learners perspective to ensure quality teaching and learning through Google Classroom.

So far to the review of literature all the research conducted on Google classroom indicated a positive response from the students.

Research Methodology:

Survey research method is used for this study. Purposive sampling method is used for study. For this study 30 students were selected from last year B.Com 27 students are fill up google form. They were all in same age group. All are Marathi Medium students. The students are semi urban and rural area and socio economically backward but all have Smart Phone. Most of the students are quite friendly with Net browsing with their mobile. They frequently use some social networking sites like Face book, Instragram, Whatsup. All of them have gmail account (which is opened at time of NAAC work) But some students are not familiar of Net browsing. The data collected with the help of Google form. 16 items are included in form. For the study the motivation of study, user friendliness, use of Google classroom and behavioral intention these variable fixed. For the analysis of data percentage method is used.

Finding of the study :

No	Particulars	Yes	No	Maybe
1	Are you agree the Google classroom is Save time of Study?	100%	0%	0%
2	Are you agree Using Google classroom I studied hard topic with the help of youtube/other learning material?.	86.4%	0%	13.6%
3	Are you agree Google classroom is easy for use.	100%	0%	0%
4	Are you agree for the study and Extracurricular activity	100%	0%	0%

	I have use the GC frequently.?			
5	Are you agree the quiz competitions are useful for Performance enhancement?	95.5%	0%	4.5%
6	Are you agree Google Classroom is useful for practical orientated course ?	95.5%	0%	4.5%
7	Have you face the difficulties using the GC?	47.6%	33.3%	19%
8	Are you agree The GC motivated me to do deep study of course.?	100%	0%	0%
9	Are you agree It is useful for all subjects?.	82.6%	0%	17.4%

The above table reveals that,

1. 100% students said that the use of Google classroom is easy for use, its save study time, it motivated to student to deep study use frequently.
2. 47.6% students are agree to they have face the difficulties using google classroom. 33.3% student don't have any problem.19% student cannot give opinion about using Google classroom.
3. 95.5% students agreed that quiz competition and extracurricular activity enhance the academic performance.
4. 82.6% students agreed that Google classroom is useful for all subjects.

5.

No	**Particular**	**SA**	**A**	**N**	**DA**	**SDA**
10	Are you agree that the GC enhance me to complete the assign task within time?	18.2%	77.3%	4.5%	0%	0%
11	Are you agreeing GC is easy for use so I am interested to use frequently?	27.3%	72.7%	0%	0%	0%
12	Are you agree Google classroom is convenient and user friendly?	27.3%	68.2%	4.5%	0%	0%
13	Are you agreeing GC is enhancing the learning efficiency?	18.2%	72.7%	9.1%	0%	0%
14	Are you agree after using the GC my academic Performance is increased?	18.2%	81.8%	0%	0%	0%
15	Are you agreeing the extracurricular activity uploaded on GC was useful for my overall development?	22.7%	72.7%	4.5%	0%	0%
16	As per my opinion E- learning increased the academic performance.	16.7%	79.2%	0%	4.1%	0%

The above table reveals that, Near about 73 to 80% students agreed and Similarly 18 to 22% students are strongly agree that the Google classroom is easy for use so I am interested to use frequently, enhancing the learning efficiency, the extracurricular activity uploaded on GC was useful for my overall development, GC enhance me to complete the assign task within time so, E-learning/Google Classroom increased the academic performance of student. But 4.5% to 9% students are neutral about the using the Google classroom for quality improvement of education.

From the finding the motivation, enhancement of academic performance and use of Google classroom have positive fluencies. Use friendliness and Behavioral intention have also positive influences these hypothesis has been accepted.

Conclusion

Recently the Google suite provides Google Classroom platform for education it is very useful for students and teachers. Google classroom has cloud computing base so it have unlimited storage therefore student user friendly. Google classroom is effective and easy to use can get so many files uploaded files at a time. The important finding of the study was that it is very user friendly for students. Regular use can enhance the performance of the students and teachers. Teachers can teach the students beyond the curriculum so the overall knowledge of the students is increased. It can be used by student as per their time and space. Teacher can do the reuse the material and save time for record keeping of the assignment submitted by the students. For active involvement of the students in Google Classroom teacher must have take active role. He has to upload extracurricular things with syllabus so students can attract G.C. In the handwritten assignment the teacher cannot find out the duplication of the work but through the use of plagiarism detective tools teacher can stop the academic dishonesty in the assignment submitted by the students. For the effective use of Google classroom in teaching–learning students and teacher must have to get training. The university has implemented the choice based credit system under this system students have to submit assignments for 50 marks when the students prepare assignment there is question about originality of the work. This concern can be overcome by applying plagiarism check on assignments in order find out the novelty of the work with the help of Google classroom and method. This CBCS will be implemented at undergraduate level at that time use of Google classroom by teacher and students will improve the overall quality of education.

References

1) I. N. M. Shaharanee, J. M. Jamil, and S. S. M. Rodzi, "The Application of Google Classroom as a Tool for Teaching and Learning," vol. 8, no. 10, pp. 5–8, 2016
2) K. M. Dicicco, (2016) "The effects of Google Classroom on teaching social studies for students with learning disabilities," Rowan University, 2016.
3) S. Hemrungrote, P. Jakkaew, and S. Assawaboonmee, "Deployment of Google Classroom to Enhance SDL Cognitive Skills : A Case Study of Introduction to Information Technology Course," in Digital Arts, Media and Technology (ICDAMT), International Conference, 2017, pp. 200–204. https://doi.org/10.1109/ICDAMT.2017.7904961
4) Shampa Iftakhar, (2016) "GOOGLE CLASSROOM: WHAT WORKS AND HOW?" Journal of Education and Social Sciences, Vol. 3, (Feb.) ISSN 2289-9855
5) Kaukab Abid Azhar and Nayab Iqbal (2018) "Effectiveness of Google Classroom : Teachers perception", Prizren Social Science Journal , Vol.2, Issue 2 May –Aug 2018 ISSN 2616-387X
6) Rana A. Saeed Al-Maroof and Mostafa Al-Emran (2018), "Students Acceptance of Google Classroom: An Exploratory Study using PLS-SEM Approach" iJET– Vol. 13, No. 6, 2018
7) Sathyendra Bhat, Ragesh Raju, Athokpam, Bikramjit, Rio D'Souza (2018) , "Leveraging E-Learning through Google Classroom: A Usability Study" Journal of Engineering Education Transformations ,Volume 31 , No. 3, January 2018, ISSN 2349-2473, eISSN 2394-1707

Enhancing Teaching-Learning with ICT Tools: A Case of Electrical Engineering Discipline

Omkar Buwa[1], Ravindra Munje[2,*]

[1,2]Department of Electrical Engineering

K. K. Wagh Institute of Engineering Education and Research, Nashik 422003, Maharashtra, India

[1]onbuwa@kkwagh.edu.in, [2]ravimunje@yahoo.co.in

Track No: 1

Track Name: Different Dimensions of Teaching-Learning

Abstract: Engineering has influenced human life to a great extent. The progressive improvement in human life depends heavily on time-to-time upgrading of engineering skills and thereby engineering education. It is important to note that, the number of graduating engineers in India is more than the USA and China and this number is increasing every year. However, there are two major things to worry about. Firstly, in spite of the largest producer of engineering graduates, no Indian university is in the top 100 universities in the world and secondly, the number of employable engineering graduates is declining. Therefore, there is an urgent need to create reforms in engineering education. Although, all the stakeholders are equally accountable for the engineering education system, teachers, students, and their relationship in the teaching-learning process is extremely imperative in transforming engineering knowledge to the applications of societal benefits. This is possible with the inclusion of information and communication technology (ICT) tools in the teaching-learning process in engineering education. This paper lists the modern ICT tools and their important features. A case of electrical engineering, the most fundamental discipline in engineering, in Savitribai Phule Pune University (SPPU) is considered to demonstrate the applicability of these tools. Application of these tools is suggested before starting, while delivering and after concluding the course. It is believed that the study reported in this paper can be a valuable guide for the novices in the teaching profession.

Keywords: Electrical engineering, engineering education, information and communication technology tools, Savitribai Phule Pune University, teaching-learning process.

1. Introduction

Browsing around the evolution of the human community from the ancient world to the modern era, engineering has played a very vital role at every stage. Human civilization has witnessed many stepping stones of engineering accomplishments, like metallurgy, shipbuilding, agricultural tools, textile producing technologies and other inventions for better human interaction and communication.

However, modern human life has four major challenges, namely sustainability, health, vulnerability and improved joy of living. These challenges seek engineering effectual solutions. Thus, it is necessary to build a nation with skillful engineering graduates who can address the aforementioned challenges of every country. This ultimately calls for improving the quality of technical education.

According to the All India Council for Technical Education (AICTE), total engineering intake in 2017-18 both for undergraduate (UG) and postgraduate (PG) programs was 16,62,470. Nevertheless, only 8,18,787 students, i.e. half of the approved capacity, were enrolled. Earlier to this, in 2014-2015, the number of students enrolled was 9,97,812. Out of these, 3,45,215 i.e. 35.5% of the total enrolled students got the placement at the end of the academic year 2017-18 [1]. Considering enrolment experience in 2017-18, AICTE has reduced intake in 2018-19 to 15,87,097. Further, the decision of not increasing the capacity from the next academic year, i.e. 2019-20 has also been taken [2].

Statistics related to Indian engineering education for the academic year 2017-18 and trend from 2013-14 shows a declining trend in enrolment as well as the passing rate of students. One of the global technology leaders and quality technical education providers in the world is the USA. In the USA, altogether 7,05,967 students were registered for UG and PG programs in the year 2017-18 compared to 6,52,011 students in 2014-15[3]. This indicates an increasing trend in enrolment in the USA. Although, the enrolment number in the USA in the year 2017-18 is lesser by approximately one lakh compared to the enrolment in India, the employment rate is relatively more. A report published by Massachusetts Institute of Technology reveals the worldwide state-of-the-art in engineering education system [4]. This report also lists current and emerging leaders in engineering education in the form of academic institutions. Many of the universities and institutions are from the USA, China and Europe. Unfortunately, no Indian technical institute has got a place over there. Also, overall contribution by Indian engineering education at the international level also looks dilute. Being a fast growing economy, this situation is alarming for India and must to be taken very seriously.

The engineering education system should be creatively updated with local and global industry engagements, workplace experiences, diversities, real-time and simulation-based project works and more importantly with the inter-disciplinary approach [5]. The Institution of Engineering Technology (IET), a well-known professional engineering society, identifies following three main challenges in engineering education

1. Meeting the demand of quality engineers by industry, **2.** Remoulding diversity, inclusivity, and flexibility of future engineers, 3.Embedding work-related learning into engineering education.

Considering increasing complexity of world and expectations of society from engineering community, engineering education ought to possess rigor of engineering knowledge, critical thinking and unstructured problem- solving, interdisciplinary and systems thinking, imagination, creativity, initiative, communication and collaboration, global mindset, diversity and mobility, ambitious learning culture, student engagement and professional learning community, skills to enhance employability and impart lifelong learning[6].

Rapid advancements took place in the areas of automation, data sciences, robotics, artificial intelligence, machine learning, Internet of Things (IoT) in the last decade and this transformation is still going on. The industry is demanding more and more skilled engineers who can think beyond and offer better technical solutions. Employers have also changed their business models due to financial stresses and weak market conditions at a global level. They are looking for graduates of specific disciplines rather than absorbing any engineering graduate. The required skill set is well- defined. However, very few engineering graduates are employable. A recent study has shown that only 3 % of graduating engineers have suitable skills to be employed in software or product market, and only 7 % can handle core engineering tasks. The rest 90 % of engineering graduates are unemployable. The main thing to worry is that, out of the unemployable 90% graduates, 36 % of graduates can be useful by further training, whereas 54 % are not even trainable. And, this is the failure of the engineering education system.

The challenges to engineering education system has two dimensions. First, making the curriculum more attractive so that enrolment rate and success rate can be improved. Second, engineering programs must enhance practical skills in fulfilling market requirements time to time so that the employment rate can be increased [7]. Due to affiliated structure, most of the engineering institutes in India fail to update their curriculum according to industrial transformations. This brings challenges in front of fresh graduates to merge with industry and satisfy the expectations. Lack of research-based teaching approach makes students lose genuine interest in their domain doing only formality for a graduation certificate.

The Strength-Weakness-Opportunity-Threat (SWOT) analysis of national technology education system and traditional engineers was published in 2002 [8]. Depending on this analysis, desired attributes for engineers in the 21st century are listed. Unfortunately, even after two decades, this analysis still stands true with very fractional improvement in the quality of education in India. Nonetheless, there is a need to overcome these drawbacks with a systematic approach and collective efforts of all the stakeholders. Stakeholders are teachers, students, institute management, parents, alumni, etc. and the contribution of each one can make engineering education more effective. There are various ways in which engineering education can be improved. Some of them are **a)** improvement in curriculum **b)** industrial training to both students and teachers for gaining practical experience and transferring the knowledge to students **c)** inclusion of co-curricular activities d) improvement in the teaching-learning process. Out of these, the teaching-learning process has a major role to play due to more contact period of students with the teacher.

The traditional method of teaching is becoming obsolete and students are not interested in passively listening to faculty. A lot of study material is available online and thus they are not dependent on notes given by the course faculty. As a consequence, there is a need to shift the paradigm of engineering education from teacher-centric to student- centric where students become an active learner and engineering education becomes live experience instead of only theoretical knowledge. Technological development in the area of information and communication technology (ICT) has itself given a new tool for this makeover. ICT is slowly becoming part and parcel of the modern teaching-learning process. ICT refers to technology that provides access to information through telecommunications, similar to Information Technology. However, the focus is primarily on communication technology. This includes the internet, wireless networks, cell phones, and other communication mediums. ICT has its origin in information technology and can be tracked since computers were evolved. It became ICT with the development of communication technologies. ICT thus refers to the technologies both hardware and software that enables humans to communicate with each other. According to UNESCO, “Measuring ICT in education is important to inform policymakers in setting national priorities and developing ICT in education policy.” Enabling ICT in institutions also benefits for NAAC, NBA, and ABET accreditation [9].

Implementation of ICT in any engineering institute must start by asking the following questions [10].

- Will students learn better with ICT based courses?
- Will the teaching-learning experience be fair and equitable and assist both students and teachers to become better people?
- Will the organization better achieve its aims?

Scope of this implementation may be discussed taking the case of any of the engineering disciplines. Let us consider electrical engineering. Growing utilization of per capita electricity is a sign of development for any country. The world without electricity is beyond imagination. Electrical engineering covers very broad areas which may start from large generating stations and percolate to systems with micro- and nano-requirements of electricity. Research in the renewable energy area is changing the face of power generation industry. The burden on limited resources, due to increase in population, requirement of quality in enhancing human life, and extending reliability of pieces of equipment need smarter electrical engineering graduates in the near future.

Electrical engineering is one of the core disciplines where the understanding of principles in depth can be possible only with the help of actual experiments. Design of electrical machines is a tedious task and takes a lot of time for calculations which otherwise can be made easier with ICT tools. Overall electrical design for either power generation, transmission, and distribution system or related to any industry also seeks the help of ICT in drawings, design calculations and decision making related coordination between types of equipment. Electrical engineering education is very much dependent upon laboratory work in hardware and creation of lab during theoretical understanding in the classroom will make students active. ICT tool, like a virtual laboratory, may be useful in such case.

There are several research papers, reports and articles accessible online, which suggest innovative ICT tools for teaching various courses. Research papers are also available on a particular course to improve understanding of a selected topic in the course using a single ICT tool. However, there are no specific and executable guidelines to make use of a particular ICT tool for a selected course. In this paper, a review of emerging and most popular ICT tools in engineering education is presented with their features. Further, the applicability of these tools to the courses in electrical engineering is investigated. The curriculum of Electrical Engineering in Savitribai Phule Pune University (SPPU) is referred for the same. This study can be considered as the guide for an engineering teacher to plan the course. The rest of the paper is organized as follows. In Section 2, emerging ICT tools in engineering education are presented. Usage of these tools to teach courses in Electrical Engineering of SPPU is discussed in Section 3. Finally, the paper is concluded in Section4.

2. Emerging ICT Tools in Engineering Education

The curriculum has an important role to play in achieving the aim of any type of education. It is helpful for both teacher and student to track fulfillment of their roles. It gives proper direction to the understanding of any course. After defining evaluation and assessment methods, prerequisites, course objectives and outcomes for a particular course, the curriculum includes content and related references. However, one of the missing things in the curriculum is course-wise suitable ICT tools for enhancing the teaching-learning process. Implementation of ICTs in engineering education, in general, can be categorized into three main areas [11].

A. ICT components embedded in the course contents

For any engineering discipline, system designs or programming are done with the help of software. Complex mathematical problem-solving, modelling, design and simulation, controller designs, algorithm developments and experimental data storage and analysis are common engineering activities irrespective of any engineering discipline. Computers are being utilized for the same since long. All these things are also part of the conventional curriculum. Thus, faculty members and students are well-familiar with this category of ICT implementation. Freely available or commercial software, validation tools, like hardware in loop (HIL) systems are resources available for this type of ICT implementation.

B. ICT for course delivery

Technology-based teaching methods effectively make students active during classroom learning and build their skills. Various technologies are available for the same and the selection of the best suitable tool is to be ensured. This selection depends upon the nature of course and topic, time availability, availability of resources, etc. Table 1 lists some of the emerging tools. The global education system is developing more and more such tools which will make teacher-student interaction more lively [12].

C. Use of ICT for learning process management

Learning management system (LMS) is a software application used for tracking the student learning process. LMS is known by different names such as course management system (CMS), learning content management system (LCMS), virtual learning environment (VLE), and virtual learning system (VLS) where the LMS is the most common term.

In this category, the teacher can share notes related to the course in various forms like text, videos, etc. Assignments can be given to students and they can submit the same with developed platforms. The stored information is easily accessible and two-way communication between teacher and student is established. Assignment grading and feedback facility is also available. LMS emerged from e-Learning concept.

LMS can be either cloud-based deployment or open source license. Popular cloud-based deployment LMS are Docebo, Adobe Captivate Prime, Litmos LMS, iSpring Learn, Talent LMS, Gnosis Connect,360Learning LMS, The Academy LMS, Kallidus Learn, Administrate LMS, Loop, Thought Industries, Knowledge Anywhere LMS, Absorb LMS, Skyprep LMS, etc. These LMS systems are more popular for corporate training and very rarely used in education systems. The education system is following open source license like MOODLE, Chamilo, Canvas, Totara Learn, OPENedX etc. Implementation of LMS can improve some skills like teamwork skills and problem-solving skills which traditional teaching fails to do. The students can share new ideas, improve creative thinking, save time and money [13,14].

Table 1.Emerging ICT tools.

ICT tool	Description
Augmented Reality for Learning	This technology is a combination of information or images with video streaming from a webcam or mobile cellular telephone camera. The study of graphic, simulation or 3D model can add value to grasping of students for subject knowledge.
Virtual Laboratories	These are software programs which emulate real experiments. Students can safely handle components before working on a real system. Virtual labs are web- based while simulators work on local level setups.
Simulators	
e-Books and Digital Libraries	This is the conversion of available study material into electronic form. Amazon, Kindle or Apple iPad are some of the famous digital reading tools. Hyperlinks and embedded media can be used for coverage of larger content in a smaller space.
Video Lectures of Experts	Audiovisual data and video conferencing can be efficiently used to connect subject experts across the world. Whiteboards and file sharing can be collaborated. The best example is the National Programme on Technology Enhanced Learning (NPTEL) video lectures and online courses.
Massive Open Online Courses (MOOC)	These are open courses through the web where unlimited participation is possible. Course content is well-defined and certificates are issued after the completion of course. This is a good tool for teacher-student interaction.
Flipped Classroom	Students teach themselves through ICT tools usage and become an active learner. The topic is shared in advance through online study material and in-depth discussion is conducted during classroom sessions.

Usages of tools in categories B and C have been very slow and inadequate. But technology transformations are enabling teachers and students to explore the same more nowadays.

Effective implementation of the above categories for electrical engineering discipline is discussed in the next section.

Relevance of ICT to Electrical Engineering

Apart from the conventional role of electrical engineers, they should be ready to serve in disruptive technologies in electrical sector. Renewable energy sources, energy storage devices, IoT, electrical transportation are some of the technologies which are going to change the face of electrical engineering in the near future. These technologies require different skill sets for electrical engineers other than the conventional one. All these technologies are dependent on digital processes, information and data communication. Hence, ICT is inseparable part of them.

Technical knowledge is a must when electrical engineers deal with any problem. But apart from that, there are few more special skills needed. One of them is creative problem-solving. Electrical engineers must have a mindset to reach to a solution in multiple ways. They may face challenges related to resources, constraints and sensitivity of systems.

Electrical projects require team work. Thereof, electrical engineers must be able to communicate their ideas effectively to teammates. They should also be in a position to communicate solutions to clients and resource requirements to management. Oral and written communication is required for this purpose. Also to estimate demands of projects, strategic choices, optimizations and goal setting, they must be a good leader. All these skills can be enhanced with the use of ICT in the teaching-learning process. Various ICT tools discussed in Section 2 can be used for teaching courses in electrical engineering.

Table 2. Application of ICT Tools to Electrical Engineering Course

Course or course-group in electrical engineering	Category 1 (ICT Content in Curriculum)	Category 2 (ICT Tool for Delivery)	Advantages over the conventional method of course understanding
Basic Electrical Engineering	MATLAB/Simulink or circuit analysis software in Lab Sessions for realizing various network theorems.	e-books and Digital Libraries, Video lectures of experts, Massive Open Online Courses, Virtual Laboratory, Simulators, Augmented Reality, Flipped Classroom	1. Impact of circuit component rating can be explained for selected circuit. 2. The interrelation between various variables of circuit and theorems can be explained simultaneously with visual results. 3. Simulations can be explained to many students at a single time, thus time-saving can be done. 4. Various circuit conditions can be compared simultaneously. 5. Simulation models can be saved and shared thus repetitiveness is possible for practice.
Electrical Machine and Measurement Group Power System Group • Power Generation Technology, • Power System Engineering, • Power System Operation and Control • Switchgear and Protection • Power Quality • HVDC, FACTS	• Machine design software for various electrical equipment, • Software for simultaneous bill of material and quantity generation. • Performance analysis of various generation technologies by modeling, curve plotting, etc. • Design and develop single line diagram and panels in Electrical AutoCAD. • Transmission line parameters calculation and analysis under various loading and fault conditions with EMTP software like ETAP, PSCAD • Relay coordination with ETAP, PSCAD, DigSILENT • Filter designs with ETAP, PSCAD		1. 3-D models of power system components can be explained through Augmented Reality. 2. Virtual Labs can save time, cost of consumables as well as students can freely deal with components as there is no possibility of physical damage due to wrong component selection as well as circuit connections. 3. Simulators can give students feel of actual field results. Students can create disturbances in the system and understand responses.
Control System Engineering Power Electronics, Control of Electrical Drives	• Controller design for power system stability with various tool boxes in MATLAB. • Design of power electronic circuits as per required output characteristics in MATLAB, PSCAD or other compatible software.		1. Time-saving in tuning of controllers during experiments. 2. Accuracy of controller design and impacts of wrong controller design can be understood by students during experiment. 3. Comparison of various power electronics topologies is possible simultaneously.

Table 2 includes various courses in the curriculum of Savitribai Phule Pune University for Electrical Engineering at undergraduate level. At first year of UG course, students have to learn various courses like basic mechanical engineering (BME), basic civil engineering etc. Basic electrical engineering (BEE) is the fundamental course of electrical engineering discipline. Hence consideration of this paper is limited to BEE for ICT implementation. Courses of second year to fourth year have been divided into three groups- a) Electrical machines and Measurement group b) Power system group c) Control Systems, Power Electronics and Electrical Drives group.

Course wise or course-group wise scope for ICT implementation in curriculum is mentioned. Table also enlists the advantages of ICT over the conventional method of course understanding. Use of ICT for LMS discussed in Section 2-C can be done by any electrical engineering course faculty irrespective of its curriculum. Therefore, it is not included in Table 2.

The overall outcome of following ICT in the curriculum, for the teaching-learning process and in assessment strengthens the teacher-student relationship, teacher can understand every student in-depth, their communication becomes bidirectional as students can share the concepts with faculty. ICT study material can be saved and shared making it available outside classroom. This helps students to work at home, use their creativity to understand the course at their own space.

It is also important to note that, the use of ICT in engineering education may also face some drawbacks, like time constraints due to academic schedules, lack of resource, self-motivation to students, etc. Nature of the course must also be considered as some of the courses which are purely quantitative in nature require face-to-face interaction of students and faculty and step-by-step understanding of the concepts. Tools like virtual laboratory may not give a feel of real-time field experience to students and thus make them less competent for field working.

Research has shown that frequent use of ICTs does not wholly support virtual interaction. Some form of face-to-face interaction is always needed for achieving the aims of the team or organization [15].

3. Conclusion

Due to the increasing demand of growing population, disruptive technology developments, constraints on the availability of resources and many other challenges related to the human community, 20th-century engineering skills are less useful and must be upgraded which will survive engineers and so the society. ICT is one of the solutions which will help stakeholders of engineering education to face technical challenges of 21st-century. It will ensure the readiness of engineering graduates to fulfill continuously changing and complex demands of human mankind. This paper discusses the potential of ICT tools for engineering education, particularly to electrical engineering. Few of the ICT tools have been enlisted to show the benefits that students will gain substantially compared to the conventional teaching-learning process. This will ultimately help teachers and academic institutions to be the centre of technical excellence and students to grow enriching their skills. When teachers and students are getting such exposure, all other stakeholders including society will be immensely benefited. Future work may focus on individual course group and in detail application of ICT tools for it with some case studies.

References

[1] Reddy BVR M, (2018), Engineering Education in India–Short and Medium Term Perspectives. Report published by AICTE, online available on: https://www.aicte-india.org/sites/default/files

[2] www.aicte-india.org

[3] Yoder, B.L., (2017), Engineering by the Numbers. Report online available on:https://www.asee.org

[5] Institution of Engineering and Technology, New Approaches to Engineering Higher Education. Report online available on:https://www.theiet.org/impact-society/

[6] Kamp A., (2014), Engineering Education in the Rapidly Changing World. Report online available on: https://www.4tu.nl/cee/en/publications/vision-engineering-education.pdf

[7] Cha J., Koo B., (2011), ICTs for New Engineering Education, UNESCO Institute for Information Technologies in Education.

[8] Natarajan R., (2002), Emerging Trends in Engineering Education-Indian Perspectives, 16th Australian International Education Conference.

[9] UNESCO Report, (2010), Engineering: Issues, Challenges and Opportunities for Development, online available on:https://unesdoc.unesco.org

[10] Christie M.F., Jaun A, Jonsson L.E. (2002), Evaluating the Use of ICT in Engineering Education, European Journal of Engineering Education, 27(1), 13-20.

[11] Ali E.A., (2013), ICT in Engineering Educational Content Delivery: Challenges and Opportunities, World Congress on Engineering Education, London, U. K.

[12] Lopes, Ana Paula, (2014), Learning Management Systems in Higher Education. online available on: https://www.researchgate.net/publication/320259239

[13] Center for Educational Innovation, University at Buffalo, Trends and the Future of Learning Management Systems (LMSs) in Higher Education, online available on :https://www.buffalo.edu/content/dam/www/ubcei/reports/

[14] Linways Team, Flipped Classroom: How Technology is Giving Education a Leap Like Never Before. online available on: https://stories.linways.in/flipped-classroom-how-technology-is-giving-education-a-leap-like-never-before-

[15] Wahab A.F.A, (2005), The Impact of Information and Communication Technology (ICT), University Industry Interaction: Malaysian Case, Proc. of Regional Conference on Engineering Education, Malaysia.

[4] Massachusetts Institute of Technology, (2018), The Global State of the Art in Engineering Education. Report online available on:https://jwel.mit.edu/assets/document/global-state-art-engineering-education

Effective Use of Interactive Tool: Raptor, Visualization Tool and Collaborative Learning for C Programming

Bharati K. Ugale [1], Dr. N.V.Dharwadkar [2], Varsha T. Lokare [3]

[1,2,3]Computer Science and Engg. Department, Rajarambapu Institute of Technology, Sakharale
[1] bharati.ugale@ritindia.edu
[2]nagraj.dharwadkar@ritindia.edu
[3] varsha.lokare@ritindia.edu
Track No:1
Track Name: Different dimensions of Teaching-Learning

Abstract: Programming Languages are basic subjects in Computer Engineering domain. The programming includes a basic understanding of the language, logic building, problem-solving skills, critical thinking and use of different tools. However, students feel difficult while studying programming languages. One of the reason could be that their logical thinking, problem-solving and critical thinking capacity. Now a day's a innovative way to boost teaching and learning performance is the use of advanced teaching methodology. This paper is based on an interactive tool for drawing flowchart, visualization tool for understanding the working of program and collaborative learning to improve students programming skill and logic building capacity. Collaborative learning makes students work in a group and share the information and solve different problem statements in an effective way.

Keywords: Visualization tool, Interactive tool, Collaborative learning, Logic building, critical thinking.

I. INTRODUCTION

Programming plays a vital role in the discipline of computing, an essential practical skill for computing, and an important element of the undergraduate curriculum. Programming languages have extensive and difficult syntaxes, which leads to many learning difficulties for novice learners. The main objective behind these activities is providing a way to learn C programming in joyful environment.

Study of any programming language or solving any problem using programming language requires an analysing the problem, writing sequence of steps to solve the problem in terms of an algorithm, conversion of the algorithm into solution in terms of the program [1]. In order to get appropriate solution problem-solving capacity, logical and critical thinking, hands-on programming skills plays an important role. Traditional teaching method were focusing on the basic concepts and its syntax, but students were facing lots of problems to understand how the exact program works, how flow transferred from one instruction to another, how static and dynamic memory management works, how function calling works. Students need more practical oriented approach and hands-on practical sessions. To avoid this difficulties, it is mandatory to modify teaching-learning methods and need to make it more interactive and collaborative [6].

1. Role play activity
2. Think pair share
3. Collaborative learning
4. Flipped classroom
5. Project-based Learning
6. Use of MOODLE
7. Problem based Learning
8. Use of Visualization Tools
9. Quizzes
10. Group Discussion

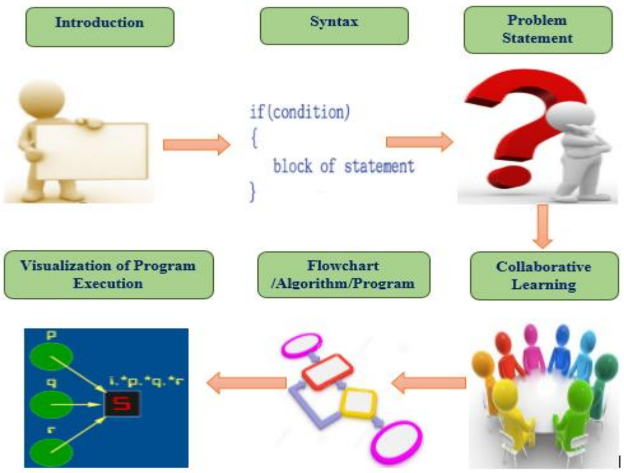


Fig 1. Teaching Learning Method for C Programming

New teaching learning method includes theory, practice, nurture students interest and practical skills. Studying C Programming involve many things like its need and introduction, syntax, use of concept to solve given problem using different editors, understanding execution of program, understanding flow of execution, memory allocation n so on. Figure1 shows new methodology used to teach C programming which uses different active teaching learning tools.

1. **Introduction:**
   First, Teacher must explain each basic concept along with its need, use, advantages and disadvantages.
2. **Syntax:**
   After introduction it is expected to write or show syntax of the concept with the help of chalk and board or PPT. Then discuss 2-3 examples based on same

concept so that students will remember the syntax and will understand the use of concept.

3. **Problem Statement:**
   Then give some problem statements to the students related to same concept.
4. **Collaborative Learning:**
   Ask students to discuss problem in a group of 3-4 students and come up with a solution.
5. **Algorithm/ Flowchart/ Program:**
   After discussion students should write algorithm/ flowchart/ program individually.
6. **Visualization of flowchart or program:**
   Ask one student to come forward and implement the same program using visualization tool. The remaining class will verify whether a correct program is written or not. If corrections require then another student will come forward and will correct that program. At the end, all students will come to know how exactly that program works step by step.

II. INTERACTIVE TOOL: RAPTOR

RAPTOR provides flowchart based programming environment and it is specially designed to help students visualize their algorithms and avoid syntactic baggage. RAPID is Rapid Algorithmic Prototyping Tool for Ordered Reasoning, it is freely available and developed by Martin C. Carlisle, Terry Wilson, Jeff Humphries and Jason Moore. This tool includes different windows for different purposes.

1. **Symbol Window:**
   This window gives list of symbols required to draw a flowchart. Students has to drag and drop symbol as per the program requirement.

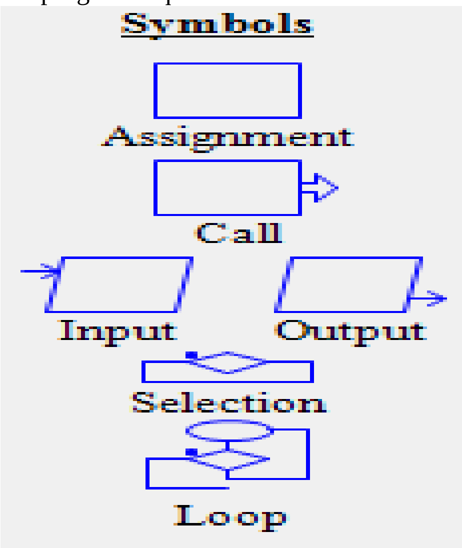


Fig 2.a: Symbol window

2. **Main window:**
   This is the window where students has to draw flowchart for given problem statement.

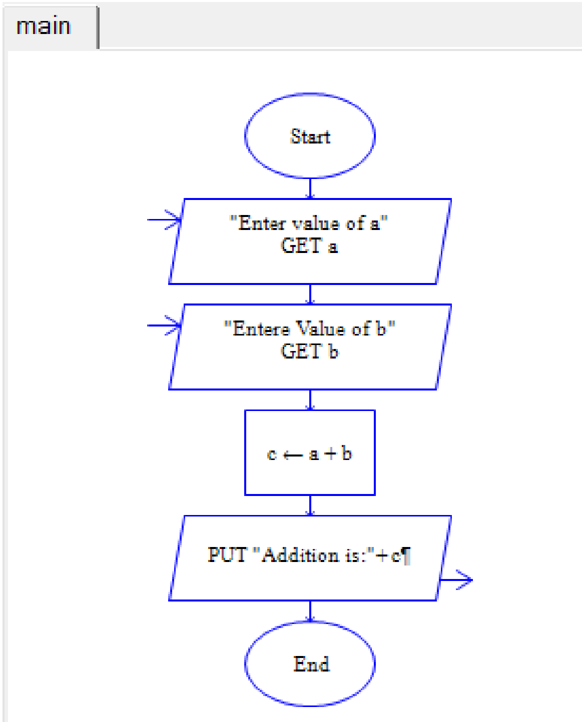


Fig 2.b: Main window

In above figure you can see the flowchart drawn to perform addition of 2 numbers.

3. **Input Window:**
   Input windows provides option to read value from user at run time without any programming knowledge.

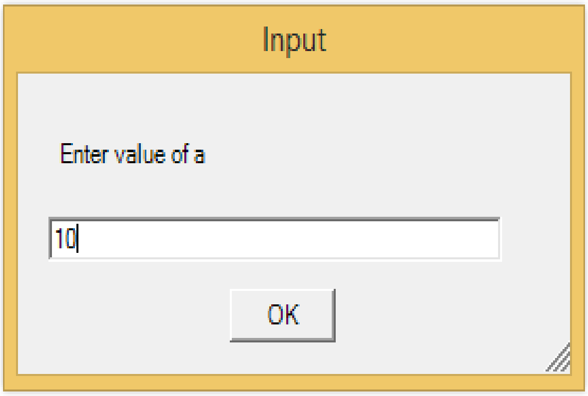


Fig 2.c: Input window

4. **Intermediate result window:**
   This windows gives result of intermediate steps.

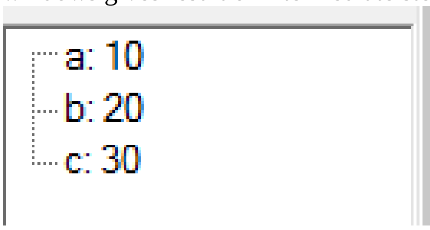


Fig 2.d: Intermediate result window

5. **Output Window:**
   This window gives final output the program.

ISBN : 978-93-88441-93-3

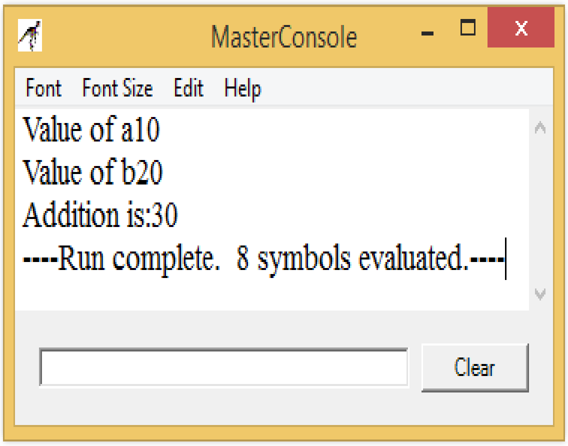


Fig 2.e: Final output window

III. VISUALIZATION TOOL: Python Tutor

1. Many students are able to write a C program but fail to explain its working or flow of execution. Student writes C program using different concepts like function, array, pointer, dynamic memory allocation. But sometimes they don't understand how the function call works, what is the local and global variables, how memory is allocated to array, how pointer and structure works. Here, visualization tool plays an important role to make them understand everything about program execution [2]. There are plenty of visualization tools are available that visualize program execution line by line. The following figure shows screenshot taken of the visualization tool during execution of the program.
   This tool is freely available on following link: http://www.pythontutor.com/c.html#mode=edit.
2. **Problem Statement:** C program to write functions for addition and subtraction of 2 numbers. Following screenshot demonstrate how the function works.

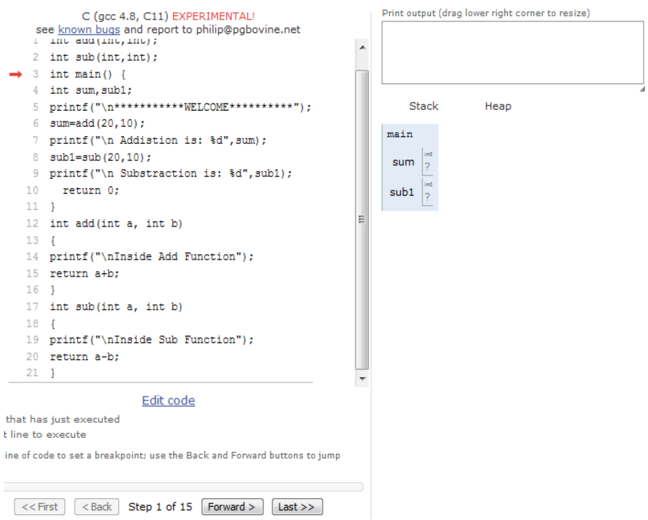


Fig 3.a: Screenshot 1

Screenshot 1 gives outline of visualization tool, which includes program window, Output window, and memory tab (Stack and Heap) and arrows. At the bottom, there are options like first, back, forward and last. Using this we can control the flow of execution and we can see how the program works. There are two arrows, the red arrow points to the next line to be executed and green arrow points to the line that has just executed. Memory tab shows stack and heap allocation as the program executes and output window displays output as the program executes. In figure 2.a, memory tab shows memory space for the main function which includes two variables sum and sub1, with empty output window. Will see step by step execution of this program through screenshots.

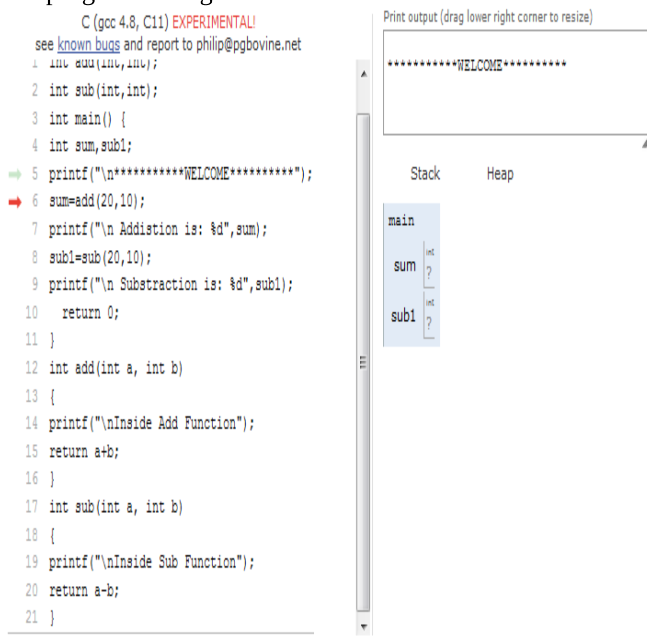


Fig 3.b: Screenshot 2

Figure 3.b shows output displayed using printf function. You can see "WELCOME" message is displayed on the output screen.

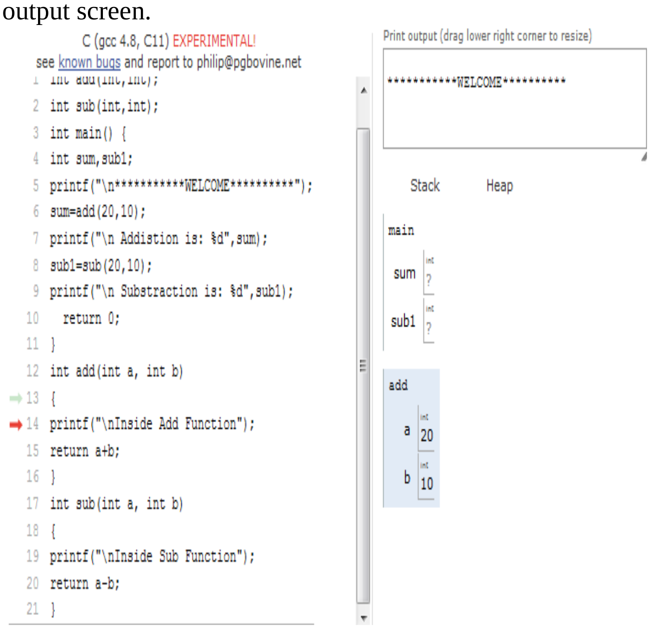


Fig 3.c: Screenshot 3

Figure 3.c shows memory allocation after function call add(). Separate memory space is allocated for add function and memory is allocated for local variables a and b.

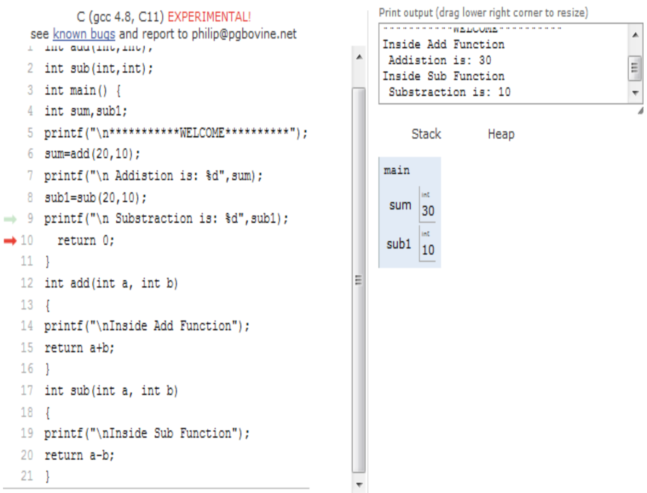


Fig 3.d: Screenshot 4

Figure 3.d shows final output after executing all the statements in the program. As per the program 2 function were called add and sub. After each function call result is returned to the main function, so we can see the result of add and sub stored in local variables of main function sum and sub1 respectively.

IV. COLLABORTIVE LEARNING

Collaborative learning means working in a group to solve given problem. In this learning happens through active engagement among peers [6]. Figure 4 shows characteristics of Collaborative Learning.

There are different characteristics of collaborative learning, some are represented through diagram: Share ideas, collaboration, discussion, brainstorming, community, interaction.

Laboratory sessions are planned to promote active and collaborative learning among the students.

Fig 4. Characteristics of Collaborative Learning

Lab Activity:

1. At the time of practical sessions, students will be divided into group of 3 to 4 students.
2. Before starting the lab session, lab manual or problem statements must be uploaded on MOODLE by faculty.
3. At the start of the practical session, teacher will give guidelines to the students about practical session and problem statements to be implemented during lab session and discuss the basic concepts required to execute those statements.
4. All the group members must take active participation in the discussion on the given problem statements and then one student will draw a flowchart, one will write an algorithm and one will write a program in discussion with each other.
5. The student has to note down errors occurred during program execution as well what action they have taken to remove those errors.
6. After completion of one program role of student will get changed like earlier who has drawn algorithm will write a program. Alternatively, they need to follow same.
7. After completion of all the programs students have to submit notebook for checking of algorithm and flowchart and all have to upload programs on MOODLE for assessment.

RESULT ANALYSIS

As we are following OBE, it is important to measure output of each and every activity to measure the performance improvement of the students. To check the performance of the students, we have considered 2 aspects. first is improvement in marks and second is CO attainment of the students for academic year 2017-18 and 2018-2019. Traditional approach was used to teach the course in academic year 2017-18 and proposed active learning method was used in academic year 2018-19.

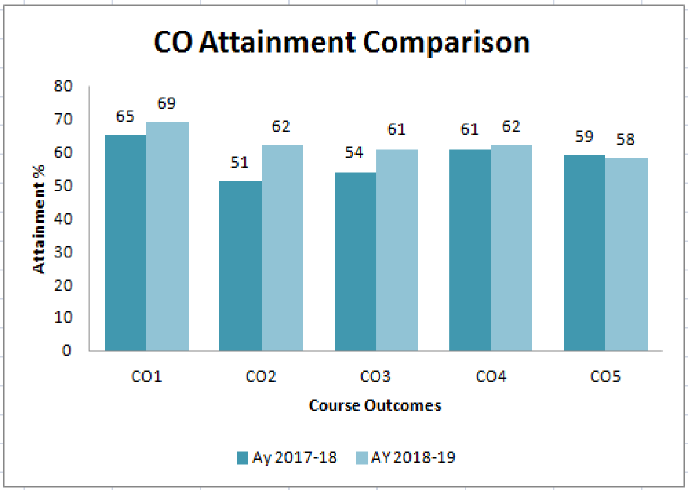


Fig 5. CO attainment Comparison

CO1: Explain the basic terminology and concepts of C programming language.

CO2: Develop algorithm and draw flow chart for the given problem.

CO3: Write C programs for given problems.

CO4: Evaluate the given C program to predict the output.

CO5: Analyse the C program to resolve the errors.

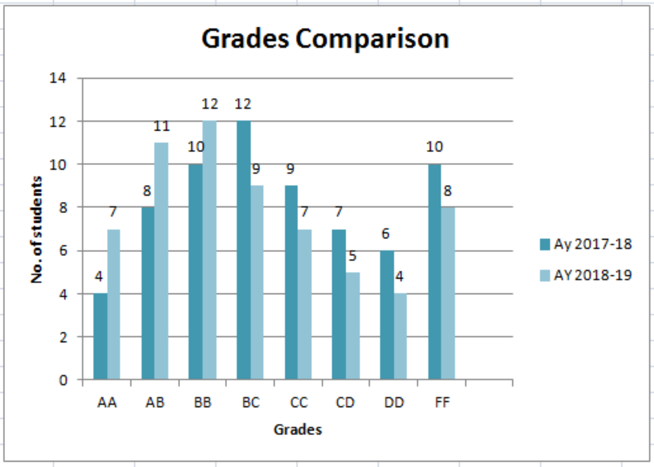


Fig 6. Student Grades Comparison

CONCLUSION

We can say that the Information and Communication Technology has made many innovations in the field of teaching and also made a radical revolution from the old prototype of teaching and learning. Traditional teaching method was teaching-centric and now it is changed to student-centric. Interactive tool: RAPTPR help students to analyze their algorithm in terms of output without any programming knowledge, as it is interactive tool it also helps to divert students interest in the field of programming. Visualization tool makes a major impact on students mind to memorize the concepts and to understand the working of the program. In the teaching method, creating a new teaching mode, proper arrangement of teaching content, design teaching case, pay attention to practice and evaluation of curriculum reform is the key. Collaborative learning helps to develop higher level thinking skills and promotes a positive attitude toward the course. Hence, in order to achieve the great result, we need to move toward modern teaching mechanism from traditional teaching method.

REFERENCES

[1] Hongqing Wu, Shaoyun Song, and Jiong Wu" Innovation Teaching Design on the C Programming of Ability Guidance" Advanced Materials Research Online: 2014-06-25

[2] Program visualization and explanation for novice C programmers, Matthew Heinsen Egan1 Chris McDonald2 Proceedings of the Sixteenth Australasian Computing Education Conference (ACE2014), Auckland, New Zealand

[3] V. T. Lokare, P. M. Jadhav," A Holistic Approach for Teaching Data Structure Course in the Department of Information Technology", Journal of Engineering Education Transformations, 2017.

[4] G. G. Shinghan Nagaraj V. Dharwadkar, "Student Quality Circle" , IUCEE-2017, Vardhaman College of Engineering, Hyderabad, 2017Publisher, IUCEE-2017.

[5] A. R. Jakhale, A. C. Attar, "A Novel Approach towards Outcome Based Engineering Education for Continuous Quality Improvement: A Case study", Journal of Engineering Education Transformations, 2015.

[6] Zachary A. Reed, "Collaborative Learning in the Classroom", faculty professional development program conducted by the Center for Faculty Excellence, United States Military Academy, West Point, NY, 2014.

[7] P. S. Jadhav, A. M. Mulla, P. M. Jadhav, (2017), "Blending ICT with Project based Learning for effective teaching and learning of Mechatronics", Journal of Engineering Education Transformations, 30(3), 47-51

[8] Prakash M. Jadhav and Varsha T. Lokare, "A Holistic Approach for Teaching Data Structure Course in the department of Information Technology", Journal of Engineering Education Transformations, 2017.

[9] Gautami G Shingan, Bharati K Ugale," A Holistic Approach for Teaching Design and Analysis of Algorithms Course in the Department of Computer Engineering", Journal of Engineering Education Transformations, 2018.

[10] Varsha T. Lokare, Prakash M. Jadhav, Snehal S. Patil," An Integrated Approach for Teaching Object Oriented Programming (C++) Course", Journal of Engineering Education Transformations, 2018.

[11] Bharati K. Ugale, Gautami G. Shingan," A Novel Approach to Improve Logical and Critical Thinking through Collaborative Learning and Using Visualization Tools", Journal of Engineering Education Transformations, 2018.

Role of e-governance and ICT Tools to Enhance the Quality of Education in Technical Institutions

Dr. P. B. Nehe[1], D. B. Zoman[2]

[1]H. O. D, Mechanical Engg. Dept., GES's R. H. Sapat College of Engineering Nashik.
[2]Mechanical Engg. Dept., GES's R. H. Sapat College of Engineering Nashik.
[1]prashantnehe@gmail.com,
[2]digambarzoman@gmail.com
Track No:1
Track Name: Different dimensions of teaching learning.

Abstract:
ICT tools are widely accepted in the technical education sector worldwide through e-governance. This Paper discusses the various methods to add value to routine teaching learning process towards outcome based education. Students, faculties and management; three stake holder of any technical institute should work in proper coordination during the span of curriculum of any course. Alumina are in contact with the institute for a long period of time and their contribution, interaction can be greatly enhance through e-governance initiatives. Various ICT tools like Google Docs, Blog, Google groups, Google Classrooms, Google web sites, Flipped Classroom, Slide Share are used to implement e-governance in the institute. These days IQAC cell is mandatory in all technical institutes to maintain and assure the quality of teaching learning process and its effectiveness can be improved by e-governance. The role of IQAC is to implement various tools like Quality Circle, Fish Bone Structure, Parento Analysis and Six Sigma techniques at department and institute level. The role of faculty in a technical institute in addition to defining the course objectives and outcomes is to set up the proper mechanism for implementation and assurance of the same.

Key Words: e-Governance[1], Information and Communication Technologies (ICT[2], Internal Quality Assurance (IQAC)[3].

1. Introduction:

The Kothari commission (1996) listed the following roles of the universities (Higher education institutions in the modern Society):

i) To seek and cultivate new knowledge, to engage dynamically and fearlessly in the pursuit of truth, and to interpret old knowledge and benefits in the light of new needs and discoveries.

ii) To provide the right kind of leadership in all walk of life, to identify gifted youth and help them develop their potential to the full of cultivating physical fitness, developing the powers of the mind and cultivating right interests, attitudes and moral and intellectual values.

iii) To provide the society with competent men and women trained in agriculture, art, medicine, science and technology and various other professions who will also be cultivated individuals, imbibed with a sense of social purpose.

iv) To strive to promote quality and social justice and to reduce social and culture differences through diffusion of education

v) To foster in the teachers, students and through them in the society generally, the attitudes and the values needed for developing the good life in individuals and society (GOI, 1996)

This paper discusses the role of ICT (Information and Communication Technologies) and its use for the governance of Engineering Institute. ICT in education sector enhance the quality of education and additionally supports for the governance of the Institution. Engineering education these days is moving towards outcome based education rather than traditional education system. Quality of education is now a day's depend on use of ICT tools and closed loop feedback mechanism with transparency in the system. Conventional chalk and board teaching methods are many times redundant in outcome based education systems. Every educational organization is striving for improving quality of education through outcome base education system.
Furthermore, e-Governance in the education bridge the communication gap between different stakeholder like students, teachers, management and educational governing bodies like the University. Various ICT tools like Google Docs, Blogs, Google groups, Google Classrooms, Google web sites, Flipped Classroom, Slide Share are used to implement e-Governance in the institute.

2. Need of e-Governance and ICT tools:

The various ways of introducing technology in education institution administration are
following (Caroline Salerno 2009) :

- Sending e-mail notices and agendas to staff, rather than printing and distributing them
- Submission of lesson plans through e-mail
- Foster technology growth by asking parents to write e-mail addresses on medical forms.

- Insist that all teachers create a class Web page
- Attend technology conferences to see what other schools are doing, what other teachers are doing to integrate technology, and what principals are doing to encourage the use of technology in their schools and classrooms.
- Admissions through web-enabled services.
- All day-to-day activities of the institution (General Administration)
- Staff administration

E-Governance in the technical education is necessary to enhance quality of education through participation, transparency and accountability. Following points highlights its importance:

- Better coordination of various departments in the Institute which leads to reduction in duplication and ease in reports preparation.
- Easy online information, submission of forms and fast payment.
- Equal opportunity to access the information, regardless physical location, disability.
- Significant reduction in transaction cost, time, space and manpower.
- Less burden on students related to data collection.

Technical education is generally understood to cover teaching, research and extension. Higher education is the source or feeder system in all walks of life and therefore supplies the much-needed human resources in management, planning, design, teaching, and research. Scientific and technological advancement and economic growth of a country are as much dependent on the higher education system as on working classes.

In India, development of indigenous technology and capabilities in agriculture, food security and other industrial areas is possible because of the higher education infrastructure. Higher education also provides opportunities for lifelong learning, allowing people to upgrade their knowledge and skills from time to time based on the societal needs.

2.1 ICT Tools:

Use of ICTs in facilitates efficient, speedy and transparent process for disseminating information to stake holders for providing services, and for performing administrative activities. Various ICT tools like Google Docs, Blog, Google groups, Google Classrooms, Google web sites are beneficial in this regard. ICT allow utilizing the learning resources. Its purpose to develop a closed loop system in the education.

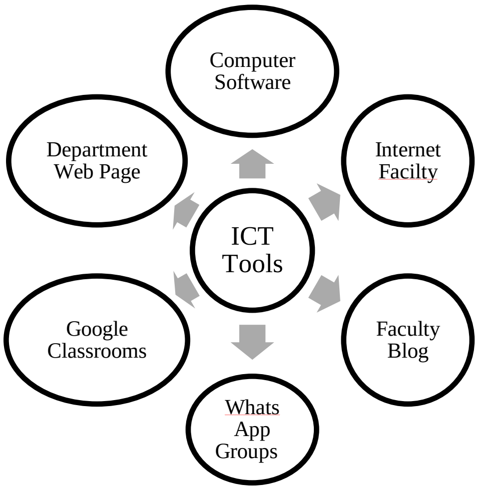


Fig 1. ICT tools used in a technical Institute

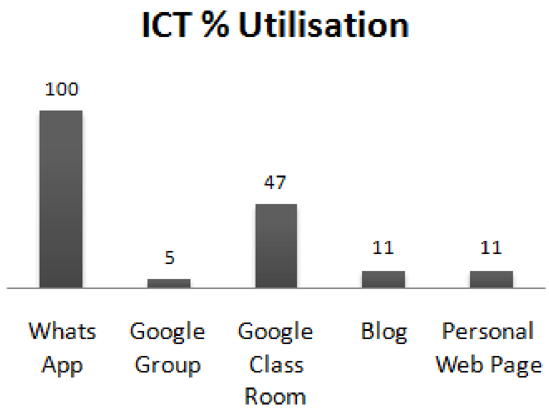


Fig 2. Percentage Utilization of ICT tools

A survey on how many faculties are using ICT tools was conducted in the department of our Institute. Fig. 2 shows the percentage of utilization of ICT tools for a selected sample. Percentage of WhatsApp used by the faculty members is more as compare to other ICT tools. Each ICT tool has merits and demerits. Since WhatsApp is more of a one way communication and in order to maintain the privacy and professionalism need, some other ICT tools needs to be used more frequently by the faculties.

On the other hand, Blogger, Google Classrooms and Google site are developed by Google and are provided with complete security. Google provide simple app base interface for modification and building a system. A faculty blog and Google website is shown in Fig. 3 and 4 respectively.

Fig 3. Faculty Blog

Fig. 4 Google Site

Google site is very useful and effective ICT tool can be used effectively to govern the various activity departments wise and institute wise. The web page displayed above, provides brief information about the Mechanical Engineering Department. Google site offers all features to develop the web page with the requirement of the stake holders. Such web pages play a vital role in communicating the information and maintain the professionalism between the stake holders.

Consider a case of faculty need to circulate basic information and needs to collect some data from students. Without ICT tools faculty has to circulate a notice and collect a data in physical presence of students which is time bound concept and has limitations. Faculty can collect the data only in working hours. If the faculty is literate about the ICT tools and tools like Google form and Google site, he/she can just share a Google form link through the Google site and collect the desired data from students.

Figure 5 shows a response sheet of workshop feedback shared with B. E Mechanical Engineering students. It is observed that the students are giving feedback through Google form with their convenient time and without disturbing the academics. Response time is shown in sheet. It is interesting to note that the students are providing feedbacks late night also and also start responding from early morning. Without the help of proper ICT tool it is tedious task for a faculty member to do the post feedback analysis.

Workshop/ Seminar Feedback Form (Responses)

Workshop/ Seminar Feedback Form (Responses) : Form responses 1

19/03/2019 19:04:56	1	1
19/03/2019 19:06:05	5	5
19/03/2019 19:14:50	1	3
19/03/2019 19:19:18	1	2
19/03/2019 19:25:21	1	2
19/03/2019 19:37:37	1	1
19/03/2019 19:38:03	1	1
19/03/2019 19:44:34	4	4
19/03/2019 19:58:47	3	3
19/03/2019 20:11:04	1	1
19/03/2019 20:11:18	3	3
19/03/2019 20:21:41	2	2
19/03/2019 20:22:58	1	1
19/03/2019 20:24:35	2	2
19/03/2019 20:51:29	2	3
19/03/2019 21:38:45	3	2
19/03/2019 22:09:39	3	3
19/03/2019 22:53:24	1	1
19/03/2019 23:01:00	1	1
20/03/2019 07:28:03	1	1
20/03/2019 08:05:42	2	1

Fig. 5 Google Form response Sheet

Google site offers all rights to the user for selection of theme, template, site pages and page design layout. Also one can upload a file and folder which helps a faculty member to share a teaching material with the student. Google site (Fig. 4) developed for Mechanical Engineering Department of our Institute, has horizontal and vertical navigation tabs containing multiple pages which provide the information about department vision mission, faculty and laboratory details, syllabus, students and faculty achievements. The important point to note is that even though the web site provides access and user rights to particular faculty it denied students access.

3. Use of ICT tools for IQAC:

ICT tools greatly help to strengthen the Internal Quality Assurance Cell. Continuous monitoring is required for governance of IQAC cell in the Institute. There is a need to develop a proper feedback mechanism for development of IQAC cell in the department. Various feedbacks to be collected from various stake holders in the institute are categorised into faculty feedback, course exit survey, program exit survey, parents, employer and alumni feedback.

Consider a case of a course exit survey for Engineering Institute for a particular department. It the faculty is literate about ICT tools, he is able to develop a mechanism for feedback collection. Survey collection centre developed for Mechanical Engineering Department is an example for collecting feedback from stake holders (Fig. 7, 8and 9). Once a feedback from stake holders is collected, it needs to be analysed and action taken report is required to be prepared. Fish bone diagram and parento analysis tools can be used for preparing action taken report and mechanism.

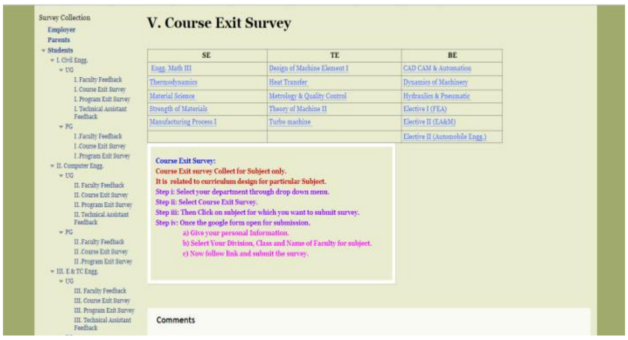


Fig. 6 Course Exit Survey

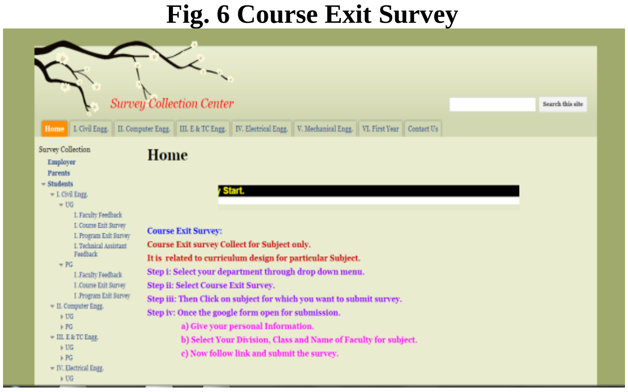
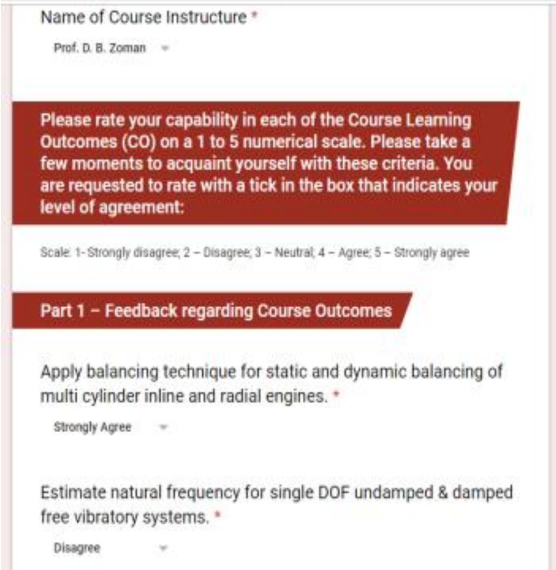


Fig. 7 Survey Collection Centre


Name of Course Instructure *

Prof. D. B. Zoman

Please rate your capability in each of the Course Learning Outcomes (CO) on a 1 to 5 numerical scale. Please take a few moments to acquaint yourself with these criteria. You are requested to rate with a tick in the box that indicates your level of agreement:

Scale: 1- Strongly disagree; 2 – Disagree; 3 – Neutral; 4 – Agree; 5 – Strongly agree

Part 1 – Feedback regarding Course Outcomes

Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines. *

Strongly Agree

Estimate natural frequency for single DOF undamped & damped free vibratory systems. *

Disagree

Fig. 8 Google Form linked to Survey collection centre

Proposed model to implement Quality Circle in technical institute is shown in Fig. 9and 10.

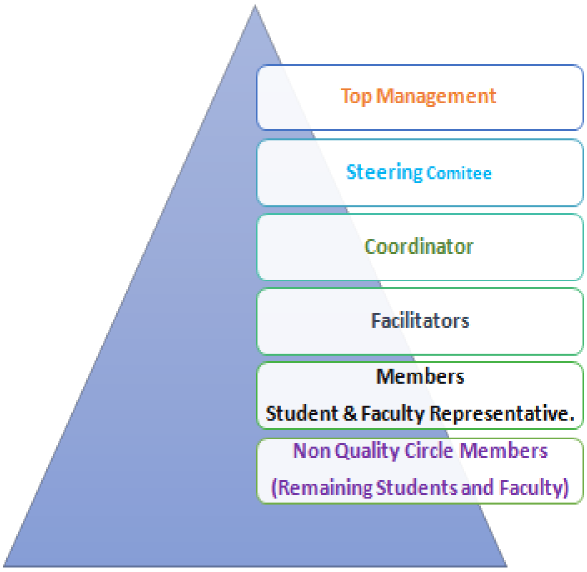


Fig. 9 Quality Circle in Technical Institute.

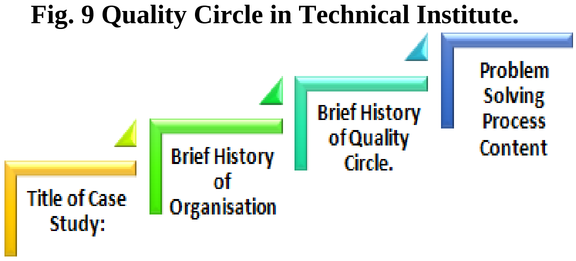


Fig. 10 Standard format for Quality Circle Implementation.

Quality circle addresses the problems related to teaching and learning. A group of enthusiastic faculty members are called as facilitators. Facilitators carry out brain storming at granular level and initiate the data collection. Fish bone diagram are drawn to identify the cause and effects related to the problems. Further problem analysis is done with Pareto Diagram.

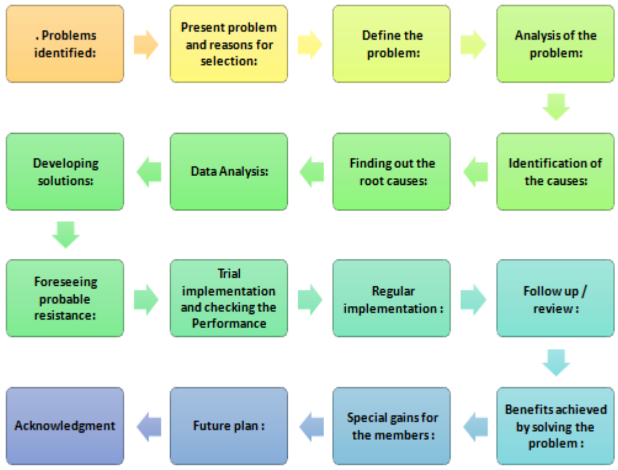


Fig. 11 Problem Solving Process.

4. Conclusions

Today ICT and e-governance has become an integral part of life of the people in the world and it is a time to apply the skills for the betterment of Indian educational system as well. The e-governance needs security for smooth information flow, best practice database and enhanced capacity for information analysis etc.

E Governance practices have been widely use of ICT has significantly reduced the paper work, approvals, procurement, supply chain management, logistics, performance management.

References

1. R. K. Shrivastava, A.K. Raizada, Neeta Saxena. (2014) Role of e-Governance to strengthen higher education system in India, IOSR Journal of Research and Method in Education (IOSR-JRME), e-ISSN: 2320–7388, p-ISSN: 2320–737X Volume 4, Issue 2 Ver. I (Mar-Apr. 2014), PP 57-62
2. Ashok Kumar, E-Governance in Education Sector (2012), Gian Jyoti E-Journal, Volume 1, Issue 2 (Jan – Mar 2012), ISSN 2250-348X.
3. R. Krishnaveni and J. Meenakumari, International Journal of Environmental Science and Development, Vol. 1, No. 3, August 2010, Usage of ICT for Information Administration in Higher education Institutions – A study.
4. Harshita Bhatnagar, e-Governance in Higher Education: A Case Study of IGNOU, New Delhi. International Journal of Scientific and Engineering Research, Volume 4, Issue 5, May-2013

Review of e-assessment Tools for Assessment for/while/of Learning

S. B. Sangle[1], N. S. Wakchaure[2]

[1,2] Assistant Professor, Department of Production Engineering,
K. K. Wagh Institute of Engineering Education and Research, Nashik, Maharashtra, India
[1] sbsangle@kkwagh.edu.in

Track No:1
Track Name: Different dimensions of Teaching-Learning

Abstract: Throughout most of the 20th century, classroom assessment was considered a mechanism for providing an index of learning, and it followed a predictable pattern: teachers taught, tested the students' knowledge of the material, made judgements about students' achievement based on the testing, and then moved on to the next unit of work. But that does not work and unfortunately there is no learning there is only teaching. It asserts that assessment works best when its purpose is clear, and when it is carefully designed to fit that purpose. The focus of this paper is on three distinct but inter-related purposes for classroom assessment: assessment for learning, assessment as learning, and assessment of learning. But next problem is time because it is difficult in the countries like India to reach each and every student for this assessment. E-assessment tools such as rubistar, Edpuzzle, Polls everywhere, testmoz etc. are very effective solution for this problem. In this paper review of all the e-assessment tools with guidelines of this tools to use in your classroom is presented.

Keywords: E-assessment, rubistar, Polls everywhere etc.

1. Introduction

To assist in the construction, delivery, storage or reporting of student assessment tasks, responses, grades or feedback. E-assessment can be undertaken with many devices, such as traditional desktop computers or laptops, with portable communication devices such as smart mobile phones, with digital devices such as iPads or through the use of electronic gaming devices. E-assessment can use multitude of formats, including text documents or portable document formats, multimedia formats such as sound, video or images; it can involve complex simulations or games; it can also be under taken by students in groups or individually and it can occur with large numbers of students in a synchronous or asynchronous manner. Teachers can use computers to construct their assessment tasks, to deliver these tasks to the relevant students and to record and provide feedback and grades to these students. Computers can also be used to analyse the students' responses, both to provide feedback to the student on the quality and relevance of their response, as well as to provide feedback to the teacher on whether the task can differentiate between students with different abilities. E-assessment can be used to test many different capabilities and skills that are developed by students. There are only a few tasks that might not be suitable for completing and recording electronically, but the number of such tasks is rapidly diminishing as technology becomes more sophisticated and widespread. In many disciplines laboratory equipment can be manipulated remotely and students can undertake real time physical performances that are able to be recorded and used for assessment purposes. We are quickly approaching the stage where our imaginations will be the limiting factor in designing e-assessment

There are four basic types of assessments you may set for students – diagnostic, formative, integrative or summative.

Diagnostic assessment is often the most underused of the traditional assessment formats in tertiary education and is too often associated with a negative model designed to identify deficiencies in students' capabilities (Benseman and Sutton2008). This situation should be changed so that diagnostic assessments are incorporated as an initial component in all courses and are seen as a means of encouraging students' ownership of their learning and assessment. Low stakes diagnostic tasks would establish a baseline for standards within a course; they would allow students to determine their preparedness for their current learning activities and allow teachers to adjust their introductory learning activities so that the majority of the students are able to participate at a meaningful level. Diagnostic assessment tasks also highlight for students the core principles and key concepts that are critical for the learning they are about to undertake.

Formative assessment tasks with timely and appropriate feedback should be used throughout a course; these tasks are primarily intended to have an impact on the current learning of students and most often use feedback to connect the formative task to potential improvements in student performance in subsequent summative tasks. It is usually posited that formative assessment is predominantly about improving learning, whether or not improvements are seen in subsequent summative tasks; however, students often view their performance in summative tasks as a measure of how much they have learnt within a course.

Summative assessment tasks are used primarily for progression and certification purposes, as well as a proxy measure of overall learning.

Integrative assessments are designed to promote and measure student self-regulation and the capabilities associated with lifelong learning (Crisp, 2012). Marks and grades could be used in integrative assessments as indicators of standards, even if they are not used to make decisions about progression and certification. Integrative tasks can be for formative or summative purposes. The advantage of identifying an assessment task as being integrative would be the highlight that the primary purpose of the task is to provide feedback (or judgement) on students' abilities to be self-regulated learners, that they are expected to identify and use standards and to apply their learning to future situations by being able to articulate their strategies or decisions in responding to a task or situation. Judgements and feedback on these integrative tasks can come from any combination of the teacher, the student or peers; the key characteristic of integrative assessment is that its primary purpose is to influence students' approaches to future learning.

Integrative assessments have the following characteristics:

- students are provided with opportunities to make judgements about their own learning or performance through review and critique;
- students are provided with opportunities to define standards and expectations in their response;
- students are provided with opportunities to track and analyse their approaches to responding to a problem, issue, situation or performance;
- students are provided with opportunities to integrate prior or current feedback into their response;
- students are provided with opportunities to engage with a meaningful task that has inherent worth beyond just an assessment activity;
- students are rewarded for the quality of their analysis of metacognitive abilities, rather than declarative knowledge.

2. E-assessment tools

There are many E-assessment tools available online which are very effective and efficient such as

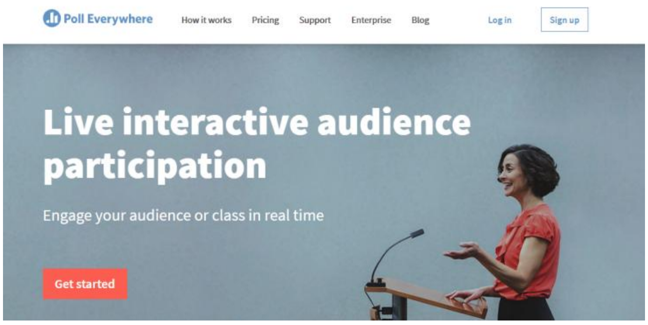
- Polls-everywhere
- Edmodo
- Edpuzzle
- Testmoz
- Rubistar

Present study will provide stepwise operating procedure of this tools.

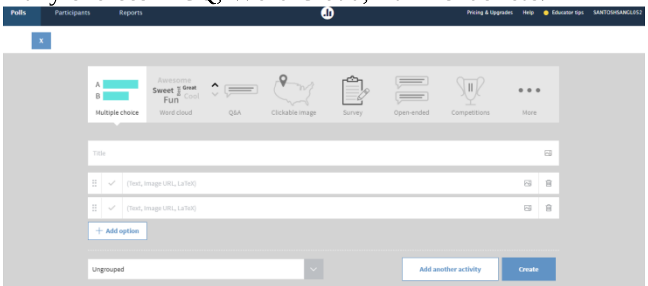
Polls-everywhere

Poll Everywhere is a free tool for creating questions for formative assessment during the class sessions. The teacher creates a poll (using variety of questions: MCQ, Word Cloud, QA, Rank Order etc.) The link of the poll is sent to students on wnatsapp or by email. They attempt the poll the result of which can be seen by all students on screen in the class immediately.

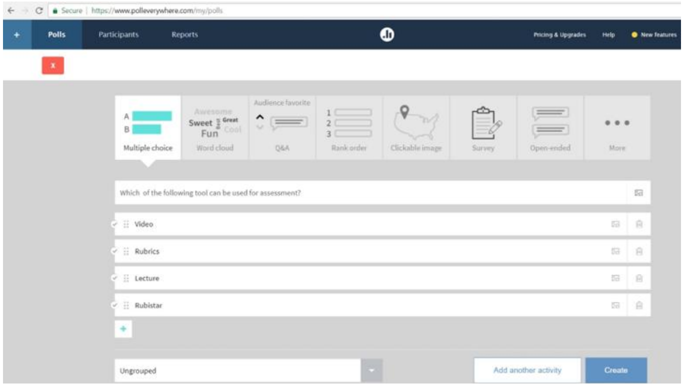
Step:1 Create an account on pollevery where Go to https://www.polleverywhere.com



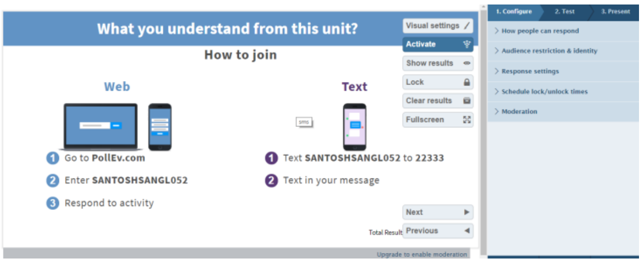
Step:2 Click on + sign for creating new poll There are many choices MCQ, Word Cloud, Rank Order etc.



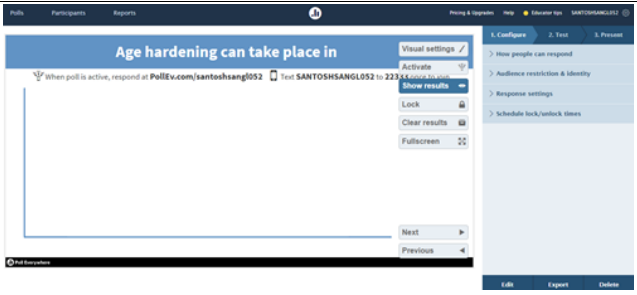
Step:3 MCQ is selected. Prepare question and add alternatives. Click on Create



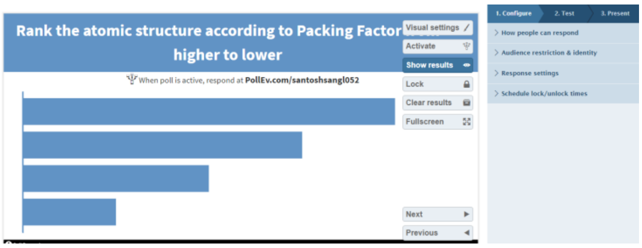
Step:4 Once created the Question looks like this. Link is created and shown on the top of the poll. Copy –paste and send to students



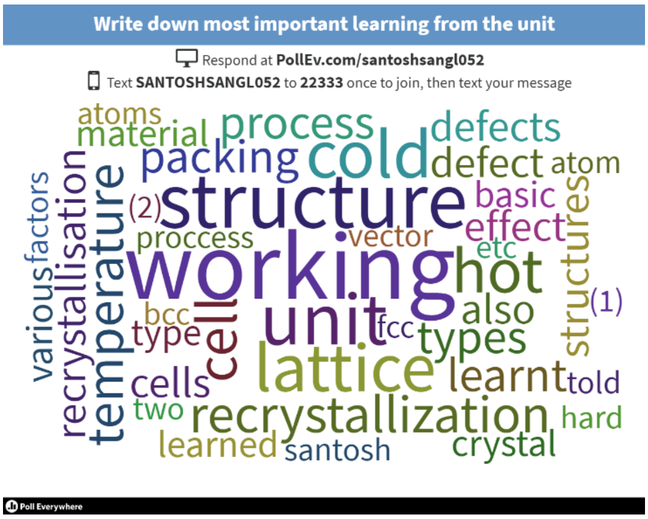
Step:5 Link is created and shown under "How people can respond" to the poll.



Step:6Once the link is sent to the students, activate the Poll.



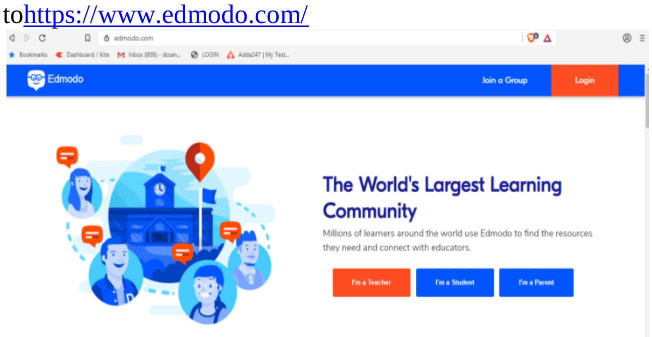
Step:7The Word Cloud created by student responses will look like this.



Edmodo

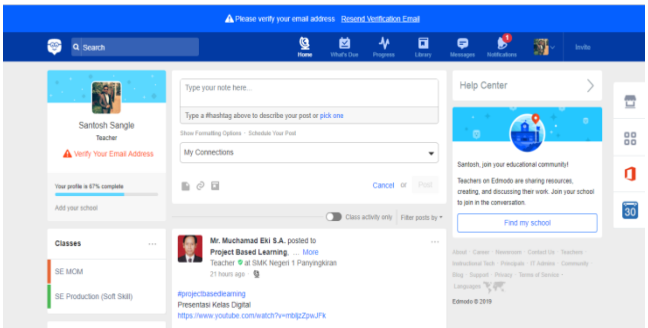
Edmodo is a free social learning platform that provides a safe way for teachers to communicate and engage with students, parents, and other teachers. On Edmodo, teachers are at the center of a powerful network that connects them with the people and resources they need to teach more.

Step 1 Create an account on Edmodo Go tohttps://www.edmodo.com/

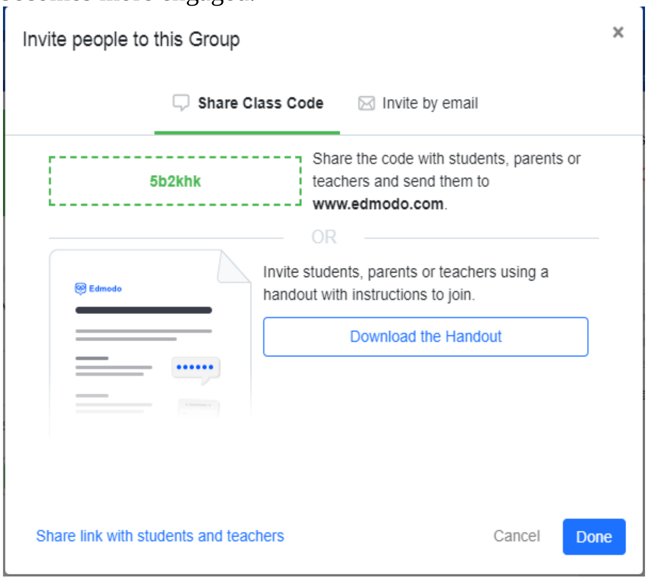


Fill out your teacher profile. Upload a photo, add office hours, and share a little about yourself with your students, parents, and colleagues

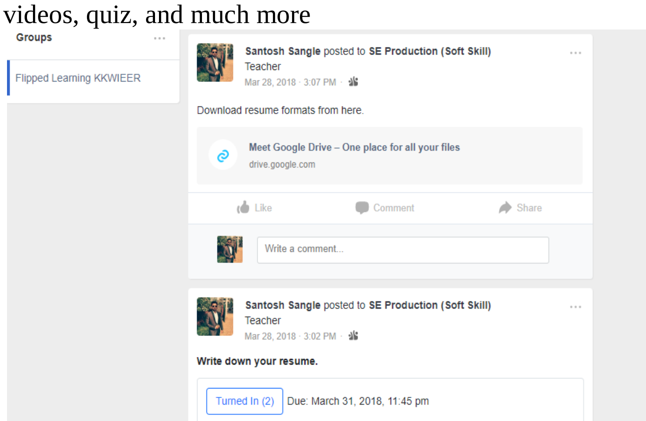
Step 2: Create a Class Classes on Edmodo are a great way to get your classroom connected and increase sharing, participation, and self-expression—all in a private, closed setting.



Step 3: Invite Students and Parents to Join Your Classes When students and parents join your Classes, everyone becomes more engaged.

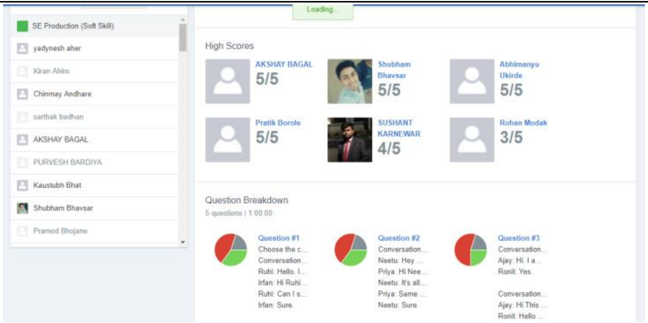


Step 4: Update the activity for student like share the videos, quiz, and much more



Step 5: See results of assignment and give comment on particular assignment to the student.

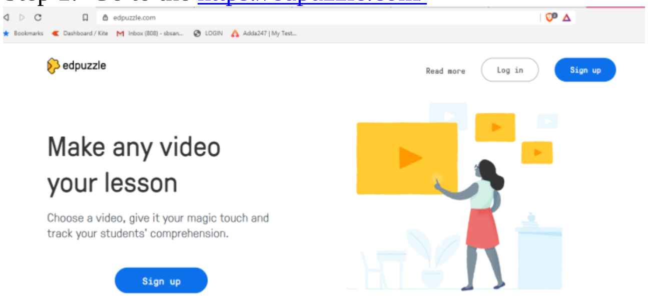
ISBN : 978-93-88441-93-3



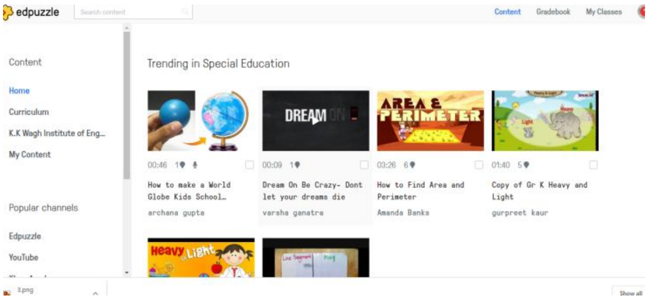
Edpuzzle:

Learning through the e content is very popular now a day. But assessment and engagement of student to the video lectures is typical problem. To solve this problem Edpuzzle is free platform available Make any video your lesson Choose a video, give it your magic touch and track your students' comprehension.

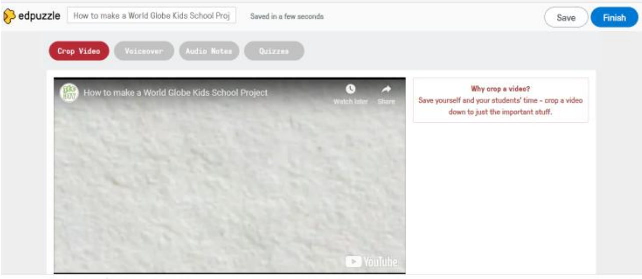
Step 1: Go to the https://edpuzzle.com/



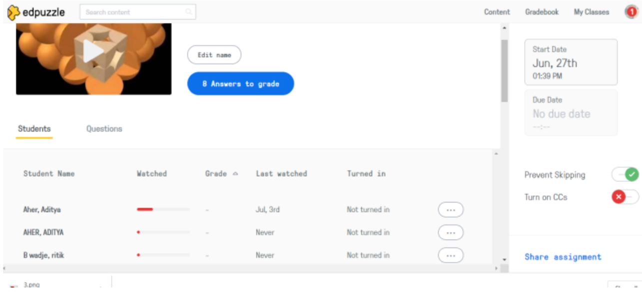
Step 2: select the video from the large number of resourses.



Step 3: Edit the video add your voice, add question in video, crop the main part of video and much more.



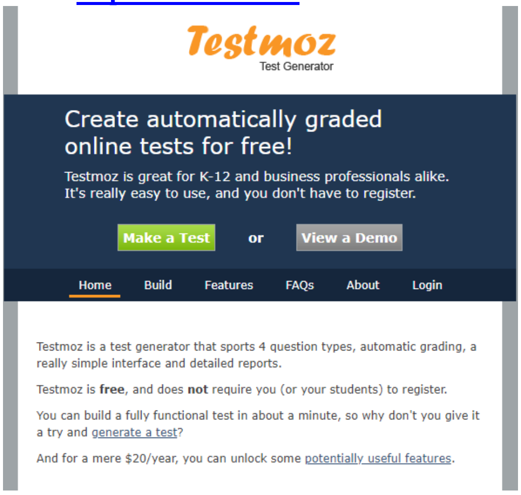
Step 4: Assign this video to the class and track the record of student by getting the result in different formats



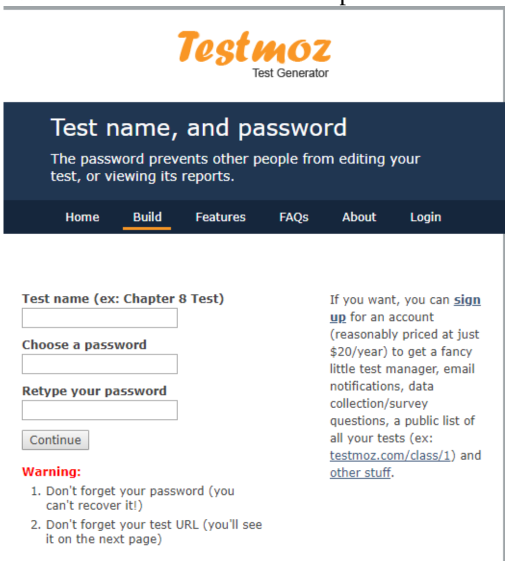
Testmoz

Testmoz is a free tool for creating quiz and administering it to students. It creates a Code for each Quiz and the user has to use that code. On submission, the teacher gets the report of each student's attempt and scores for each item in the quiz. It also creates a report of all students in the class for each question in the Quiz.

Step:1 Go to**https://testmoz.com**

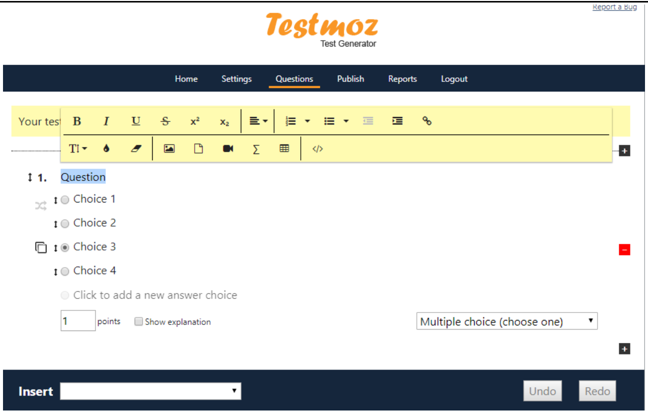


Step: 2 Write down the test name and password

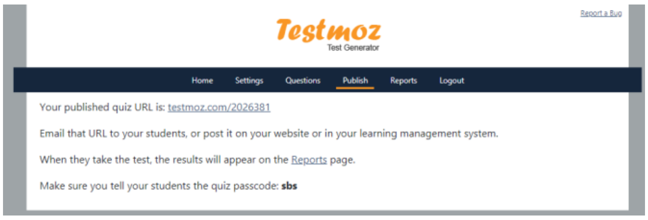


Step:3 Select the question type and Write down the questions Question types available:

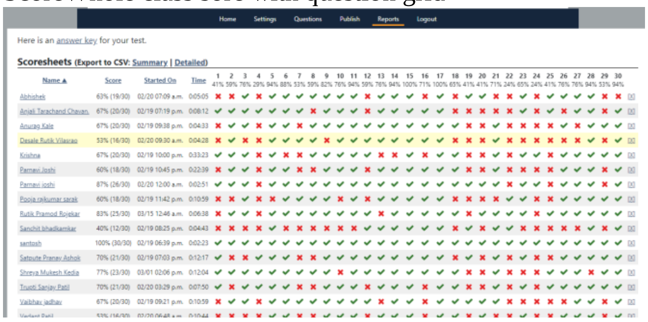
- MCQ
- True or False
- Filling the blank
- Diagram based questions etc.



Step: 4 Publish the Quiz The link with the code is sent to students

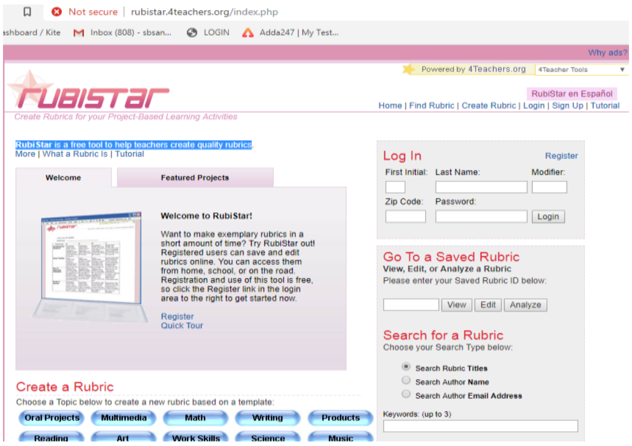


Step: 5 Report is generated in two parts Each Student ScoreWhole class sore with question grid



RubiStar

RubiStar is a free tool to help teachers create quality rubrics.



Step: 2 Search for a readymade rubric for assessing a content / skill from your subject. Share the link of that rubric on discussion forum in Moodle.

Conclusions

Assessment is a complex activity; meaningful, assessment requires effort on the part of the teacher and student. We can design assessment tasks that are easy to prepare and grade, or we can take the time to design an assessment thath as intrinsic worth for both the student and the teacher. E-assessment offers a range of potential opportunities and advantages for teachers, students and institutions, including:

Efficiency: Time lineness, Flexible delivery, Automatic processing response, Effective storage results and grades.

Effectiveness: Immediate feedback, Analysis of question validity, new question types.

Authenticity: Access to people and resources, can be design to simulate the real world, can set complex task.

Engagement: Multimodal formats, can use virtual world, can use self and peer review.

The quickest benefits to be gained from usinge-assessments are associated with diagnostic and formative tasks which provide detailed and timely feedback for students to use in a subsequent task. By requiring students to complete assessment tasks early in the course, you can highlight the key concepts that students must understand in order to build new learning experiences.

References

Abdulwahed, M., Nagy, Z. K., and Blanchard, R. (2008). The TriLab, a novel view of laboratory education. Innovation,

Good Practice and Research in Engineering Education. EE2008 Conference. Engineering Subject Centre, Lough borough, UK, 14-16 July, P051. Retrieved November 20, 2011, from http://www.engsc.ac.uk/downloads/ scholarart/ee2008/p051-abdulwahed.pdf

Ablin, J. A. (2008). Learning as problem design versus problem solving: Making the connection between cognitive neuroscience research and educational practice. Mind, Brain, and Education, 2(2), 52-54.

Aldrich, C. (2009). The complete guide to serious games and simulations. Somerset, NJ: Wiley.

Allen, E., and Seaman, J. (2010). Learning on demand. Online education in the United States, 2009. Babson Survey Research Group. Retrieved November 20, 2011, from http://sloanconsortium.org/publications/survey/pdf/learningondemand.pdf

Role of Information and Communication Technology to Improve Quality in School Education

Ghodam Srinivas[1], Venkat Rao Kursenga[2]
[1]M.A. in English, M.Ed, NET. Teacher at AHS Sports School Utnoor, (Telangana)
Mail: ghodamcnu@gmail.com
[2]M.A. in English Teacher at MPUPS Devapoor, Indervelly, (Telangana)
Mail:kvvenkyurdude@gmail.com
Track No: 1
Track Name: Different dimensions of Teaching-Learning

1. Abstract

Information and communication technology plays very vital role in the field of school education. ICT increases the quality of teaching and learning and it will enhance the listening abilities of students. This is the era of information and communication technology and with the help of information and communication technology school education rapidly changed. Information and Communication Technologies (ICT) can be an extremely powerful enabler in efforts to bring positive and sustainable development to countries around the globe. ICT can play a vital role in increasing access to education as well as providing better quality education. A study conducted by the International Institute for Communication and Development (IICD) indicated that 80% of its participants felt more aware and empowered by their exposure to ICT in education, and 60% stated that the process of teaching as well as learning were directly and positively affected by the use of ICT. The unprecedented speed and general availability of information due to ICT extends educational opportunities to marginalized and vulnerable groups. ICT gives students and teachers new tools with which to learn and teach. ICT can improve the learning process through the provision of more interactive educational materials that increase learner motivation and facilitate the acquisition of basic skills. The use of various multimedia devices such as television, videos and computer software can offer a more challenging and engaging learning environment for students of all ages.
KEY WORDS: Role, ICT, School education, teaching and learning.

2. Introduction

Today, everyone needs a basic understanding of ICT and how to make productive use of it, just to be good students, workers and citizens. Teaching people how to be competent basic users of ICT technologies is an important role of ICT education, so they will be successful in their academic and work careers, and so they can efficiently participate in modern technical society. Information and communication technologies (ICT) competencies are increasingly important for most of our employers, regardless of role. In the 21st century, an ability to work with information and communication technologies is becoming as essential to education, life and workplace success as "reading, writing and arithmetic".” ICT Digital Literacy should be considered a basic skill by educational systems, something taught to and assessed for all students.

3. Objectives

- **i.** To know about ICT
- **ii.** To discuss about impact ICT in school education
- **iii.** To discuss about advantages of ICT in school education.
- **iv.** To discuss about challenges of ICT in school education.

4. ICT

Information and Communications Technologies is becoming the global standard term for all computer, software and communications technology related fields. From a big picture perspective, which is important in developing policies or educational systems, it is useful to consider as one thing all of the closely interrelated, rapidly developing and converging fields related to computers, software, communications technologies and associated management practices In the U.S., ICT and its various sub-fields are called many different things, ICT educational departments have many different names and focuses, and there are important differences in ways ICT is taught, and in ways ICT degrees and certifications are packaged

5. Role and Importance of ICT in Education

A vibrant education sector is fundamental for developing human capital within countries. With an active and transformative education policy and a supportive infrastructure, the development of a knowledge-based population can apply itself to sustained and equitable growth. ICT can play a vital role in increasing access to education as well as providing better quality education. A study conducted by the International Institute for Communication and Development (IICD) indicated that 80% of its participants felt more aware and empowered by their exposure to ICT in education, and 60% stated that the process of teaching as well as learning were directly and positively affected by the use of ICT.

6. Increased Access to Education through ICT

ICT is used worldwide to increase access to, and improve the relevance and quality of education. The unprecedented speed and general availability of information due to ICT extends educational opportunities to marginalized and vulnerable groups. ICT gives students and teachers new tools with which to learn and teach. Geographical distance is no longer an obstacle to obtaining an education. It is no longer necessary for teachers and students to be in the same space, due to innovations of technologies such as teleconferencing and distance learning, which allow for synchronous learning. The Internet can also provide these groups with an abundance of online learning materials, covering a wide range of subjects that are up-to-date and produced by cutting-edge technologies. Thus, teachers and learners are no longer solely dependent on physical media such as printed textbooks which are often times outdated especially in the developing world. With today's technology, one even has the ability to access experts, professionals, and leaders in the field around the world at any given time.

7. Quality of Education through ICT

ICT can enable teachers to transform their practices by providing them with improved educational content and more effective teaching methods. Continuous teacher training in updating and enhancing their methodologies is critical to effective education policy and practice to keep pace with the constant advancement of technology. Through online teaching resources and other interactive educational materials, teacher development can be greatly improved. ICT can improve the learning process through the provision of more interactive educational materials that increase learner motivation and facilitate the acquisition of basic skills. The use of various multimedia devices such as television, videos and computer software can offer a more challenging and engaging learning environment for students of all ages. Twenty-first century education reform policy has been focused on a shift from the traditional teacher-centered pedagogy to more learner-centered methods. Active, collaborative learning environments facilitated by ICT contribute to the creation of a knowledge-based student population. In addition, ICT skills that come along with this shift in pedagogy are also useful for students hoping to transition into today's job market, which in many countries is increasingly demanding these skills. Developing a critical mass of knowledge workers with proficient ICT skills will greatly improve long term economic opportunities. Education leadership, management and governance can also be improved through ICT by enhancing educational content development and supporting administrative processes in schools and other educational establishments. By supporting management and reforming administrative procedures more effectively, ICT would serve as an incentive for leaders and staff at all levels to institutionalize its use. Clearly there is great potential for ICT to enhance education around the globe going forward

Challenges of ICT in Education

Unfortunately, many local, national and regional government bodies are still not giving ICTE the attention and priority it deserves despite the benefits it brings. Providing basic access to ICT to young people living in either impoverished communities or rural locations often neglected by policy makers is one major challenge being faced. These areas oftentimes lack basic infrastructure such as classrooms, let alone Internet connectivity. The availability of quality teachers to apply ICT to the existing education systems is also in short supply. Bringing long-term, sustainable ICTE reform will also be costly and will challenge policymakers handling national budget allocations to make difficult decisions in how to allocate national monetary resources and foreign aid. Finally, shifting the existing focus from the traditional educational models in place, depending on the specific country, to one that is ICT driven, will certainly not be easy. The following sections, using specific country examples, will discuss how these many challenges are being addressed, since learning from the experiences of others is necessary for policymakers hoping to successfully implement ICT in school education in the future.

8. Conclusion

Being aware of the significant role of ICT in our life, especially in the educational activities, education authorities should be wise enough in implementing the strategies to empower ICT in supporting the teaching and learning process in the classroom. ICT is not just the bloom of the educational activities, but also it will be the secondary option to improve the effective and meaningful educational process. The main purpose of the Strategy for Information and Communication Technology role in Education is to provide the prospects and trends of integrating information and communication technology (ICT) into the general educational activities. There are some unavoidable facts in the modern education; First, the ICT has been developing very rapidly nowadays. Therefore, in order to balance it, the whole educational system should be reformed and ICT should be integrated into educational activities.

References

1. Online References

- http://edtechreview.in/trends-insights/insights/813-role-of-ict-in-teacher-education-in-remote-areas-real-life-examples retrived on 16/06/2016
- http://www.unescobkk.org/education/ict/online-resources/features/ict-in-teacher-education/retrived on 16/06/2016
- http://www.infodev.org/articles/teachers-teaching-and-icts retrived on17/6/2016

- **Journals and books**
- Mishra, P., and Koehler, M.J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teacher knowledge. Teachers College Record, 108 (6), 1017-1054.
- Times of India (2007) It is Elementary, Editorial, Times of India, 18 December 2007

- Yusuf, M.O. (2005). An Investigation into Teachers Self-Efficacy in Implementing Computer Education in Nigerian Secondary Schools. Meridian: *A Middle School Computer Technology Journal*, Vol. 8, Issue 2.
- Maclkemenjima, D. (2005). E-Education in Nigeria: Challenges and prospects. Proceedings of the 8th UN ICT Task Force Meeting April 13-15, Dublin, Ireland.

2. Dictionaries

- http://dictionary.reference.com/browse/teacher retrived on 20/06/2016
- http://www.oxfordreference.com/view/10.1093/acref/9780199212064.001.0001/acref-9780199212064 retrived on 20/06/2016
- http://www.dictionaryofeducation.co.uk/retrived on 21/06/2016

Encashing Social Media in Teaching Learning

Sunil Kute[1], Sagar Suryawanshi[2], Suhas Pandit[3]

[1]Dean Academics K.K.W.Institute of Engineering Education and Research, Nasik.
[2, 3] Assistant Professor, Department of Civil Engineering, K. K. W. Institute of Engineering Education and Research, Nasik.
[1]sunil_kute@ rediffmail.com
[2]sagarsuryawanshi5088@gmail.com
[3]supandit@kkwagh.edu.in

Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: Post 1990 generation which can be termed as Google generation has borned with some special characteristics. These characteristics are unmatched with previous generation. Techno savy, extreme addiction of social media, eccentrically busy with screen time, different biological clock schedules, less attention span and lost interest in class room lectures are some of these characteristics which have posed serious challenges for the teachers to attract Google generation and engage them in classrooms.

Present paper shares some of the applications of social media which have resulted in overcoming the ill effects of special characteristics of Google generation and creating interest in its mind for active engagement in learning process.

Keywords: Google generation, Whats App, Face Book, You Tube, Mobile App

Introduction:

The human evaluation has taken place in stages and has history of more than five hundred crore years. On each stage, the next generation was placed with genetic modifications and special characteristics. Such modifications and characteristics resulted into intellectual, emotional and biological changes. These changes have created some positive and some adverse effects on next generations. The present generation has also, gone through these changes. In day to day teaching-learning process, in class room, these changes can be realized and experienced. The teachers have faced many problems and challenges while handling the class of Google generation.

On one front where the Google generation is blessed with characteristics such as techno-saviness, smart in using technology and deriving greater efficiency from cell phones, on other front, it is adversely affected by extreme addiction of social media, eccentrically busy with screen time, different biological clock schedules, less attention span and lost interest in class room lectures. This has created a dire need to overcome the adverse effects and posed the challenges to attract and engage the students in class rooms.

The situation demands to channelize the potential of Google generation in effective encashment for learning process.

The authors have tried some of the social media and cell phone based activities to tune the interests of Google generation for attracting them in learning process and same are shared herewith in following paragraphs…

2.1 WhatsApp

It can be verified that more than half the screen time is utilized by mobile phone users in WhatsApp. It is very difficult to stop or prevent the students from using WhatsApp, now days. Can we divert them from common messages to technical messages? It was decided in class room to perform an activity that every student will upload at least one definition on statement or principle or equation or discussion or explanation that has discussed in class room lecture on that day before going to bed. The students started uploading such technical messages on their class groups.

This has diverted their non-technical screen time into technical screen time. Some students started uploading the explanation in their own words with some mistakes. Others started correcting them. Some started adding value in uploaded messages. Each message from everybody has created a good message bank of about 70 technical messages read by 70 students thus, creating a reading impact factor 70 X 70 = 4900 hits/day. If this activity continues for all subjects, its impact will be enhanced by five times, considering five subjects per semester. The response of students for this activity was so great because teacher has not opposed them from using cell phone as usual but here the use of cell phone was promoted.

This has channelized there screen time in technical use which or otherwise would have been wasted in non-technical messages. Also, this has inculcated a habit in minds of students to revise the lecture at home. Some students improved their style of taking notes in class rooms, thereby writing even micro points so as to have something different and uncommon in their message than others.

2.2 Facebook

Majority of social media users are Facebook (FB) account holders. They spend significant time on FB out of total screen time in a day. The FB timeline provides latest updates like, messages, comments, shares, selfee etc. The Google generation is fond of referring FB frequently for checking own existence on its timeline. The addiction of FB has resulted into a new kind of psychological disease known as Fear Of Missing Out (FOMO). Just not to miss out from FB, the new generation students strive to maintain their existence on screen. This has kept them away from regular studies.

An attempt was made to divert the non technical screen time of students into technical time by opening dedicated FB account for teaching-learning process. A concept of 'e-assignment' was started in which all the students are required to upload / submit their assignments on their timeline. Since all the students of class are FB account holders of this special account, the submitted answers will be visible to all of them. This has created a nice learning platform.

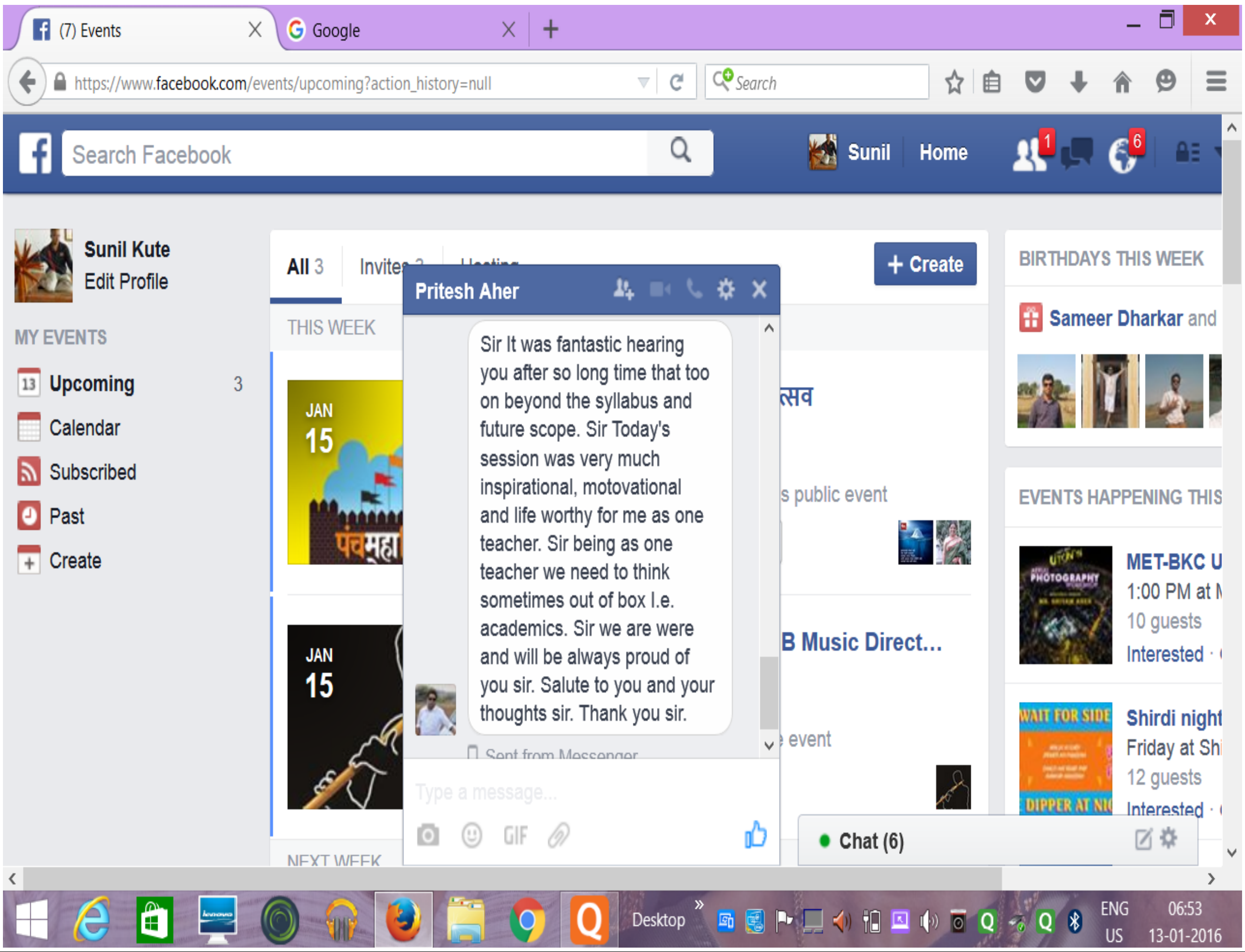
Everybody could observe the presentation of answers, mistakes in answers, the modifications in content and the subsequent discussions / comments on FB. The time of uploading the submission is displayed on FB. This has improved the transparency in submissions by knowing who is punctual and who is late. The race started for 'to be first' in submitting the answers. The conventional assignments submission which is considered as headache has now became an event for waiting to hit.

Besides the e-assignments, various competitions such as selfee which constructions sites, selfee with technical events (exhibitions, seminars, workshops, conference etc.) where launched. This has improved the spirit amongst the students to attend these events.

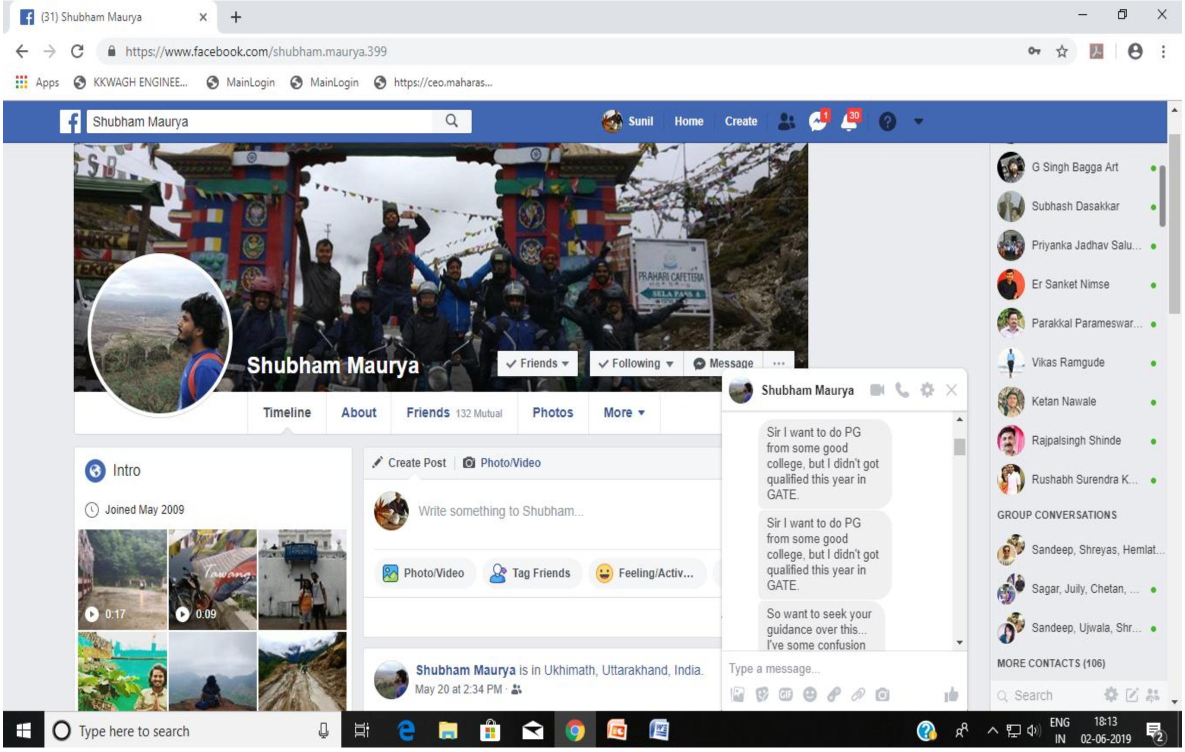
There are many sites on FB which share great videos of field related learning. A competition to share such sites has not only diverted non technical screen time of students in to technical but also, added a value in their filed knowledge. Having developed this habit, then the competition was oriented on sharing specific topic wise videos than general videos. The topic discussed on a specific day was the topic for competitions. This has produced the outcome of collections of good videos. This can also, be termed as Project Based Learning (PEB). The response of students to such FB activities was nice to improve the creativity of teachers to design / draft the assignment. This has further facilitated to develop a good video library.

Another aspect of Face Book as a discussion forum is equally promising. The students ask many difficulties through online chat platform of Face Book. These difficulties are related to technical topics, submission queries, placement doubts and career counseling. Some students who are shy in nature or who do not dare to interact face to face in the class room are blessed with this facility of online chat on Face Book.

Over and above, day to day teaching –Learning, a general account on Face Book facilitates to establish and maintain a sound network of alumni. It has also, a good potential in developing placement activities.



ISBN : 978-93-88441-93-3



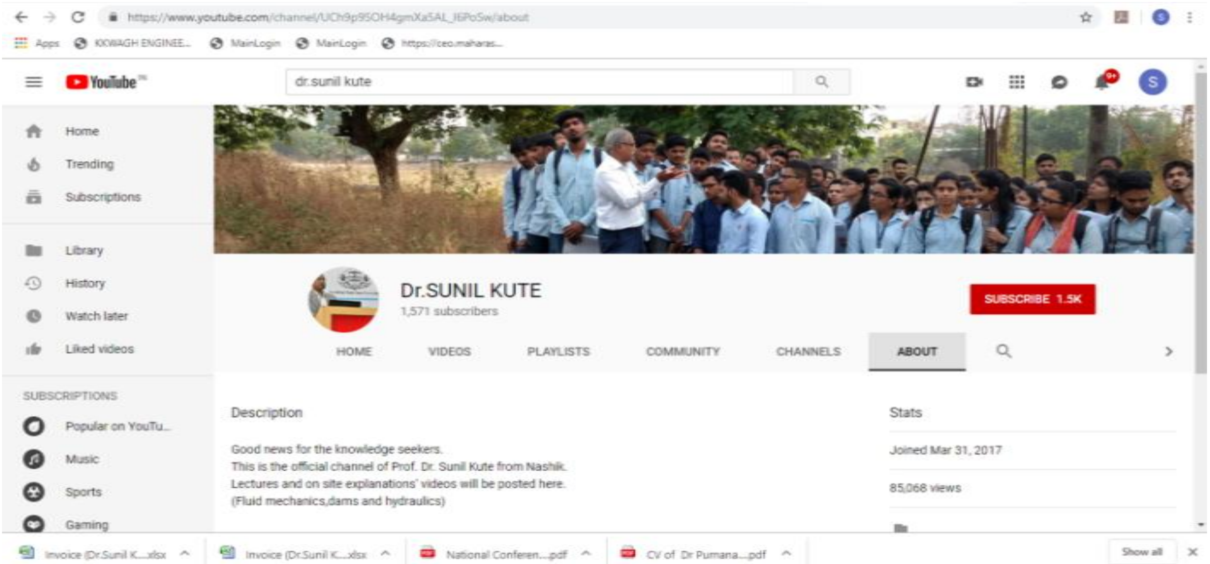
2.3 You Tube

This is one of the popular social media amongst the Google generation. Students spend their substantial time on You Tube. The class room lectures and site visit lectures were shoot and uploaded on You Tube. The students who cannot attend the class room lectures are benefitted due to these videos. This has also, opened an opportunity of interactions

And / questions-answers on You Tube platform.

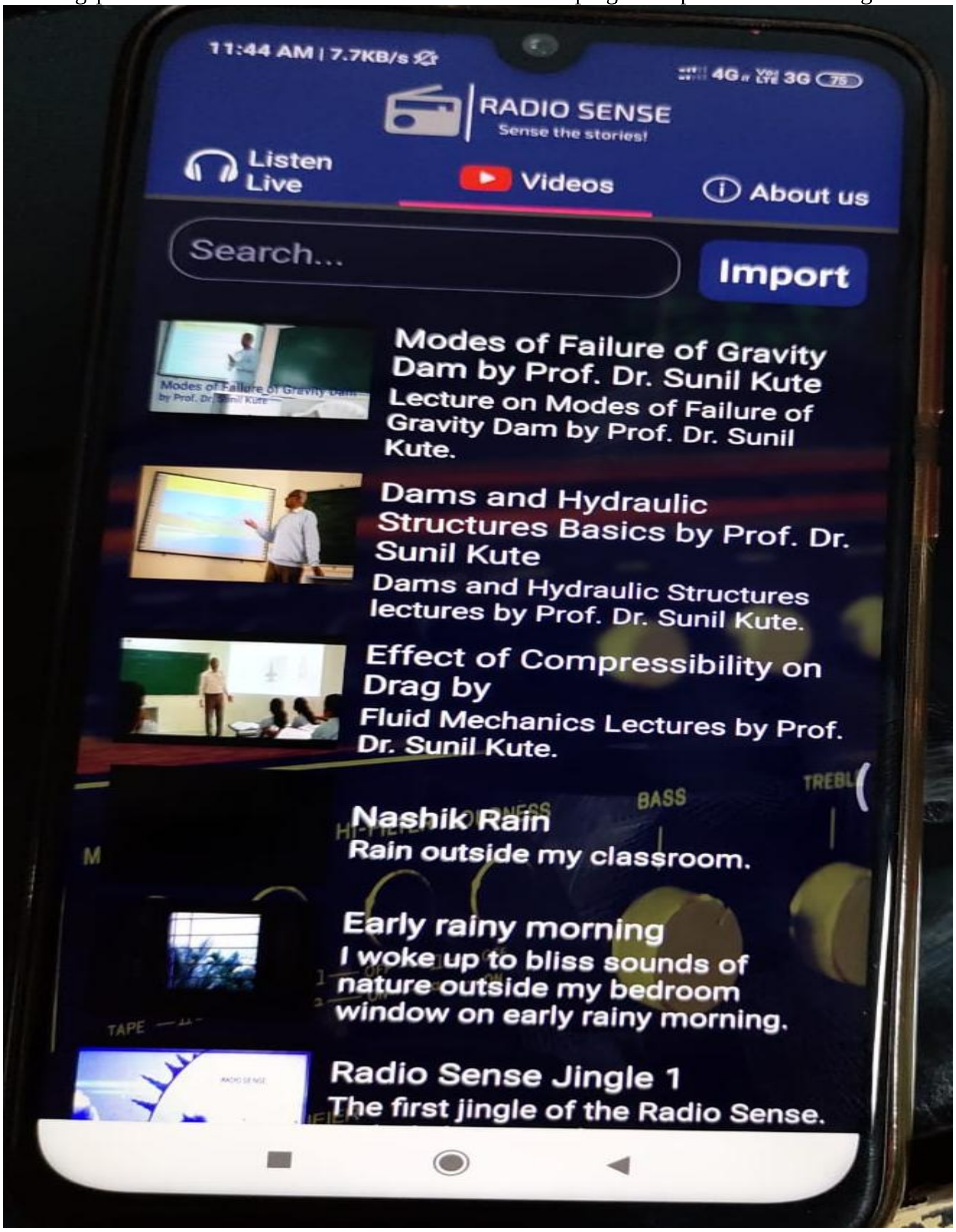
The competition of downloading good videos on a given topic has also, diverted non-technical screen time of students into technical screen time of students towards technical screen time. The prize winning videos were shown in class room during student activity hours and this produced a good outcome to touch the topics of “Beyond syllabus” nature. It is proposed in near future to shoot and upload the short presentations of about 2-3 minutes of the students on You tube.

These presentations will be based on the theme of “Conclude the lecture”. A lecture delivered by the teacher will be summed up in 2-3 minutes by students. This will improve attention of students in class and their summing skills. Such short presentations may provide a zest of a lecture within 2-3 minutes.



2.4 Mobile App

A mobile App is developed and it can be downloaded as www.radiosencelive.com where the class room lecture videos are uploaded. The Google generation prefers use of cell phone in learning process. Students listen and watch audio-video lectures on their cell phone as per their convenience. A particular topic which was not understood clearly in class room can be watched at home to clear the concepts. This app has produced significant outcome in developing conceptual understanding.



3.0 Conclusion

The addiction of social media has shifted the focus of Google generation from technical learning to non-technical engagements. With the help of some of the simple activities, the wastage of time can be channelized into fruitful technical learning. The output obtained from WhatsApp, Face Book, You Tube, and mobile app have resulted in improving the conceptual understanding of the topics and revision of the subjects. This has materialized with the inner choice and liking by the students without any compulsion.

Active Learning Classrooms: Effective Teaching -Learning

Vidya Kurtadikar[1,] Mamta Bhamare[2,] Laxmi Bhagwat[3], Vrushali Kulkarni[4,] Mangesh Bedekar[5]

[1,2,3]Assistant Professor, School of Computer Engg and Technology, MITWPU, Pune.
[4,5]Professor, School of Computer Engg and Technology, MITWPU, Pune.
[1]vidya.kurtadikar@mitwpu.edu.in
mamta.bhamare@mitwpu.edu.in
[3] laxmi.bhagwat@mitwpu.edu.in
[4] vrushali.kulkarni@mitwpu.edu.in
mangesh.bedekar@mitwpu.edu.in
Track No:1
Track Name: Different Dimensions of Teaching-Learning

ABSTRACT
Active learning is a way to actively involve students in learning process. This is learner centric process than traditional teacher centric process. Therefore teacher role changes from teacher to facilitator and role of student to active participant than mere listener. Active learning engages students in two ways – doing things and thinking about the things they are doing .It helps in increasing self-learning attitude of students. Participation of each and every student is necessary and therefore students more attention span is required than traditional learning process.
School of computer engineering and technology under MIT World Peace University encourages faculties to conduct active learning sessions. After conducting these sessions we have observed lots of changes in student's active participation in a class thereby improving their attendance.
Under active learning we have used flipped classroom concept. We have selected some topics for self learning and shared some good videos and other learning resources with students well in advance. Thereafter we have conducted activity in class. During this activity, group of three or four members are formed. Separate problem sheets are circulated among these groups and Teacher interacted with students and helping them to solve. The purpose of this paper is to share experiences of S. Y. B.Tech teachers after conducting active learning activities in their classes and also different ways of conducting these active learning techniques are discussed in detail in this paper. We have also shared feedback from students in this paper.

Keywords: Active learning, flipped classroom

1. Introduction

Active learning is a form of learning in which students' involvement is more in the learning than in other methods Any instructional method that involves students in the learning process is generally defined. In short, active learning requires meaningful learning activities for students and what they are doing. It involves students in two ways –doing things and thinking about the things they do. It helps to increase students ' self-learning attitude. Active learning's basic ideas can be traced back to John Dewey, Piaget, and maybe even Plato. The principles are basically simple. hey are designed to make the student more active in the learning process. This often involves (but not always) introspection, problem solving, worksheets, physical activity or group involvement [2]. Confucius observed this about learning more than two thousand years ago: I hear, I forget to see, I remember doing, I understand that Confucius believed that students learn best through active rather than passive involvement in the learning process. Over the ages, this perspective has received a lot of support [3].

2. Need of Active Learning

The literature of education usually quotes studies showing that when material is delivered using a single method its concentration limit is between 10 and 20 minutes, a small fraction of a lecture[1] Listening passively to a lecture can be useful in promoting learning at the lower end of a learning taxonomy such as ' remember ' and ' comprehend ' but is not as good in promoting higher-level skills such as ' apply, ' ' analyze ' and ' evaluate [1]'. There are different techniques to teach computer engineering courses. It very well may be done by perusing, composing, talking about, taking care of an issue, or reacting to questions that require more than truthful answers. This is important, because students who are passive have a decline in concentration after 10 -15 instant s in a 50 minute speech. Further, the act of acquisition is not passive. It helps in increasing self-learning mental attitude of bookman. Participation of each and every student is necessary and therefore scholar more attending twain is required than traditional learning process. These environments rework ancient learning environments into versatile zones which will simply adapt to maneuver the eye aloof from the front of the area to encourage additional collaboration and interaction each with the teacher and alternative students. They need a rethinking in room style each in terms of article of furniture and technology to support a range of modalities for learning together with little cluster work, teacher semiconductor diode discussion, pair work, etc.

Technology plays an important role in active learning, considering current generation's electronic gadget usage we have considered to use this positively as a learning tool. We have created our google classroom and created discussion forums to actively involve each student of a class. We have observed that it helped students which do not speak in big group have started participating on these forums.

3. Literature Review

Scott Freemana et al.[4] had meta analysed 225 students performance of undergraduate students in science, technology, engineering, and mathematics (STEM) courses to test traditional lecturing versus active learning. The results shown by the authors indicate that average examination scores by about 6% because of active learning and students performance with traditional learning deteriorated and students were 1.5 times more likely to fail. Authors evaluated the performance using two outcome variable: :(i) scores on identical or formally equivalent examinations, concept inventories, or other assessments; or

(ii) failure rates, measured as the percentage of students receiving D or F grade or withdrawal from course which in consideration. They mainly focused on two related questions. Does active learning boost examination scores? Does it lower failure rates?

Richard Pierce et al.[5] implemented a "flipped classroom" model for a renal pharmacotherapy topic module and assess the impact on pharmacy students' performance and attitudes. Students viewed vodcasts (video podcasts) of lectures prior to the scheduled class and then discussed interactive cases of patients with end-stage renal disease in class. A process-oriented guided inquiry learning (POGIL) activity was developed and implemented that complemented, summarized, and allowed for application of the material contained in the previously viewed lectures. According to authors assessment students' performance on the final examination significantly improved compared to performance of students the previous year who completed the same module in a traditional classroom setting. Students' opinions of the POGIL activity and the flipped classroom instructional model were mostly positive.

So, they concluded that implementing a flipped classroom model to teach a renal pharmacotherapy module resulted in improved student performance and favorable student perceptions about the instructional approach. Some of the factors that may have contributed to students' improved scores included: student mediated contact with the course material prior to classes, benchmark and formative assessments administered during the module, and the interactive class activities.

Kuniaki YAJMA et al. [6] suggested that for AL sufficient learning environment should be produced instead of the traditional one of static desk and chair. A teacher stands in front of the classroom, and gives them a lecture, Students are the style that sits down. It's the problem that maintenance of the environment is important to perform the lecture of the active learning style into effect efficiently.

Improvement of the environment is needed to put the lecture of the AL type into effect. Such learning environment should be offered with priority. But for this to be effective time and the cost of the money may be a problem for implementation. So, authors did the improvement of the learning environment, in low cost, and worked on the problem solving performed by a short time. They suggested that they cooperated with students to produce their AL classroom. Work of environmental improvement is PBL for a student. This improved student's motivation. Students proposed newly during a this PBL.

In this paper, authors have gathered activity with PBL. They introduced a usage example in the maintained classroom. They were convinced that this paper is useful for maintenance in the future's AL classroom , regarding an environmental construction for AL, with adopting as a process of solving a problem, it also confirmed that students are actively able to work on. It is significant to resolve the problem by making the most of an idea without a specialized knowledge (e.g. software development). In addition, it demands to education to the rivalry is suppressed, it is effective for student's motivation that everyone could share things which is approaching completion. Authors would work on an environmental construction in a college with students.

Lenis Saweda Liverpool-Tasie et al.[7] showed that how group characteristics (e.g., group size) affect learning outcomes. Consequently, this article explores how group characteristics affect learning. Authors have leveraged a random assignment of students into groups of predetermined sizes to explore the effect of group size on learning outcomes in an undergraduate economics class. Though confirming the benefits of collaborative learning, their results indicate smaller group sizes (i.e., groups of about 5 or 6 members) are preferred to enhance learning, in our study context. They also found group learning effects tend to be limited for students with cultural and/or language barriers that limit participation. This is an important consideration for many US institutions with increasing enrollments of international students, particularly from Asian countries. However, the fact that they are still able to detect a statistically significant improvement in scores on average among students after the group discussion which varies with group size and student characteristics (knowledge and race) is important. It indicates that group learning is important and heterogeneous across group and student characteristics. However, a replication of this study in other contexts, for other group sizes and in other disciplines, to see how much these results are maintained would be informative. Furthermore, more deliberate attempts to investigate if students with cultural and/or language barriers benefit less from peer instruction methods in other contexts, and identifying the reasons why this might obtain would also be useful to many US institutions of higher learning.

Fabio R. Aric`o, et al. [8] offers a reflective discussion of recent developments in active learning pedagogical approaches, with a focus on class-flipping and peer instruction. We present two case studies based on the experience of the authors in promoting active learning in two large-class undergraduate modules in Introductory Macroeconomics and Descriptive Inorganic Chemistry at the University of East Anglia.

Both case-studies are based on a flipping model with in-class active learning delivered through peer instruction. In the Introductory Macroeconomics case-study, we discuss how combining peer instruction with a self-assessment component can support the development of students' metacognitive skills. In the Descriptive Inorganic Chemistry case-study, which demonstrate that peer instruction questions can be co-designed in partnership with students to foster engagement and challenge misconceptions. Authors argue that peer instruction can be used as an effective, scalable, and easily adaptable active learning pedagogy in many different learning environments. Reflecting on their experience, as well as the student voice, the concluding discussion considers: (i) the importance of careful question design, (ii) the role of audience response technologies, as well as (iii) present and future challenges to the promotion of active learning approaches in Higher Education.

However, teaching through pedagogies such as peer instruction requires considerably more time for a given topic. This should lead to careful reflection on the case for including each component of a course. In many instances, time can be freed for active learning by sacrificing insignificant parts of the syllabus. When content has been cut to the essential, and there is still insufficient time, then flipping provides an answer. There is no single pedagogy for flipping, but the uniting principle is the drive to move the content delivery component out of the classroom and to free contact time for constructivist pedagogies.

Satish Sharma et al. [9] researched on a group of 222 undergraduate finance students completed a questionnaire focusing on their opinions of the financial trading room (FTR),. An exploratory factor analysis identified six statistically related factors capturing student perception of Enhancement and Satisfaction, Networking, Relevance, Resistance, Proficiency and Product Creation. There are high levels of student agreement regarding the overall usefulness of the FTR in absolute terms and this is strongly associated with the factors Enhancement and Satisfaction and Product Creation. The identified student-held FTR perceptions can potentially inform future teaching practice and associated curricula, identifying the extent to which integration of theory takes place and the student perceived FTR value as an effective deliverer of experiential learning and enhanced preparedness for graduate employment.

4. Proposed Methodology

Active learning is a form of learning in which teaching strives to involve students in the learning process more directly than in other methods. in particular, students must engage in such higher-order thinking tasks as analysis, synthesis, and evaluation[10]. Active learning engages students in two aspects – doing things and thinking about the things they are doing activity it is learner-centered, not teacher-centered, and requires more than just listening; the active participation of each and every student is a necessary aspect in active learning Under different types of active learning we have selected flipped classroom activity. Flipped classroom reverses traditional learning environment. In a flipped classroom, students watch online lectures, collaborate in online discussions, or carry out research at home while engaging in concepts in the classroom with the guidance of a mentor.

Flipped classroom is a learner-centered model designed in such a way that time in the classroom is used to explore topics in greater depth thereby creating meaningful learning opportunities while students are initially introduced to new topics outside of the classroom. Amongst all one of content delivery method can be video lessons prepared by third parties. It has been shown that the ideal length of the video lesson to be is eight to twelve minutes [11][12][13]

Among different class activities we find concept practice as suitable method for our course, Data Structure - II, which is one of core subject for Second Year students from School of Computer Engineering and Technology at MIT World Peace University. In this course we can select one or more topics such that more time can be spent in class on higher-order thinking skills such as problem-finding, collaboration, design and problem solving as students tackle difficult problems, work in groups, research, and construct knowledge with the help of their teacher and peers.14]

We have proposed two different phases for flipped classroom. These two phases are explained in detail as shown in Table 1.

a) Activity preparation

Table 1:Task List

Tasks List	Task Description	Duration
1. Topic finalization	**Selected Topic:** Dijkastra's Single source All destination shortest path algorithm **Problem statement :** Given a directed weighted connected graph with nonnegative weights Find shortest path along with its weight from source vertex to all	2/3 Days

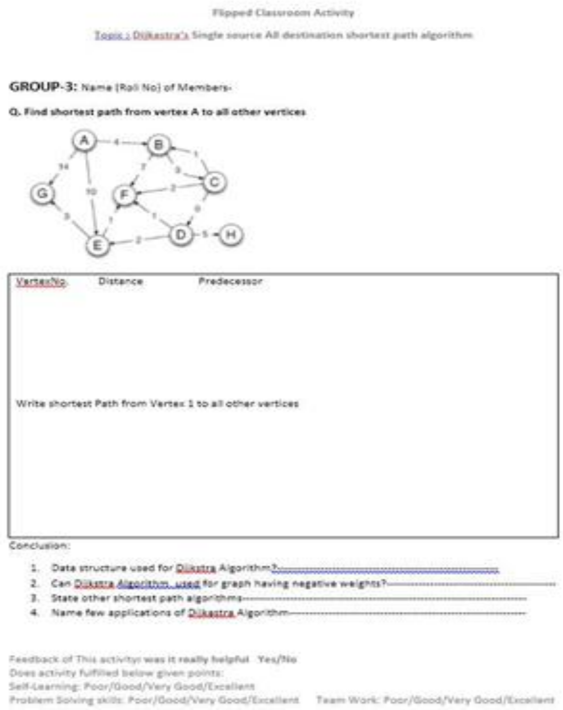
	other vertices **Input:** directed/weighted connected weighted graph with nonnegative weights and a source vertex **Expected output :** Find shortest path along with its weight from source vertex to all other vertices	
2. Deciding on outcome of flipped classroom	Problem Solving, tackle difficult problems, work in groups	1 day
3. Searching on videos		2/3 days
4. Student orientation and Video Sharing		30 minutes
5. Estimating total groups and Preparing problem statements for each group		1/2 Days

b) Activity Conduction

A group activity was conducted in a lecture with duration of 45 minutes to 60 minutes. Groups were formed with at most four students. Following outcomes were expected at the end of activity: problem solving, tackling difficult problems of similar kind, work in groups. Total No. of groups: 13

Total Mentors required : 2

Each group consists of group representative and group members


Flipped Classroom Activity

Topic : Dijkastra's Single source All destination shortest path algorithm

GROUP-3: Name (Roll No) of Members-

Q. Find shortest path from vertex A to all other vertices

Vertex No. Distance Predecessor

Write shortest Path from Vertex 1 to all other vertices

Conclusion:

1. Data structure used for Dijkstra Algorithm?
2. Can Dijkstra Algorithm used for graph having negative weights?
3. State other shortest path algorithms
4. Name few applications of Dijkastra Algorithm

Feedback of This activity: was it really helpful Yes/No
Does activity fulfilled below given points:
Self-Learning: Poor/Good/Very Good/Excellent
Problem Solving skills: Poor/Good/Very Good/Excellent Team Work: Poor/Good/Very Good/Excellent

Fig.1 Sample Activity Sheet

After actual conduction of activity Group representative along with his/her team members come with a solution and answered following questions related to activity as given in Table 2.

Table 2: Learning outcomes

1.	Data structure used for Dijkstra Algorithm?
2.	Can Dijkstra Algorithm used for graph having negative weights?
3.	State other shortest path algorithms
4.	Name few applications of Dijkastra Algorithm

Also following feedback shown in Table 3 was also filled by them that will help us to plan such more activities in future in a better manner.

Table 3: Feedback of activity

Questions	Possible Answers
Was it really helpful	Yes/No
Self-Learning:	Poor/Good/Very Good/Excellent
Problem Solving skills:	Poor/Good/Very Good/Excellent
Team Work:	Poor/Good/Very Good/Excellent

5. Results

a) Learning outcomes

After actual conduction of Activity, we have compiled solution generated by students and activity feedback to get learning objectives mentioned in Table 2

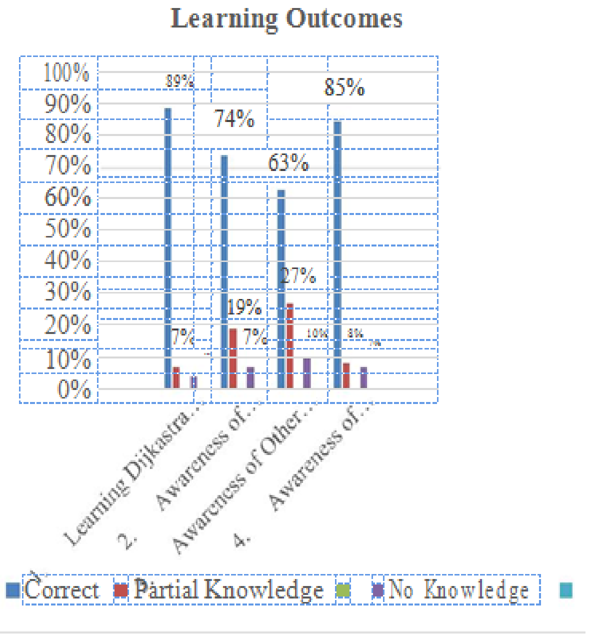
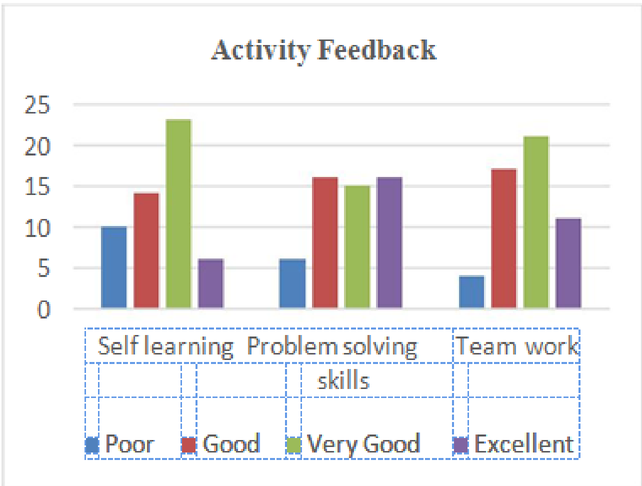


Fig.2 Measuring Learning Outcome

b) Activity Feedback

We have also complied feedback of actual activity and we got following results



6. Conclusions

Active learning is a learner centric process than traditional teacher centric process. We have conducted flipped classroom activity under this. As a result of that we have achieved most of learning outcomes under the given topic. We have also observed that students have enjoyed active learning sessions under flipped class room which is very clear from activity feedback. Flipped classroom initiated self-learning as well as developed their problem solving skills. Students have also learned to work in team and also learned from peers. Students were demanding to keep such more activities. It helped in increasing self-learning attitude of students. We as a teacher are encouraged to use more techniques under active learning which will be suitable and appropriate for coming generations.

REFERENCES

[1] Jess Gifkins," What Is 'Active Learning' and Why Is It Important?", Oct 8 2015.

[2] A. Budd, Timothy. (2006). An active learning approach to teaching the data structures course. ACM Sigcse Bulletin. 38. 143-147. 10.1145/1124706.1121388.

[3] C. L. Gunn and J. Raven, "Smart education: Introducing active learning engineering classrooms in the Middle East," *2017 Fourth HCT Information Technology Trends*

(ITT), Al Ain, 2017, pp. 1-4. doi: 10.1109/CTIT.2017.8259556

[4] Active learning increases student performance in science, engineering, and mathematics
Scott Freemana,1, Sarah L. Eddya, Miles McDonougha, Michelle K. Smithb, Nnadozie Okoroafora, Hannah Jordta, and Mary Pat , Psychological and Cognitive Sciences, Pnas Early Edition.

[5] Vodcasts and Active-Learning Exercises in a "Flipped Classroom" Model of a Renal Pharmacotherapy Module
Richard Pierce, EdD, and Jeremy Fox, Pharm D Bernard J. Dunn School of Pharmacy, Shenandoah University, Winchester, VA, American Journal of Pharmaceutical Education 2012.

[6] Construction of Active Learning Environment Kuniaki Yajma*, Yoshihiro Hayakawa, Yashuhiro Kashiwaba, Akiko Takahshi and Seishi Oiguchi, 2016.

[7] Collaborative Learning in Economics: Do Group Characteristics Matter? Authors: Lenis Saweda Liverpool-Tasie, Guigonan Serge Adjognon, Aaron J. McKim PII:
S1477- 880(18)30103-8, International Review of Economics Education (2019),
https://doi.org/10.1016/j.iree.2019.100159DOI:
https://doi.org/10.1016/j.iree.2019.100159.

[8] Title: Facilitating active learning and enhancing student self-assessment skills Authors: Fabio R. Aric`o, Simon J. Lancaster PII: S1477-3880(18)30046-X, International Review of Economics Education (2018),
https://doi.org/10.1016/j.iree.2018.06.002.

[9] How do students conceptualise a “real world” learning environment: An empirical study of a financial trading room? Satish Sharma A, Ian Charity B, Andrew Robson B, Simon Lillystone B

[10] Renkl, A., Atkinson, R. K., Maier, U. H., and Staley, R. (2002). “From example study to problem solving: Smooth transitions help learning”. Journal of Experimental Education, 70 (4), 293–315.

[11] Abey Sekera, Lakmal, and Phillip Dawson (2015). "Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research." Higher Education Research and Development 34(1), 1-14.

[12] Marco Ronchetti (June 2010), "Using video lectures to make teaching more interactive", International Journal of Emerging Technologies in Learning (iJET)

[13] Greg Topp, "Flipped classrooms take advantage of technology", USA Today

[14] Bennett, B., Spencer, D., Bergmann, J., Cockrum, T., Musallam, R., Sams, A., Fisch, K., and Overmyer, J. (2013). "The flipped classroom manifest".

Crossword Puzzle: An Effective Teaching Learning Method

Prof. Namrata M. Pagare[1], Prof. Monali P. Mahajan [2]

[1]Department of Computer Engineering, KKWIEER, Nasik
[2]Department of Computer Engineering, KKWIEER, Nasik
[1]nmpagare@kkwagh.edu.in
[2]mjmetkar@kkwagh.edu.in
Track No: 1
Track Name: Different dimensions of Teaching-Learning

Abstract: There are various methods carried out for improving involvement of students in teaching learning process. One of the interesting methods used to improve students interest in specific course is Crossword puzzle. It is puzzle game consisting of squares or rectangular grids. In this method, the squares are filled with words, phrases according to the clues. Aim of this is to improve brains ability, motivate students to actively participate in teaching learning process, increase interest and enhance the retention of capability of course material. To achieve the objective students were given questions for which answers are filled in the across or down the squares for the topics which require remembering and understanding of the course. From the results it was been observed students were significantly able to retain the information during examinations and there was improved interest in the subject. So, this paper focuses on how this method helped students to increase their learning ability.

Keywords: Puzzle, remembering, understanding

17. Introduction

In recent years, the teaching learning process is drastically changing. The process has been incorporating various methods to improve interest and enhance the learning by introducing puzzles and games. The traditional puzzles which were initially used for relaxation or for passing time while idling has moved over to an effective method for sharpening brains ability, engaging and for increasing knowledge etc.

Due to effectiveness of crossword puzzle, this method is included in education for retention of course material and making learning enjoyable. So, crossword puzzles' is blend of the gaming aspect and learning which helps to encourage students in their learning process.

There are various types of crossword puzzles. Crossword grids as shown in Fig. 1 are which appears in North American newspapers and magazines consisting of solid areas of white squares. Every letter is verifies as a part of both an "across" word and a "down" word and typically every answer should contain at least three letters.

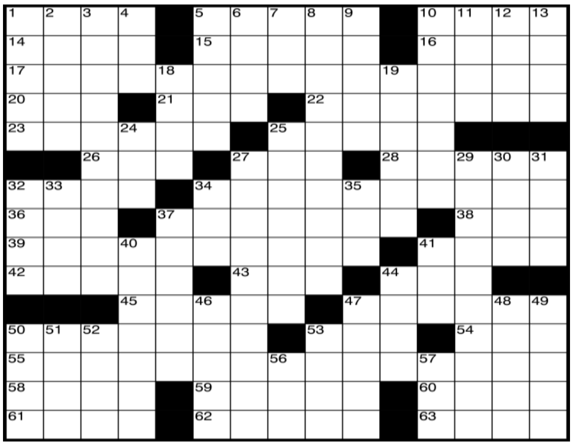


Fig. 2American Style Grid [4]

Crossword grids in countries like Britain, South Africa, India and Australia, have a lattice-like structure, with a higher percentage of shaded squares leaving about half the letters in an answer unchecked as shown in Fig. 2.

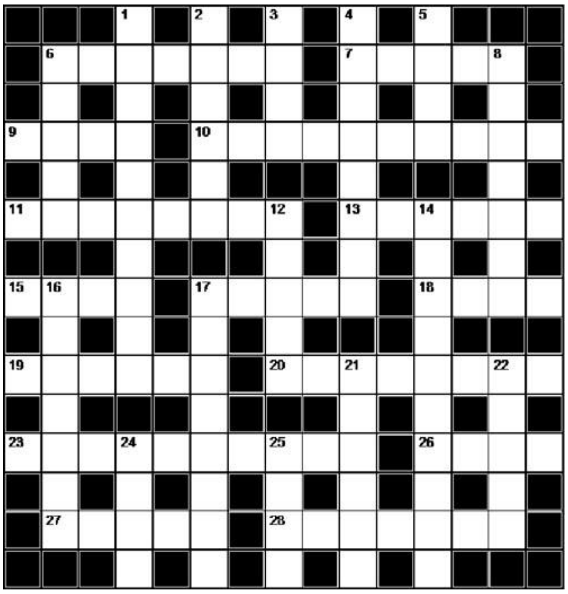


Fig. 2 British/South African-style grid [4]

In Japanese crossword grids have two extra rules: that shaded cells may not share a side and that the corner squares must be white as shown in Fig. 3.

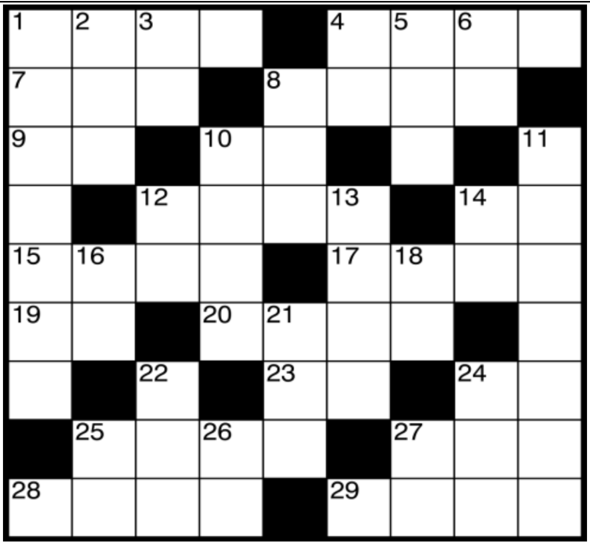


Fig. 3 Japanese-style grid [4]

Another form of crossword as shown in Fig. 4 is barred crosswords, consisting of bold lines between squares (instead of shaded squares) to separate answers, and circular designs, with answers entered either radially or in concentric circles.

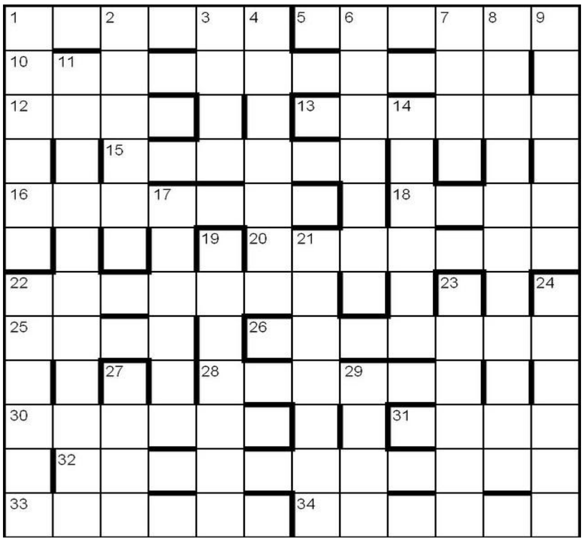


Fig. 4 Barred grids [4]

Thus crossword is an innovative teaching learning method which can be used in various disciplines because of its versatility and flexibility. As crossword is considered as Recreational activity, hence making teaching learning more enjoyable.

18. Related Work

Arthur Wynne a journalist from Liverpool, initially published crosswords on December 21, 1913. Crosswords, which were primarily intended for entertainment for readers who subscribed to national dailies, shortly turned into a nation wide trend in the US. The Times Crossword is one of the most prominent puzzles available. However, the crosswords which were proposed for fun pastime turned into a teaching learning tool as discussed in later section.

Roderick Lottering, Robert Hans and Manoj Lall [1] have reported following advantages like increased students interests in course material, improvement in student's marks, and enhancement in critical thinking skills of the students. A comparative analysis of the performance of two groups of students registered for a particular subject were performed to observe the effect of using crossword puzzles as a means of assessment. To achieve this objective one group was accessed using crossword puzzles and the other one was assessed using the traditional methods. But, none of the groups were subjected to crossword puzzles during the teaching of the subject. The results indicated that the students who were assessed using crossword puzzles performed significantly well than the other group. So it was inferred that crossword puzzles may be used as an assessment tool. In this paper, it has not only confirmed findings of other similar studies regarding puzzles improving students' performance but also indicated that 'conventional' assessment techniques may be substituted at any given time with puzzles.

A R Jobin, Anand G Menon, Ashwin Sekhar and Vinay Damodaran [2] goals to implement a crossword solver, which supports the user by providing a solution set to a given clue, by applying knowledge-based concepts of NLP. The challenges that are faced by NLP is being able to determine the meaning and essence of a sentence which may have multiple variations of syntax and semantics. Crossword solving utilizes the knowledge one has over the language and applying it with the various constraints that a clue will provide. The solver provides the user with apotential solution set which contains a collection of words out of which the user may choose the answer which he or she feels is most appropriate. Thus, the entire crossword can be solved by using the knowledge obtained from natural language processing, and this method stays true to the essence of crossword solving.

Dr. Joan Bryant [3] used crossword puzzles to teach undergraduates as it develops the interest and brings change in the dull routine lecture for human physiology. He designed a simple crossword on the Physiology of He most as is with clues given "across" and "down", using TheTeachersCorner.net crossword maker website. A one hour lecture was given and the concepts were then tested in the crossword after appropriate instructions to the students [3]. Students Feedback was collected after the conduction of the crossword. It was observed maximum of the students agreed that the use of the crossword was fun and an innovative method of teaching. Also many students concluded that it helped them in learning the new terminology and understanding the concepts and that they wanted more of such games.

19. Design and Implementation

Crossword is helpful in many ways. Crossword can be designed for technical and non-technical subjects. In

curriculum crossword increases interest of specific topic in that course. Some of the courses in curriculum are hard from student's point of view.
To motivate students for studying this subject crossword puzzles are really very helpful.

To design crossword puzzle following steps can be used:

1. Prepare a list of words for designing crossword puzzle
Here select the words according to a topic of your interest. These words can be related to technical or non-technical topics as shown in Fig. 5.

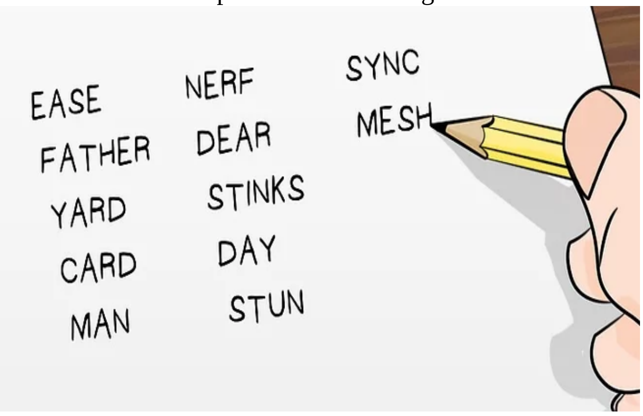


Fig. 5 List of Words [4]

2. Put the words in a grid format as shown in Fig. 6.
This part of preparing crossword is challenging same as actually solving a crossword.
Some of the important points for this step are as follows:

a. While putting words unused squares can be filled out
b. Grid having only words without filled squares can be made.
c. There should not be spaces between the words
d. Words are to be generally filled with capital letters
e. Words should not include punctuation marks
f. No repetition of words

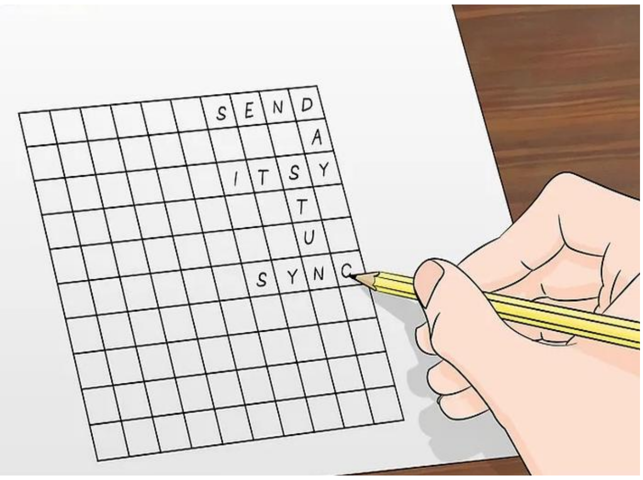


Fig. 6 Grid [4]

3. Number each word in grid
To do this step, as shown in Fig. 7, unique number should be given to each word in the grid.
This numbering should be done in such a way that they will match clues with ACROSS and DOWN.
Numbering can be given horizontally or vertically.
Remaining blocks in a grid can be filled with black color.

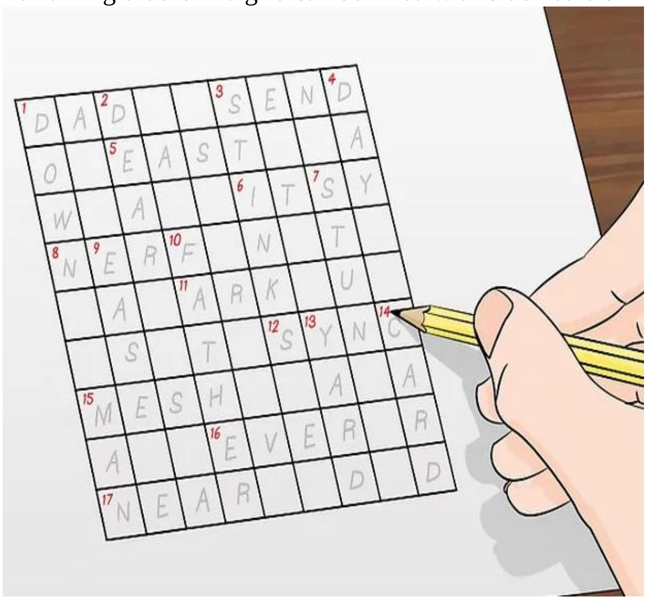


Fig. 7 Grid with words [4]

4. Creating clues for ACROSS and DOWN
To perform this step, following ways can be used
a. Start with quick clues: These are referred as "straight" clues which are easiest to write, for example:
Cat baby = KITTEN
b. Indirect clues: These rely on lateral thinking.
c. Cryptic Clues
5. Organizing the clues in list format

After making clues, number them according to their position in grid.
This numbering should be in a such a way that all the ACROOS clues should be together in ascending numerical order and all DOWN clues should be tighter in ascending numerical order.

Let us take example of technical crossword we designed for second year computer engineering students for the course Microprocessor.
Microprocessor is basic course in computer engineering branch, which is required for lifelong learning. Among various microprocessors, study of 80386DX microprocessor is considered.

Even if there are daily advancement in microprocessors but basic concepts remains same and hence this course is having great importance in curriculum.
Following are the objectives to give crossword puzzle for this course:

11. To enhance verbal skills
12. To improve ability to find words
13. To improve memory and brain function
14. To enhance problem solving skills

15. To improve interest

Topic used for designing this crossword is Initialization of 80386DX, Debugging and Virtual 8086 Mode.
Following steps are used for designing crossword puzzle:

1. To design this crossword initially important word from this topic were identified and these words are listed.

BREAKPOINT
TESTCOMMAND
STACKSEGMENT
EAX
FOUR
TRAP
DEBUGCONTROL
VM
10FFFEFH
LEN
T
20
NMI
TESTDATA
TF
FAULT
ET
DEBUGSTATUS
FFFFFFF0H

2. After listing, these words are to be placed in grid. To do this square grid can be made by filling remaining blocks with black color or making a grid of required squares. As shown in Fig. 8 we have used second method to make a grid that is making grid with required square. While putting these words in a grid, ACROSS and DOWN words are matched with no spaces between the words.

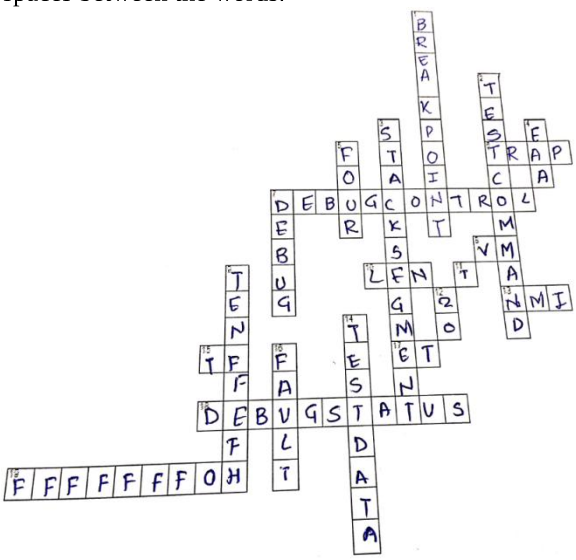


Fig. 8 Sample solved crossword

3. After making the puzzle, clues are formed for ACROSS and DOWN as follows:

ACROSS:

6. Data address breakpoint is ____

7. DR7 is ____ register.

8. Processor executes in V86 mode when __ bit in the EFLAG register is set.

10. Length of data item is monitored through which bits?

13. Interrupt table is accessed if an exception or __ occurs

15. The BS bit is associated with __ bit of EFLAGs.

17. Which bit of CR0 is set if an 80387 is present?

18. DR6 is ____ register.

19. First instruction begins at which physical address of 80386?

DOWN:

1. INT 3 is___ exception

2. TR6 is____ register

3. Instruction cannot use stack unit ____ register has been loaded.

4. Which register indicates power on self-test is successful or not?

5. TLB is ___ way set associative memory?

7. INT 1 is ___ exception

9. An 8086 program may generate linear addresses anywhere in the range 0 to ____

11. The BT bit is associated with __ bit of TSS.

12. Size of tags in TLB is ___ bits

14. TR7 is____ register

16. Instruction address breakpoint is ____

While giving this crossword puzzle to students, ACROSS and DOWN clues are given with the following blank crossword as shown in Fig. 9.

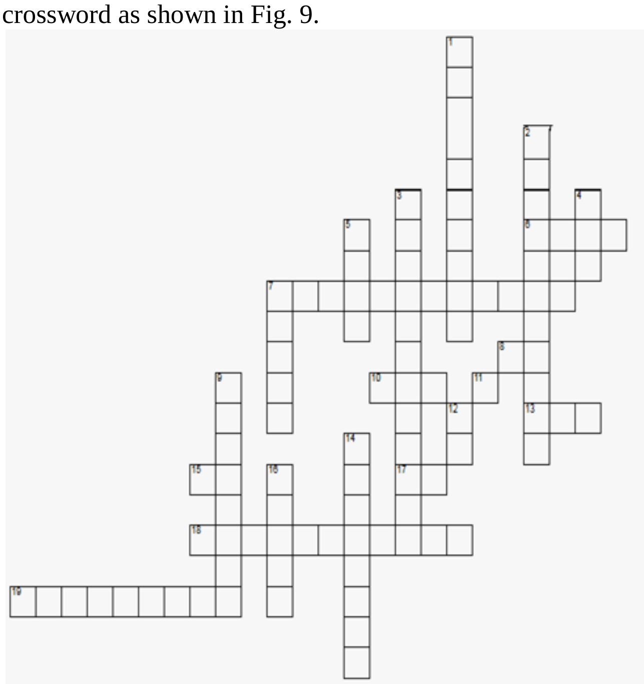


Fig. 9 Sample blank crossword

Following are the outcomes that have been observed, after solving this puzzle students will be able to:

1. Improve verbal skills

2. Improve interest

3. Enhance problem solving skills

ISBN : 978-93-88441-93-3

4. Conclusion

Crossword puzzle is an effective methods used for improving teaching learning process. As Games are recognized as a way to make a calm and relaxed environment that enables students to perform better. It has been observed there are noteworthy variations in performance of students as it has boosted the interest of subjects which student find critical to study. Hence Crossword are revealed to be useful teaching tools for pairing key concepts with related names, definitions, spelling and terminology, leading to greater retention and memorization. This indicates that introducing crossword puzzles as alearning and assessment tool may be done at any given time in the course of study for development of students.

5. References

1. Roderick Lottering, Robert Hans and Manoj Lall," The Impact of Crossword Puzzles on Students' Performance: Does Pre-exposure to Puzzles Matter?", IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE),2018

2. A R Jobin, Anand GMenon, Ashwin Sekhar and Vinay Damodaran," Key to Crossword Solving : NLP", IEEE,2017

3. Joan Bryant, "Crossword Puzzles – Entertaining tool to reinforce lecture content in undergraduate physiology teaching", International Journal of Biomedical Research 2016; 7(6): 346-349
https://en.wikipedia.org/wiki/Crossword

Enhancing Bloom's Learning Levels for an Outcome Based Teaching-Learning Process in Geotechnical Engineering: A Case Study of Failed Boiler House

Dada S. Patil

Civil Engineering Department, Anjuman-I-Islam's Kalsekar Technical Campus, School of Engineering and Technology, Panvel, Navi Mumbai, 410206

Track No.: 1
Track Name: Different Dimensions of Teaching-Learning

Abstract: The understanding of fundamental principles of Geotechnical Engineering (Soil Engineering) by learners is considered to be an essential foundation upon which their future practical experience can be firmly built. In an introductory course of Geotechnical Engineering, the learners need to be taught basic concepts in a simple pedagogy using their background in Mechanics, Physics and Mathematics. A firm background knowledge, to hopefully launch the learners in life-long learning of various Geotechnical Engineering issues, needs to be imparted. The learning domains can be classified as cognitive domain (knowledge), psychomotor domain (skills) and affective domain (attitudes). Bloom's Taxonomy of learning levels, introduced in 1956 and revised in 2001, is one of the most powerful tools for classifying educational goals, objectives and standards and it is practically synonymous with the cognitive domain. The Bloom's Taxonomy clearly depicts the ascending orders of learning as Remembering, Understanding, Applying, Analyzing, Evaluating and Creating. The learning outcomes for the learners in connection with the introductory concept of index properties of soil and their interrelationships generally deal with the low learning levels like *explaining* three-phase diagram of soil, *discussing* various index properties of soil for the purpose of their classification and use, *describing* interrelationship between different index properties of soil, etc. They seldom reach to the higher learning levels of Bloom's Taxonomy like analyzing and evaluating. The learners get well-acquainted with understanding the basic three-phase diagram of soil; moreover, using the diagram, they develop an ability to define the various fundamental soil properties like void ratio, porosity, water content, degree of saturation, etc. They are also capable of establishing the interrelationships among the various fundamental soil properties, using the three-phase diagram. However, many learners inadvertently confine their understanding of the concepts to the low learning levels, without realizing the practical implications and applications of the concepts learnt. Case study of soil failures is one of the strong tools. It facilitates in connecting the theory with the practice very well. The introductory and fundamental concepts can also be learnt at higher Bloom's levels by incorporating the case studies of soil failures. One such attempt was made while teaching the Geotechnical Engineering-I course at fifth semester (Third Year) for undergraduate learners. A case study of collapsed boiler house in the United Kingdom was dealt with in the class in order to demonstrate the use of soil three-phase diagram and various soil index properties for predicting the possible cause of failure of boiler house. A case study illustrated in a reference book titled "A Guide to Soil Mechanics by Malcolm D. Bolton (Universities Press)" was chosen for the purpose. The learners were made aware about the client's trouble, the engineer's investigation, the laboratory report, the engineer's calculations and his conclusion. In this paper, an attempt has been made to briefly present the above mentioned case study of soil failure to stress upon the vital fact that the case studies of detailed investigation of failures facilitate in understanding the concepts in a pragmatic sense and in turn, enhance the learning levels of the learners. It is intended to throw a light on the importance of inculcating case studies in Civil Engineering, in general and Geotechnical Engineering, in particular. The oral feedback obtained from the learners after the session, was overwhelmingly encouraging. The session seemed to instill the confidence in learners in conformity with the practical applications of various concepts and equations they learnt to deal with the real world problems. The illustration of the case study in the class also helped the learners to realize that, apart from laboratory reports and theoretical calculations, engineer's (investigator's) common sense is equally vital to arrive at the rational and logical conclusion and decision.

Key words: Blooms Taxonomy, Learning levels, learning domains, void ratio, porosity, degree of saturation, specific gravity, water content, investigation, laboratory report, etc.

1. Introduction

Teaching-Learning process in Geotechnical Engineering can be made more effective and lively by incorporating the failure case studies. This facilitates to make the process more learner-centric. Inculcating the failure case studies in the class room helps the learners to understand the difficult concepts better, analyze the reasons of failure and learn the lessons from the failure. Knowledge gained by a detailed and scientific analysis of a particular failure helps to evolve a better design methodology and increase one's confidence in the design. It also instills confidence among the learners to enhance their problem solving skills, exercise better judgment in choosing appropriate geotechnical parameters in the design process [1]. Usually the failure case studies are not taught to the learners. Curriculum does not cater for the courses which exclusively deal with the failure case studies. Case study approach to Engineering Education provides a greater understanding of the multifaceted nature of Civil Engineering [2]. Geotechnical Engineering is a branch of Civil Engineering that deals with soil, rock and underground water and their relation to the design and construction of engineering projects [3]. Inculcating learners about the failures due to unethical practices or inappropriate design and poor construction practices will mould them to become better Geotechnical Engineering professionals. An introductory module of Geotechnical Engineering-I course at fifth Semester (Third Year) Undergraduate Civil Engineering program deals with the soil index properties, three phase diagram of soil mass, interrelationships among the various index properties and solving simple problems using the fundamental definitions of index properties and derived relationships among them.

After finishing with the prescribed content of the introductory module, a case study of failed boiler house (United Kingdom) was dealt with in a very detailed way. The case study was picked up from a reference book titled "A Guide to Soil Mechanics by Malcolm D. Bolton (Universities Press)". It was clearly conveyed to the learners about how the investigator made use of soil three-phase diagram, various index properties and interrelationships among them to arrive at a logical conclusion about the cause of failure. The exercise helped in improving the learning level of the learners. They were exposed to the different dimensions of Teaching-Learning process through this simple case study. In this paper, the case study is illustrated in a brief manner in order to stress upon a vital point about the way in which it helped the learners to enhance the learning levels as per Bloom's Taxonomy. Relatively young faculty members dealing with the Geotechnical Engineering course or for that matter any other Engineering course need to cultivate a habit of inculcating the case studies. This would definitely lead to an outcome based Teaching-Learning process.

2. The Client's Trouble

In 1981, a light engineering firm was taken over in United Kingdom. New owners spent over £9,00000 on expansions and modernization. Another £4,00000 were spent for a new boiler house to supply steam under pressure to a plastics molding shed, in addition to its main role of heating the whole factory. Only a matter of weeks after going into full production, the boiler house was giving trouble. First, windows began to shatter and then cracks appeared in the concrete floor. The local builder who had organized the whole modernization plan was called back, but he seemed unable to effect any substantial improvement. The first threats of industrial action were sensed by the owners when two men were scalded by steam burst on the fitting which gathered the pipes from the boiler before they were taken through the boiler house wall to the plastic shed. By January 1982, it was clear that the building would have to be closed. The walls had suffered substantial inward rotation, the roof leaked and the boiler itself was subsiding on a badly crazed floor slab. There being no heating and no steam for the molding process, those men who were not laid off walked out. The owners approached a consulting Geotechnical Engineer for his technical advice [4].

3. The Engineer's Investigation

A preliminary site investigation revealed that foundation of the brick structure housing the boiler had settled and tilted. When earth was removed from around the outside of the walls in two or three places, substantial cracks could be seen in the concrete raft which supported the walls and the boiler structure inside the building. The engineer noted that the raft did not appear to be unduly thin; indeed, the steel reinforcement, which he could just discern in one region of very badly broken concrete, looked rather heavier than he had been expecting. Inside the building, it was impossible to elicit much from a visual inspection since the floor had been covered recently with a layer of asphalt. It was clear from the broken pipe brackets, however, that the boiler had settled by at least 0.1 m. (100 mm). In walking back to the managing director's office, the engineer observed that the other new buildings were showing no sign of distress.

A team of workers cut through the foundation slab at the place near the door which the engineer indicated. The closely spaced steel reinforcing mesh had been burned away from the roughly chiseled hole. By the light of the flash lamp, the assembled group could clearly see the culprit, directly under the concrete slab. Where there should have been compacted rubble, there was a gap so deep that it was only just possible to confirm that the rubble did indeed exist, somewhere below. As the engineer ruefully withdrew his hand, he took back with him another clue in the form of a blistered finger. The ground was very hot indeed; a thermometer installed later registered 100°C in the rubble, while the concrete raft was only warm to the touch. In order to complete his report, it was necessary only for the engineer to ask a drilling company to sink a few small boreholes through the raft and rubble, and also in the general vicinity of the boiler house, away from the influence of the heat. Clayey dust overlying very compact dried clay up to 2 m. in depth below the boiler confirmed his opinion. The builder had established the raft on the compacted rubble overlying clay.

No doubt, the clay stratum had initially been strong enough to support the raft, walls and boiler. Certainly the slab was more than equal to its task of spreading the foundation loads to the soil, had the soil remained in contact with it. Unfortunately, as the clay dried out, it shrank away from the raft that it was supposed to be supporting. Although the soil was becoming stronger and stronger, it was so completely losing its function. In the words of the engineer, there was an 'incompatibility' between the clay and its hot load. The builder had fallen into the traps of suiting materials to only one aspect of their working environment. Figure 1 shows the schematic view of badly hampered boiler house [4].

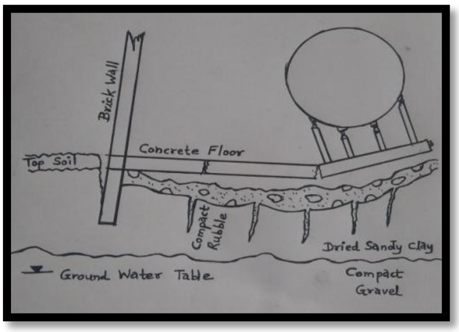


Fig. 1. Damaged Boiler House, [4]

In this case, builder forgot that clay soils settle owing to drying as readily as they compress under the load. Back in his office, the engineer began to prepare his report. To substantiate his finding in a fashion that would stand up in the court, if the builder refuses to pay compensation for the damage, the engineer wanted to show that the drying of the clay layer 2 m thick could account for the measured ground settlement of up to 0.2 m. He, therefore, sent samples of the soil to a soil testing laboratory for moisture content determination.

4. The Laboratory Report

It is always easier to report on changes of mass rather than volume in case of soils. The standard procedure for natural moisture content (soil index property) determination is to weigh a small sample of the soil in its natural state. Then dry it in an oven at 105^{o}C for 24 hours to evaporate the free water, and then re-weigh. The laboratory carried out this procedure on the soil sample which the engineer recovered some distance away from the boiler house. The laboratory details were as below.

Mass of container = 55.12 g
Mass of (container + moist soil) = 117.85 g
Mass of (container + dry soil) = 108.06 g
Soil Moisture Content = (Mass of water/ Mass of dry soil)
= {(117.85 – 108.06) / (108.06 – 55.12)} X 100%
= 18.5%

The same test carried on the soil from underneath the boiler house showed that there was still water trapped there. The moisture content was as low as only 3.1 %.

5. The Engineer's Calculation

The engineer used the soil three phase diagram as shown in figure 2 [4].

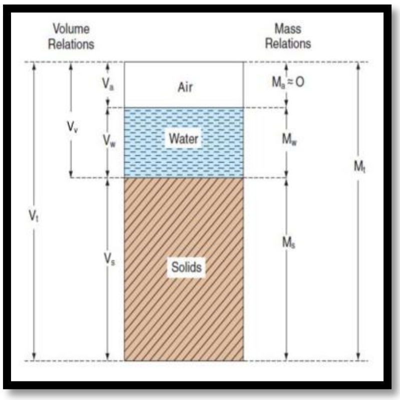


Fig. 2. Soil Three Phase Diagram, [4]

Moisture (water) content,
w = Mass of water (M_w) /Mass of dry soil solids (M_s)
Degree of saturation,
S = Volume of water (V_w) / Volume of voids (V_v)
Void ratio,
e = Volume of voids (V_v)/ Volume of soil solids (V_s)
G = Specific gravity of soil solids

To arrive at volume changes, according to derived equation, w= (Se/G), one needs to be able to estimate both S and G. The engineer was prepared to guess both. He knew that, most natural clays are fully saturated i.e. all the voids are fully filled with water (S= 100% or 1.00) and that well-compacted, man-made clays rarely have a saturation (S) of less than 0.80. He also knew that, the range of specific gravities met within soil minerals is quite limited; say 2.60 to 2.75 in almost all the cases. He, therefore, opted to take S = 1.00 and G = 2.70 as an initial approximation using his common sense.

He estimated void ratio as, e = (wG/S)
= (0.185 x 2.70/1.00) = 0.50

He then arranged it as, e = (V_v/V_s) = 0.50, i. e., volume of voids is 0.50 times the volume of soil solids.

He adopted volume of soil solids as 1 for ease of calculation, i.e., V_s = 1. Therefore, e = V_v/1 = 0.50.

If the soil is fully saturated, volume of voids (V_v) = volume of water (V_w), then volume of water (V_w) = 0.50.

It showed that roughly one part in three by volume of the original clay material was water. This could be visualized as 0.67 m. [i.e. (1/3) X 2] of water within the 2 m. total thickness of clay.

He then calculated the void ratio of the clay under the boiler house by using moisture content (w) = 3.1%.
e = (wG/S) = (0.031 x 2.70/ 1.00) = 0.08.

The engineer concluded that such a low value of void ratio is not likely. As clay is dried, air enters the fabric and the saturation (S) eventually falls to zero. It is rare for the minimum void ratio (e) of clay after drying to be above 0.45 or below 0.35.So, the engineer was prepared to approximately assume that e = 0.40 was the final value for the soil underneath the boiler house.

Referring to fig. 3 [4] and considering volume of soil solids (V_s) = 1, he expressed void ratio, e = (V_v/ V_s) = V_v.

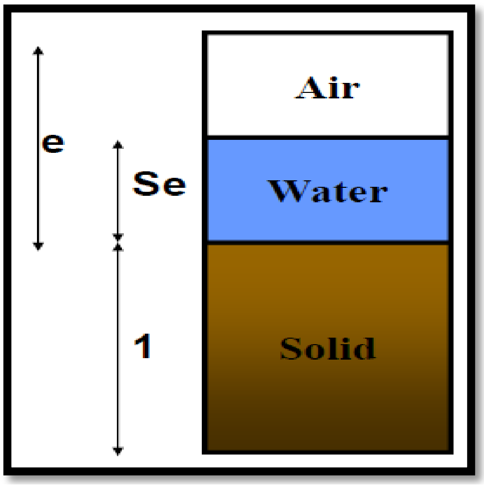


Fig. 3. Soil Three Phase Diagram in Terms of Void Ratio, [4]

So, Total Volume, $V_t = (V_s + V_v) = (1 + e)$.
The engineer could then estimate that,
Final volume of clay (1+e) / original volume of clay (1+e) = (1+0.40) / (1+0.50) = 0.93.
In other words, (final thickness of clay layer / original thickness of clay layer) = 0.93.
Taking 2.00 m as the original thickness, he obtained 1.86 m. as the final thickness. This implied 0.14 m. (140 mm.) settlement of the clay surface.
The engineer was fairly pleased with the correspondence he had achieved. He saved samples of the soil that he had retrieved in case his arguments were challenged. He was aware that a much more careful analysis was possible if it should be necessary. But considering the urgent need for progress, he submitted his report without further delay.

6. The Engineer's Conclusion

The boiler house was supported on a slab, which was designed on the assumption that it would be supported across its whole span by the underlying soil. The soil was very firm sandy clay, which could be loose nearly 10% of its volume on being dried. The heat from the badly ventilated boiler was sufficient to dry the underlying clay, which subsequently shrank away from the raft by up to 0.2 m. The raft then broke, being unable to span the void. This caused great structural deformation and malfunction. The most efficient remedial action would be to jack the slab back into its original position, pump concrete into the void underneath, to re-level the boiler on adjustable supports, to make the windows and roof safe and to provide ventilation. This would bring factory quickly back into production. It would be a satisfactory medium-term solution since only 3.1% water remained in the underlying clay. The engineer did not doubt that a new boiler house with improved ventilation should be designed and built near the old one as quickly as possible, so that the badly damaged structure could be demolished.

7. Conclusion

Through this simple case study in which it was demonstrated that the engineer utilized certain basic soil index properties, three phase diagram and interrelationship among the index properties; the learners could achieve higher levels of learning as per Bloom's Taxonomy. In addition to an expected outcome of merely understanding, explaining and to certain extent applying the various concepts learnt in the routine introductory module of Geotechnical Engineering-I course, the learners could accomplish a step further by inadvertently acquiring the skills of analyzing and evaluating, which are Bloom's higher learning levels. Interestingly, the case study did not involve any concept which is not covered in the introductory module of the course. The learners were more than happy for having acquainted with an enhanced technical know-how other than the routine and sometimes mundane theoretical instructions in the class.
Though the faculty member may be teaching the same course for quite a few years, there is a dire need to improvise every year. The faculty member has plenty of opportunities to improve upon the presentation and depth of the concept, year after year. Dealing with the case studies is one among those. In this dynamic and fast changing world, teaching an Engineering course is not all about dictating some obsolete notes or merely completing the syllabus; it's all about going further and compelling the young budding engineers to think, analyze, question and then arrive at a logical and rational conclusion. Inculcating the case studies of failure forms vital and essential part of teaching Civil Engineering courses, in general and Geotechnical Engineering course, in particular.

References

[1] R. Shivashankar, NITK, Surathkal, India, "Role Of Case Histories in Geotechnical Engineering Teaching and Practice", 7th International Conference on Case Histories in Geotechnical Engineering- 2013, Missouri University of Science and Technology, Scholars' mine.

[2] Akili, Waddah (2007), "Better Teaching and Learning using Case Histories in Geotechnical Engineering" Proc. 37th ASEE/IEEE Frontiers in Education Conference, Milwaukee, WI, pp. S2A-22 to S2A-27

[3] Coduto, Donald P. (2002), "Geotechnical Engineering- Principles and Practices", Prentice-Hall India, New Delhi.

[4] Malcolm D. Bolton, "A Guide to Soil Mechanics" Universities Press

Effect of Flipped Classroom Teaching Strategy on Academic Performance of Students

Popat D. Kumbhar

Department of Civil Engineering,
K.E.Society's, Rajarambapu Institute of Technology, Rajaramnagar (Islampur), Dist. Sangli (MS, India), 415414
Popat.kumbhar@ritindia.edu
Track No.: 1
Track Name: Different Dimensions of Teaching-Learning

Abstract:
In this paper an attempt has been made to investigate effect of flipped classroom approach on academic performance of Third Year Civil Engineering students' in 'Concrete Technology' course. The approach was used for the entire class of 72 students by providing them with online access to videos, Power Point presentations and other resources using MOODLE for the topic 'concrete mix design' of the 'Concrete Technology' course. Students' performance in Unit Test examination was evaluated by analysing results of the examination. Results showed that students' performance (average attainment) improves by 17% after implementing 'flipped classroom' approach compared to the conventional teaching. Results also revealed that majority of students had a positive attitude towards flipped classroom and use of video's and MOODLE.

Keywords: Outcome based education, active learning, flipped classroom, and students' performance.

20. Introduction

Outcome-based education (OBE) is one of the most important developments, especially in the higher education. It is based more on student's learning and less on the role of a teacher or the content to be taught. It requires a fundamental change in teaching learning process in engineering education system as it focuses more on development of all the three learning domains, namely cognitive, affective, and psychomotor contradictory to the traditional teaching which focuses only on the development of cognitive and psychomotor domains. OBE is an educational theory in which each part of an educational system focuses around goals or learning outcomes. It ensures that, by the end of the educational experience, each student achieves the stated goal **(Ghosh and Saha, 2017).** Traditional teaching lacks in providing focused learning, interactivity, and doesn't encourage critical thinking skills and hence, OBE is favoured to traditional teaching **(Wadhwa et al, 2015).**

Active learning is an integral part of OBE, as successful completion of the task by student, indicates system's effectiveness and curriculum. Active learning involves students and engages them actively in the learning process. It increases students' achievement and is associated with increases students enjoyment and engagement **(Braseby, 2014).**

A. Challenges in Implementing OBE in Engineering Education:

Several active learning techniques or approaches such as think pair share, jigsaw, flipped classroom, problem based learning, project based learning etc. are available and are being used in OBE system. These approaches not only help students learn the content but also provide chance to develop professional skills which has become an essential attribute that the engineers to get equipped in today's competitive global market and changing work environment **(Aliye et al, 2018).** However, implementing OBE in Indian Education sector is becoming a great challenge, especially in the engineering education. The realistic picture is rooted with several difficulties or problems in the implementation of OBE. One of the major difficulties in implementing OBE is the large class room and at the same time, learning process must be active, not passive and is one of the biggest challenges for large classroom.

Further, due to large number of students with diverse learning styles in each class, it is not possible to provide personal attention. Another problem in implementing OBE in large classroom is to map course outcomes with programme outcomes achieved by all learners through the appropriate assessment techniques **(Wadhwa et al, 2015).** Apart from this, provision of required infrastructure and environment in implementing OBE need economic support in the institutions /universities.

Any active, student-centred learning method relies greatly on students' pre-class work and come to class prepared and be ready to engage in the learning activities. If students are not prepared for the pre-class work, then it becomes a big challenge to proceed further. Thus, ensuring students' preparation outside the classroom is one of the challenges faced by teachers, especially while implementing flipped classroom approach, regardless of what and where the teachers teach them. If students are not prepared for class, then it becomes difficult to conduct the activities where students apply, analyze, and create that are based on their pre-class work. Several ways have been suggested in the literature to address the challenges of unprepared students' while implementing flipped classroom. Having conversation with students, reviewing pre-class assignment, proceeding as planned, providing participation grades, setting up a corner etc. **(Barbi, 2016)** are some of the ways suggested to address these challenges.

In the present work, 'setting up a corner' method was adopted for getting pre-class work completed from the students in response to the students' unpreparedness. In 'setting up a corner' method, students who did not complete the pre-class work would go to finish their assignment during class time.

In traditional teaching, lecturers or teachers are treated as providers which hold answers to the questions while in OBE, the lecturers role is not to provide solutions but to guide students for finding the solutions. Thus, in OBE there is high expectation for extremely self dependent, resourceful and independent student personalities which are generally contradicted by its reality **(Rajaee et al, 2013).** The flipped classroom model is based on the idea that traditional teaching is inverted in the sense that what is normally done in class is flipped or switched with that which is normally done by the students out of class. Thus, instead of students listening to a lecture in class and then going home to work on a set of assigned problems, they read course literature and assimilate lecture material through video at home and engage in teacher-guided problem-solving, analysis and discussions in class.

.

B. Flipped Classroom:

The flipped classroom is one of the active learning approaches and has become the latest buzzword in engineering education. The basic concept of this approach is to reverse the traditional teaching, which means, what is normally done by students in the classroom is flipped or reversed with that which is normally done by students out of the classroom **(Nouri, 2016).** In this approach, the activities that have traditionally taken place inside the classroom take place outside the classroom and contrariwise. The students gain first exposure to new learning material outside the class, usually through reading material or lecture videos and then using the class time to do the harder work of understanding the knowledge, possibly through problem-solving, discussion, etc. **(Brame, 2013).** Thus, this approach is in contrasts to the traditional teaching in which 'first exposure' occurs by way of lecture in class, and students learn knowledge through homework; and hence, the method is called as "flipped classroom" or 'inverted classroom' **(Bishop and Verleger, 2013).** The concept of flipped classroom is demonstrated in Table 1.

Table 1: Definition of Flipped Classroom (Bishop and Verleger, 2013)

Style	**Inside Class**	**Outside Class**
Traditional	Lectures	Practice Exercises and Problem Solving
Flipped	Practice, Exercises and Problem Solving	Video Lectures

Thus, flipped classroom model offers promising ways to engage students in more effective, supportive, motivating and active learning, especially for low performers and students that may require efforts traditional teaching **(Nouri, 2016).**

For the successful flipped classroom, planning and responsibility are considered to be the two important requirements. Further, all learning levels of Bloom's Taxonomy can be fulfilled, with lower order learning levels at outside classroom while higher order learning levels within the classroom. The effectiveness of flipped classroom lies in the fact that, the time normally spent in lecturing, is used for classroom activities such as discussions, problems, group projects etc. **(Szparagowski, 2014).**

1. *Key elements or design principles of flipped classroom:* The key elements or design principles recommended for the flipped classroom are as follows (Uzunboylu et al, 2015) :

- Providing an opportunity for students to gain preliminary information before the class activity,
- Encouraging students to watch online lectures and be prepared before the class activity,
- Organizing methods of assessment,
- Linking in-class activities with out-of-class activities,
- Providing in-class activities that focus on higher level cognitive activities.
- Supplying clearly stated and well organized guidance,
- Providing sufficient time for the completion of assignments,
- Promoting students to build a learning community,
- Providing immediate feedback on individual or group works,
- Providing the use of familiar technologies which can be accessed easily by students.

Thus, in the present paper, effect of flipped classroom approach has been investigated to study academic performance of Third Year Civil Engineering students' in 'Concrete Technology' course by evaluating students' performance in Unit Test examinations. The results of the study has shown that students' performance (average attainment) improves by 17% after implementing 'flipped classroom' approach compared to the conventional teaching. Results also revealed that majority of students had a positive attitude towards flipped classroom and in making use of video lectures and MOODLE.

21. Methodology Adopted:

The 'flipped classroom' approach was implemented as active learning method for teaching the concept of mix design of concrete and for designing the concrete mix of any given grade using revised IS Code method to the students of Third Year B Tech Civil Engineering for the course of ‘Concrete Technology’ (semester VI). The technique was implemented for the entire class of 72 students’.

The original ‘flipped classroom’ technique was slightly modified in response to the students’ unpreparedness in completing the pre-class work assigned to them. All the students were asked to finish the pre-class works (setting up corner method) in the classroom. A learning management system (MOODLE) was used during the implementation flipped classroom approach for making the learning resources available to students’ and thus support them for learning processes. The steps adopted for implementing the technique are as given below.

A. Formation of diverse groups (9 groups):
Total 9 (nine) diverse groups of students were formed. Each group was consisting of approx. 8 members.

B. Uploading of Resource material on MOODLE:
All the required resources such as Power point presentations, video clips, book chapters, IS Codes etc. were uploaded on MOODLE for students’ reference and study before starting the flipped class.

C. Allowing students to read the content of the topic in the classroom for 3 class hours:
From the past experience, implementation of flipped classroom technique was slightly modified. As students were found to be reluctant in reading or studying the resources uploaded at home, students were encouraged to read the content of the topic by referring to the resource material uploaded on MOODLE in the classroom only (setting up corner method). The students were asked to download and read the content of the topic in the classroom hours in groups.

D. Addressing students queries:
Students were asked to raise their queries whenever they face difficulty in understanding and get these queries resolved.

E. Conducting an Exercise for Designing a Concrete Mix of given Grade:
All the groups were assigned with a separate problem of designing the concrete mix of a given grade using IS Code method. Each group was given a different grade of concrete like M20, M25, M30, etc. and by changing the exposure conditions like, mild, moderate, severe, very severe and extreme. The students were suppose to design the concrete mix following the guidelines of IS Code method by referring to various codes and literature.

F. Assessment of students (One Minute Paper):
After the exercise is over, the students were assessed for their learning by conducting another classroom assessment technique namely, ‘One Minute Paper’. The one-minute paper is easily used assessment technique which involves asking students one or two rapid but deep questions on the topic taught, usually before the class ends and requires about one-minute to complete. The technique makes students to reflect and identify the most important points they have learnt during the class. Through these questions, students may be able to self-assess their learning. The questions that are required to be answered by students in one minute paper technique consist **(Angelo and Cross, 1993):**

1. What are the two [three, four, five] most significant [central, useful, meaningful, surprising, disturbing] things you have learned during this session?
2. What question(s) remain uppermost in your mind?
3. Is there anything you did not understand?

From the above technique, it was observed that majority of students had understood how to perform the mix design but they were facing difficulties in applying corrections and determining the quantities of aggregates by making adjustments due to field conditions. To resolve this query an illustrative example was prepared in MS word form and the file was uploaded on MOODLE for the students’ reference and clearing their doubt.

Fig. 1: Students finishing the pre-class work in the classroom

Fig.2: Student Groups involved in Flipped Classroom

G. Evaluation of students in Unit Test Examination:
The performance of students, after implementation of flipped classroom approach, was evaluated through Unit

Test examination (2018-19) by calculating the average attainment of course outcome (CO) obtained by students. The Unit Test examination was conducted for 25 marks. Of the two total questions of the Unit Test examination, question no.1 was set on the topic taught by using flipped classroom method. The questions were mapped with CO3 of the course ‘concrete technology’. The statement of CO3 is stated as ‘Design the concrete mixes of given grade by using mix design procedures recommended by IS code and ACI code’.

The performance of students of previous year (2017-18), using traditional teaching, in the same Unit Test examination was also evaluated. The questions set in both the Unit Test examinations (current year and previous years Question Paper) were approximately for same marks. The comparison of marks obtained by students and the average attainment in the Unit Test examinations of the current year (2018-19) and previous year (2017-18) are presented in the Table 2.

Table 2: Result of Unit Test -2 (UT2) and Attainment of CO

Year	**2017-18 (Sem VI)**		**2018-19 (Sem VI)**	
Sr. No.	**10Mrk**	**4 Mrk**	**9 Mrk**	**6 Mrk**
	Q.1(a)	**Q.1(b)**	**Q 1a**	**Q1b**
1	0.5	2.5	2	4
2	3	1	1	0
3	0	2	8	4
4	4	1	2	0
5	0	2	0	0
6	6	3	6	4
7	5	3	5	2
8	5	3	6	1
9	5	2	7	5
10	5	1	0	5
11	7	2	9	5
12	5	3	9	4
13	5	0	9	4
14	4	3	9	5
15	5	3	9	5
16	5	3	9	3
17	3	3	9	1
18	9	0	8	5
19	5	3	9	4
20	6	3	5	0
21	5	3	8	4
22	5	3	5	5
23	9	3	5	5
24	10	1	7	4
25	9	2	9	5
26	7	3	0	0
27	6	3	0	3
28	8	2	6	3
29	7	3	4	2
30	7	2	0	4
31	8	2	7	2
32	6	3	6	3
33	6	3	9	5
34	5	3	5	3
35	7	3	9	5
36	8	3	9	3
37	3	0	9	5
38	7	3	3	5
39	4	3	9	5
40	6	3	7	5
41	6	2	9	2
42	5	2	5	5
43	5	0	5	4
44	5	0	0	0
45	7	1	6	3
46	9	3	9	4
47	7	3	2	2
48	7	3	7	5
49	7	3	7	4
50	6	3	9	4
51	6	3	7	5
52	5.5	3.5	7	5
53	5	2	6	4
54	7	3	9	5
55	6	2	8	3
56	9	3	9	5
57	6	1	9	5
58	7	3	6	5
59	5	2	8	5
60	5	3	6	5
61	6	2	4	5
62	4	2	0	0
63	5	0	6	4
64	5	2	7	5
65	9	3	4	4
66	8	3	5	2
67	6	3	7	4
68	4	3	0	5
69	2.5	2.5	6	3
70	4	3	8	5
71	6	2	4	4
72	5	3	6	4
73	5	1	-	-
74	5	3	-	-
75	4	2	-	-
76	6	2	-	-
Total Marks	**430.5**	**176.5**	**430**	**262**
Tot. Students attempting Question	74	70	64	65
Avg. Mrks= Tot Mrks/Tot Stud	5.82	2.52	6.71	4.03
Avg.Attainment ,%=(Avg.Mrk/ Max. Marks of Que)*100	58.2	63.04	74.60	67.20

Avg. Attainment% = (Q1a+Q1b)/2	60.61 (Traditional Method)	70.90 (Flipped Classroom)
Remarks	Improvement over traditional method 17%	

Results and Discussions:
The performance of the students in the Unit Test examination using flipped classroom over traditional approach shows approximately 17% improvement in learning the concepts of mix design and application of the mix design method. The improvement in the performance of students is graphically illustrated in Fig.3.

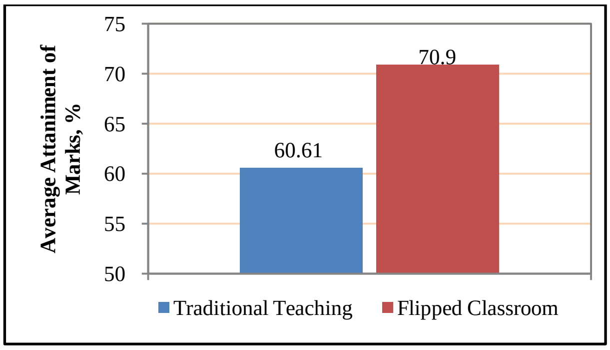


Fig.3 Average Attainment of Students

22. Conclusions
From the study, following conclusions can be drawn:

- Implementing flipped classroom approach resulted in improving students' performance by about 17% over traditional teaching.
- Flipped classroom approach helped in developing a positive attitude of students towards the use of video lectures and MOODLE.
- An appropriate method needs to be used for addressing the challenge of making students to complete the pre-class work while implementing flipped classroom approach.
- Flipped classroom approach provides better opportunities for students to achieve higher order critical thinking skills and allows for deeper learning of the course content.

Acknowledgement
Author would like to thank Dr. Mrs. S. S. Kulkarni, Director and Dr. S. K. Patil, Dean Academic, of K.E.Society's, Rajarambapu Institute of Technology, Rajaramnagar for encouragement and motivation during this study.

References
Angelo, T.A. and Cross, K. P. (1993) Classroom Assessment Techniques, 2nd ed. San Francisco: Jossey-Bass, 148-53.

Aliye, K., Nadia, J. C. and Charles T. J. (2018) doi:10.1111/bjet.12548

Barbi, H. 2016. Five Ways to Motivate Unprepared Students in the Flipped Classroom. Retrieved [7.55.2019] from https://www.facultyfocus.com/articles/blended-flipped-learning/five-ways-to-motivate-unprepared-students-in-the-flipped-classroom/

Bishop, J. L. and Verleger, M.A. (2-13) The Flipped Classroom: A Survey of the Research, 120th ASEE Annual Conference and Exposition, Paper ID #6219. Retrieved [7.5.2019] from https://www.asee.org/public/conferences/20/papersb/6219/view

Brame, C. J. (2013). Flipping the classroom. Vanderbilt University Center for Teaching. Retrieved [7.5.2019] from http://cft.vanderbilt.edu/guides-sub-pages/flipping-the classroom/.

Braseby, A. M.(2014) The Flipped Classroom , University of Texas, Austin. Retrieved [7.5.2019] from https://files.eric.ed.gov/fulltext/ED565291.pdf

Jalal, N. (2016) doi 10.1186/s41239-016-0032-z

Rajaee, N., Junaidi, E., Taib, S.N.L. Salleh, S.F. and Munot M.A. (2013) Issues and Challenges in Implementing Outcome Based Education in Engineering Education, International Journal for Innovation Education and Research www.ijier.net 1(4), 1-9.

Ghosh, S. and Saha, B. (2017) Outcome Based Education (OBE) in Engineering Colleges, International Journal of Innovations and Advancement in Computer Science IJIACS ISSN 2347 – 8616 6(4),100-109.

Wadhwa, S., Barlow, A. and Jadeja, S. (2015) Activity Based Learning: Overcoming problems in implementing OBE in Engineering Education during transition phase, 43rd Annual SEFI Conference, Orléans, France, 1-9.

Szparagowski, R.(2014) "The Effectiveness of the Flipped Classroom, *Honors Projects*, 1-33. Retrieved [7.5.2019] from https://scholarworks.bgsu.edu/honorsprojects/127

Uzunboylu H. and Karagozlu D. (2015) doi: http://dx.doi.org/10.18844/wjet.v7i2.46.

Enhancing the Outcome Based Teaching-Learning Process through Laboratory Session to Impart Critical Thinking to the Learners: Demonstration of Conflicting Results of Various Concrete Workability Tests

Dada S. Patil[1], Dr. Abdul Razak Honnutagi[2]

[1]Civil Engineering Department, Anjuman-I-Islam's Kalsekar Technical Campus, School of Engineering and Technology, Panvel, Navi Mumbai, 410206.
[2]Anjuman-I-Islam's Kalsekar Technical Campus, Panvel, Navi Mumbai, 410206.
[1]dada.patil@aiktc.ac.in
[2]director@aiktc.ac.in
Track No: 1
Track Name: Different Dimensions of Teaching-Learning

Abstract: An effective teaching-learning process plays a vital and significant role owing to the fact that it has major contribution to improve the quality of education. The process needs to be dynamic, scientific, logical and outcome based in Engineering Education. The learning domains are broadly classified as cognitive domain (knowledge), psychomotor domain (skills) and affective domain (attitudes). Bloom's Taxonomy of learning levels, introduced in 1956 and revised in 2001caters to the classification of educational goals, objectives and standards. Moreover, it is pragmatically close to the cognitive domain. The Bloom's Taxonomy presents the ascending orders of learning as Remembering, Understanding, Applying, Analyzing, Evaluating and Creating. It is well established fact that, unlike certain Engineering Programs wherein the learners have to constantly deal with the soft wares, circuits, etc. in the laboratory, Civil Engineering Program comprises of bulky laboratories to cater to the material testing. Concrete Technology Laboratory is one among those. Workability of fresh concrete is one of the important parameters, defined as the ease with which the concrete can be worked and molded; the comfort and convenience with which it can be placed and compacted adequately. There are various tests for arriving at workability value of a fresh concrete. While dealing with Concrete Technology course during Second Year, the undergraduate Civil Engineering learners undergo theoretical concepts in connection with these workability tests and subsequently carry out laboratory tests as per the guidelines laid down in the relevant standard codes of their respective countries. The learners carry out each test of workability mentioned in their curriculum, separately. As a usual practice, they present their results and comments to the instructor. The combined effect of theoretical concepts learnt and laboratory experiments conducted in order to merely cope up with the curriculum requirements is that the learners confine themselves to the low learning levels of Blooms Taxonomy like Remembering, Understanding and to some extent, Applying. Moreover, learners get accustomed to the philosophy of accepting the various technical clauses and guidelines mentioned in the relevant standard codes, without rationally and logically questioning them. They obviously get habituated to a mechanical and conventional way of thinking that standard codes are ultimate benchmarks and the laboratory results obtained by using the codes are undoubtedly accurate. However, this is not practically true many times. In order to demonstrate to the Second Year Civil Engineering Undergraduate learners the importance of thinking critically, three different workability tests were carried out on the fresh concrete simultaneously. Three different concrete mixes A, B and C were prepared in the laboratory. For each mix, workability tests namely, Slump Cone test, Vebe Consistometer test and Compacting Factor test were carried out simultaneously, following the codal provisions. The results obtained were conflicting. They were contradictory to the set rules. The results had an erratic pattern to such an extent that the logic behind devising a particular workability test by the code itself was questionable. A message was clearly conveyed to the learners that the various workability tests suggested by the standard codes of various countries are single point tests and they are unreliable. They were made aware that the prevailing workability tests may become outdated in near future and a more reliable way of measuring workability known as concrete rheology (science of deformation and flow of matter) may get included in the codes. It was an intentionally planned exercise to make the learners realize that the guidelines given in the codes have limitations and loopholes. At the end of the laboratory session, the learners seemed to have inadvertently acquired a skill of thinking laterally and critically. An oral feedback obtained from the learners about the laboratory session was highly motivating for the course owner (teacher). In this paper, an attempt has been made to present the way in which the said exercise was carried out. An impetus is given to stressing upon the fact that it enhanced the learning level of learners. Instead of just understanding, they could be able to critically comment about a well-established

concept. For a field expert or an experienced academician, such an exercise may seem meager. But, from learners' perspective, it adds a value through a bit of research component associated with it. The paper does not intend to explain the procedure of workability tests. It is directed towards directly using the workability test results to connect it to the enhancement of learning level and contribution towards improved outcome based teaching-learning process.

Key Words: Workability tests, fresh concrete, conflicting results, standard codes, Bloom's taxonomy, teaching-learning process, critical thinking, learning level, outcome based education, etc.

1. Introduction

In an Engineering education, the Teaching-Learning process which results in to contribution towards the practically significant outcome is the most vital factor to enhance the instructional quality. Many course owners (teachers) follow a traditional method in teaching-learning process, in which a teacher teaches and the learners listen without much interaction and without any critical thinking component. The teacher is a subject and the learners are mere objects [1]. Bloom's Taxonomy of learning levels is based upon the cognitive (knowledge) domain [2]. In Concrete Technology Course in Civil Engineering program, learners carry out the various concrete workability tests to assess the ease and comfort with which the fresh concrete can be placed and compacted. In other words, workability is consistency of a freshly mixed concrete [3]. Generally the curriculum comprises of workability tests namely, Slump Test, Compacting Factor Test, Vebe Consistometer Test and Flow Table Test. It is usual practice for the learners to carry out these tests in Concrete Technology laboratory separately on different concrete mixes as per the guidelines given by the standard codes of the respective countries. As the learners conduct these different workability tests on different concrete mixes one at a time, it is not possible for them to critically compare the results obtained by each test. While doing so, the learners acquire Bloom's learning levels of remembering, understanding and to certain extent applying. The Second Year Undergraduate Civil Engineering learners were given an interesting exercise of conducting the three workability tests on fresh concrete, namely Slump Test, Compacting Factor Test, Vebe Consistometer Test. They were instructed to produce three different concrete mixes A, B and C. The three workability tests were carried out simultaneously for each fresh (plastic) concrete mix. The whole exercise was aimed at making the learners understand that the set procedures given in the standard codes have certain limitations and there is a need to logically question them in order to arrive at a rational conclusion. This obviously boosted the confidence of the learners and in turn, they attained a higher level of learning. This facilitates the improved Teaching-Learning process which is the backbone of an Outcome Based Education. At the end of the session, the learners were made aware that the various concrete workability tests followed across the world are just a single point test; they lead to the contradictory results when conducted simultaneously on the same concrete mix and there is a need to adopt a more reliable way of measuring the concrete workability. The learners were imparted an introductory concept of concrete rheology (science of deformation and flow of matter); stressing upon a fact that the concrete rheology needs to be studied at depth in order to deal with the workability in true sense. An oral feedback obtained from the leaners confirmed that the whole exercise helped them to attain the technical competency which otherwise was not possible by merely following the curriculum; moreover, a relatively new terminology from learners' perspective, known as concrete rheology was introduced to them. This made the learners to think critically in connection with exploring the possibilities beyond the usual curriculum. As the learners could compare three test results; find the contrast among the results and question the set guidelines of the standard codes of practice, it ultimately lead to the higher level of learning as per Bloom's Taxonomy.

2. Laboratory Session: Enhancement of Outcome Based Teaching-Learning Process

The learners were divided in to 3 batches. Slump tests of three different concrete mixes A, B and C were carried out by batch 1, Compacting Factor tests of three mixes were conducted by batch 2 and Vebe Consistometer tests were carried out on three mixes by batch 3. The results are tabulated below.

Table 1. Slump, Compacting Factor and Vebe Consistometer Results from 3 Concrete Mixes

Concrete Mix	Slump (mm)	Compacting Factor	Vebe (Seconds)
A	45	0.90	3.8
B	56	0.85	4.8
C	65	0.93	4.2

The lower slump value indicates that the concrete is less workable. The higher slump value indicates that the concrete has good workability. In other words, as the slump value increases, the workability of fresh concrete increases. Similarly, as the Compacting Factor increases, the concrete workability increases. However, the lower Vebe value measured in terms of time (seconds) indicates high workability and the higher value is obtained for a low workable concrete.

The learners were asked to arrange the workability of three concrete mixes in an increasing order and it resulted in to the following table.

Table 2. Arrangement of the Concrete Mixes as per the Increasing Workability

Increasing Workability			
By Slump	A	B	C
By Compacting Factor	B	A	C
By Vebe Consistometer	B	C	A

3. Results and Discussions

Referring to three workability test values from table 1 and table 2, the following interpretations can be done.

- Slump test values indicate that concrete mix A is having relatively low workability; mix B is of medium workability and mix C possesses highest workability.
- On the contrary, Compacting Factor test results show that mix B is less workable, mix A is medium workable and mix C is most workable.
- To further add to the conflicting results, Vebe Consistometer test values recognize mixes B, C and A in the increasing order of workability.
- The learners could easily interpret that these three rankings are clearly unsatisfactory.
- They were intentionally made aware that the various single point workability tests devised by the relevant codes of various countries have limitations and they are misleading too.
- Had the learners conducted the three workability tests separately at the rate of one test per laboratory session (practical hours) just as a part of curriculum, they would have never realized about the conflicting results of workability tests.
- By conducting three workability tests simultaneously on the three mixes, the learners inadvertently learnt that the guidelines given by the standard codes have their own limitations and loopholes.
- It was clearly conveyed to the learners not to confine themselves to the mundane habit of undoubtedly accepting the guidelines set in the codes. Moreover, they were told not to simply follow the literature available in the regular reference books; rather, through this demonstration, they were shown how to cultivate the culture of technical quest for contradictory philosophy and how to logically question the set guidelines.
- The learners were told that for greater understanding of behavior, in general and an explanation of the anomalies that can arise from singe point testing, in particular, there is a need to learn about the Science of Rheology.
- The objective of the whole exercise was to convey the learners the importance of critical and rational thinking and not to inculcate the concrete rheology in detail.
- So, the learners were made aware that the rheology is the science of the deformation and flow of matter. It's concerned with the relationships between stress, strain, rate of strain and time.
- It was discussed with the learners that plenty of research in the field of concrete rheology is currently being carried out in premier institutes across the world, including Indian Institutes of Technology (IITs).
- An oral feedback given by the learners clearly depicted that they were happy about the whole demonstration done through simple and easy experiments. They conveyed that their confidence got boosted. Moreover; they were pushed to the higher level of learning unknowingly.

4. Conclusion

Following are the vital concluding remarks.

- Through simple laboratory demonstration, the learners can be taught to think critically. It is possible with the special theoretical sessions as well.
- Though the exercise did not cater for the higher level of research, it surely added a small research component from the undergraduate civil engineering learners' perspective.
- The demonstration of the conflicting results of various workability tests using laboratory session facilitated an enhancement in the outcome based teaching-learning process, thereby compelling the learners to think laterally and critically.
- Such simple exercises, apart from completing the content prescribed in the regular curriculum, act as an extra edge and should be frequently practiced by the course owner (teacher).
- An interesting and notable point is that the three concrete workability tests conducted are prescribed in the undergraduate concrete technology course in civil engineering program; but, a comparative study using the same tests gave rise to a new way of thinking for the learners.
- If every course owner (teacher) in an Engineering Education makes deliberate efforts to impart an extra level of learning to the learners through laboratory sessions or special theory sessions, it would significantly contribute towards the improvement in outcome based teaching-learning process.

References

[1] C. Fobes and P. Kaufman, "Critical Pedagogy in the Sociology Class room: Challenges and Concerns", Teaching Sociology, Vol. 36 (January), pp. 26-33, 2008.

[2] Sirous Tabrizi, Glenn Rideout, University of Windsor, Canada, "Active Learning: Using Blooms Taxonomy to Support Critical Pedagogy", International Journal for Cross-Disciplinary Subjects in Education (IJCDSE), Volume 8, Issue 3, September 2017.

[3] M. S. Shetty, "Concrete Technology: Theory and Practice", S. Chand Publications, 2008.

Poster Making - A Visual Stimulates for Active Learning

M. B. Shelar

Department of Sciences and Humanities,
Rajarambapu Institute of Technology, Rajaramnagar, Islampur.
mahesh.shelar@ritindia.edu
Track No: 1
Track Name: Different Dimensions of Teaching-Learning

Abstract- This paper investigates the undergraduate compelling information and conveying it utilizing blurb making learning apparatus in Physics class, moderately another idea in the field of educating and learning in building establishments. This examination was directed in First Year B. Tech undergraduate students. In this specific course, understudies got presentation to various exercises, and notice making is one of them. Since Physics educating and learning is a dynamic field, it requires consistent development and research on the contemporary practices in the class and this has made this paper a greater amount of gaining from encounters. The specific poster making activity is in fact a tool for alternative assessment for the students in the speaking class and exposer to their knowledge. To conduct this Poster making activity the physics points was given to the students. Students could visualize and understand their own progress in terms of physics knowledge and creativity on the poster. The paper aims to see how poster making task transforms a student's performance and makes them confident speakers as it works as a catalyst to invigorate the new physics learning process.

Keywords: Undergraduates, Science, rubrics, assessment.

Introduction:
Posters are used as a visual aid to present any specific information in a concise way in academic environment. However, it is very popular and widely used in scientific projects. This tool can be used in Physics classroom where students will be engaged with a task to prepare and they will present their outcome within a poster prepares in group to demonstrate their understanding and analytical skill followed by presentation. The major objective of this poster making activity is to develop oral proficiency and to make them active learner in the class. The primary aim of the present study therefore was to see how effective the poster making task was to develop students' understanding and communication skill as they use it as a visual aid. First Year have developed three hypotheses to conduct the Session for posters

- Poster making % presentation makes positive environment amongst them.
- Poster presentation develops language proficiency
- Posters provide room for innovation and creativity that promote active language learning

Methodology:
This manuscript is basically based on a small scale quantitative active learning tool have been employed. This poster making active tool developing lesson plan, monitoring the changes in the student's performance in the class room and assessing the performance through defined rubrics. This will help student to improve their own concept understanding and presentation skills.

Participants:
A total of 65 students from the course Engineering Physics at Rajarambapu Institute of Technology, Islampur (An Autonomous Institute). At the same time, the participants were almost same age (around 19 years) having almost variable proficiency level coming from different parts of Maharashtra with Marathi as a basic language. The Physics teachers have already taught the points which had been allotted to students for poster presentation.

Poster making Instructions:
The Active Poster method is executed as follows.
• Write and hand in paper on allotted physics points.
• Prepare a poster presentation on card sheet paper or digital flex and post it on the designated wall space prior to the Active Poster session [poster includes figures, graphs and tables].

Session arrangement:

- A seating arrangement allowing in front of poster displayed on wall of classroom, for the short start-up discussion with general introduction by the respective poster groups, and the presentations by group members to the teachers for their assessment
- Poster arrangement kept such that the people in the class to move around and scrutinise the posters by the experts.
- Suggested intensity: 15 posters for 2 hours session.

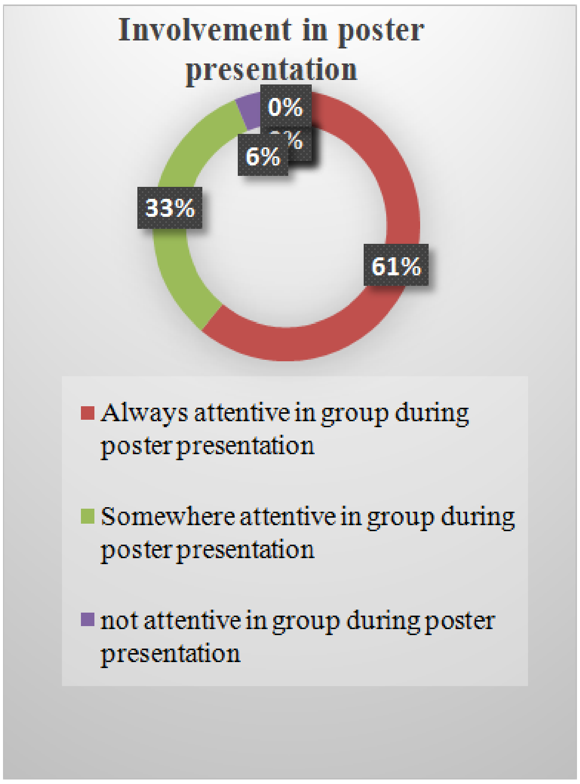
Data Analysis:

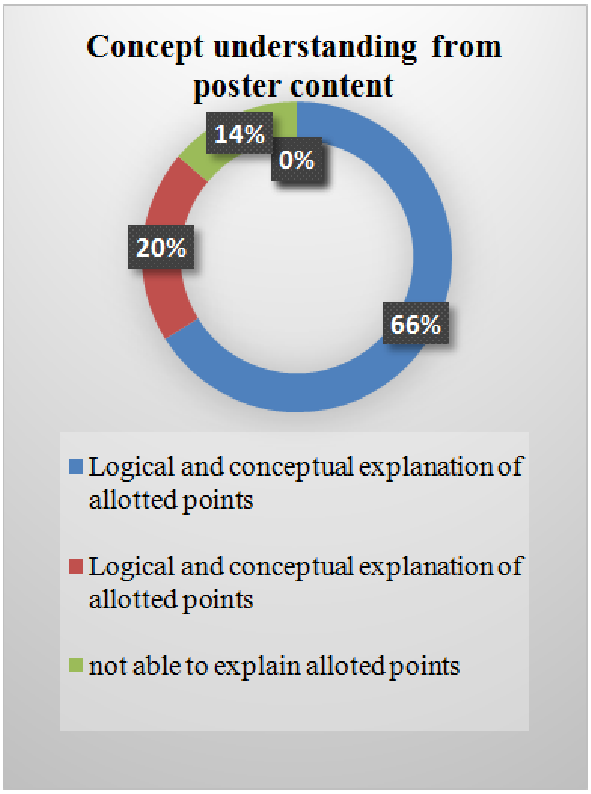
The Qualitative methods have been used to get a more comprehensible result. After collecting 65 questionnaires the quantitative data was sorted through student wise and converted into In semester evaluation marks. After analysing of data from rubrics record separately, the results were compared to measure the validity of the overall findings to get in-depth understanding of the students. Overall development where poster making was used as an alternative tool for assessment. The Students evaluation as per defined Rubrics is done

Procedure:

Measures	Assessment Rubrics		
	3 Marks	**2 marks**	**1 mark**
Involvement in poster presentation	Always attentive in group during poster presentation	Somewhere attentive in group during poster presentation	not attentive in group during poster presentation
Concept understanding from poster content	Logical and conceptual explanation of allotted points	Logical and conceptual explanation of allotted points	Not able to explain allotted points

The chapter was completed within 5 hours with duration of each lecture is 1 hour. In a very first lecture, students received all the necessary handout about the allotted tasks and instructed to use reference book. The group of 6 students were advised to divide their readings and discussion as per their convenient time. In the 6th class, students finished their readings and based on the reading they had written notes which was checked by respective faculties. In the last class, the assessment where they presented their poster s prepared within groups beyond the class timing. The faculty asked questions to different groups followed by the defined rubrics as below.





progressively. Based upon their question answer capability, communication skills, logical thinking, the following pie chart is prepared to focus on evaluation based on rubrics.

Conclusion:

I am happy to have the Active Poster making and presentation in my "teachers toolbox. Our students have found this poster making and presentation as enjoyable experience, First Year students are more exposed to Physics knowledge and in other oral assessments they have already used power point. The major impact of the study was they had the spirit to work actively. occasion seemed to have benefitted the first-year students in terms of language development, subject knowledge, confidence built up to expose their prepared knowledge to the peers.

ACKNOWLEDGMENT:

Thanks to our department faculty at the RIT, helped during poster evaluation process.

REFERENCES

[1] Çetin, Y. and Flamand, Lee. (2013). Posters, self-directed learning, and L2 vocabulary acquisition. ELT Journal Volume 67/1 January 2013; doi:10.1093/elt/ccs053. Retrived July 24, 2013 from http://eltj.oxfordjournals.org/

Project Based Learning approach to teach Industrial Engineering

Shailesh Shirguppikar[1], Lokesh Patil[2]

[1,2]Department of mechanical engineering, RIT, Rajaramnagar
[1]shailesh.shirguppikar@ritindia.edu
[2]lokesh.patil@ritindia.edu

Track No: 1
Track Name: Different Dimensions of Teaching-Learning

Abstract: Industrial engineering course consist core concepts and students need to understand it. In conventional teaching learning process students able to understand the concept but only understanding is not enough for final year students. In final year, students should able to implement the concept in industries. In project based learning approach, students has to identify need of industry and try to solve them the problems by applying knowledge of industrial engineering. This approach improved interest of students towards course and also solve life problems faced by industries. This approach is very much useful to improve course attainment and result of student.

Keywords: Project based Learning, Industrial Engineering

1. Introduction

Higher education institutions have been responding to challenges that have led to a transformation of educational practices, particularly towards the implementation of active learning strategies, in order to create meaningful teaching and learning experiences, with increasingly more autonomous, cooperative and motivated students. In the particular case of Engineering, graduates should be able to develop their professional activities, dealing with a wide range of different types of problems that require the proficiency of technical and transversal competences. Transversal competences are being recognized as equally relevant for the engineering practice, such as working with multicultural teams, communicating at different contexts, dealing with uncertain and unpredictable situations (Cai, 2013; Jackson, 2012; Lima, Mesquita, and Rocha, 2013; Passow, 2012). Aiming to increase the relevance of the teaching and learning processes, the Integrated Masters degree in Industrial Engineering and Management (IEM) an engineering program of 5 years (10 semesters), at the School of Engineering in the University of Minho, Portugal, focused their efforts on building curriculum innovation. The work developed was focused mainly on changing the teaching and learning processes to implement Interdisciplinary Projects (PBL – “Project-Based Learning”), inspired by the Powell and Weenk approach – PLEE, “Project Led Engineering Education” (Powell, 2004; Powell and Weenk, 2003). Thus, the first curriculum innovation experiences were based on Interdisciplinary Projects, which started in the context of the preparation for changes within the Bologna Process demands. Currently, interdisciplinary projects are part of the formal curriculum of the Industrial Engineering and Management program.

The increasing awareness of a different professional profile needed for Industrial Engineering and Management (IEM) graduates, requiring the development of competences, both technical and transversal, and simultaneously the ambition to have students more motivated and engaged with a meaningful learning environment, were the main reasons that led a group of teachers of the IEM program at the University of Minho to start a journey of active learning amongst their courses..

Therefore, from 2005 onwards, interdisciplinary projects were developed within the IEM program to promote the development of technical and transversal competences (also known as professional or transferable competences), engaging student teams throughout the semester in the search of a possible solution to a problem.

The purpose of this chapter is to describe the model and changing process of 10 years of Project-Based Learning in the Integrated Masters degree program of Industrial Engineering and Management (IEM) at University of Minho, Portugal. The IEM program has three formal PBL approaches in its 10-semester curriculum, i.e. semesters 1, 7 and 8. It has some non-systematic approaches in other semesters, and a final individual master thesis project of one and a half semesters. This work will describe PBL approaches of semester 1 and 7, which were selected by their specific features, as one is a first year project (semester 1) and the other a project carried out in interaction with industrial companies (semester 7).

2. Change in scenario

Engineers are recognized by their technical competences and for being required to design, operate, execute, and manage technological systems. Within these processes, they must apply rigorous mathematical and scientific concepts, and tools to identify, formulate and solve problems that contribute to society. Furthermore, but less recognized, engineers must have a strong sense of human interaction, both when designing solutions for the society and when planning, executing and managing the development of solutions. The Bologna Process was an institutional movement all over the European Union (EU) that committed a large number of countries to change their Higher Education (HE) systems based on three main principles: quality, mobility and employability.

These principles were the main drivers of improvement of HE systems, mainly concerning curriculum development and innovation. This included, for instance, the reorganization of the programs based on the uniformity of HE systems through a credit system (ECTS – European Credit Transfer System) with impact on student learning, teaching practice, institutional support, amongst other issues. These were great challenges for HE institutions, followed by tensions and critical issues that needed to be explored deeper (Wihlborg and Teelken, 2014). All countries in the EU had different timings and Portugal was committed to change in 2007 integrating the first group, including the University of Minho.

Thus, in 2004, considering this national and European requirement, the rectory of the University of Minho developed a set of strategies for the implementation of curriculum changes. Within these strategies, there were opportunities for discussions, pedagogical training for teachers, and a funding program for innovative educational experiences. These experiences were developed during the period before the formal Bologna curriculum change and best practices were to be included in new curricula.

3. Change in Process

All these circumstances created the appropriate groundwork for curriculum innovation by groups of teachers. The previously referred to group of teachers from the IEM program involved themselves in the training opportunities provided for engineering teachers in the context of the Bologna Process. Some relevant examples of the training sessions for curriculum innovation included: Richard Felder and Rebeca Brent on Active Learning; Peter Powell in Project Led Engineering Education; Manuel

Firmino Torres in Effective Communication for Teachers; Maria Assunção Flores in Assessment Processes; Natascha van Hattum-Janssen in Course Planning and Peer Evaluation. All these opportunities contributed to change or reinforce teachers' engagement with the process and the need to change the learning processes. Of great importance for the IEM program was the opportunity to learn the principles of Project-Led Engineering Education with Professor Peter Powell (Powell, 2004; Powell and Weenk, 2003). This contact provided the necessary elements to support previous ideas and experiences with project approaches in the context of engineering education. Two of these teachers were at the time teaching first year courses and decided, with the support of the program coordinator and a colleague from another department, to create a project proposal for an educational program funded by the rectory. They strongly believed that it was possible to create projects with open problems for students of the first year and that was seen as highly innovative. The project was funded by the Rectory of the University and in March 2005, the group of teachers (authors of this study) and a number of other teachers from different departments and schools of the University of Minho got together to implement a first experience of Project-Based Learning in the second semester of the first year of the IEM program. These experiences were supported, since the beginning and during the following years, by educational researchers that also integrated the coordination team and made the difference, both in regard to the implementation and evaluation process and also the research carried out in the following years. Simultaneous with the referred to first year experience, some of these teachers decided to implement a PBL experience in the last year of the IEM program, in interaction with industrial companies, and the first experience started in September 2005. Currently, the interdisciplinary projects in cooperation with industrial companies still occur and research developed in this field shows the relevance of the cooperation between university and industry (Lima, Mesquita, and Flores, 2014; Mesquita, Lima, and Flores, 2013). The teachers and researchers involved in the first experiences aimed to develop a learning environment characterized by open-ended problems from real and meaningful contexts, in which teams of students should present solutions, by developing a wide range of technical and transversal competences. The aim was for students to mobilize their knowledge, attitudes, principles, etc., to identify, formulate and solve open-ended problems. To achieve this goal, the Project-Based Learning approach was chosen.

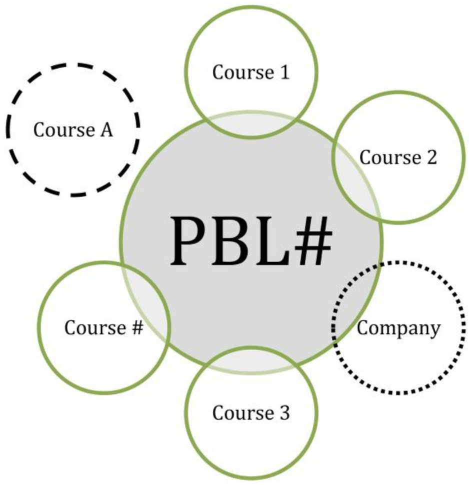


Figure 1: PBL Interaction

4. Process of PBL:

Formulation of group: Two students each group

In next phase students were asked to visit industry as per their convenience.

Students were asked to identify and define real life industrial problem.

Students discussed their identified problems with supervisors during tutorial hours.

Students were asked to develop optimum solution to problem using various industrial engineering tools and techniques.

Students submitted reports approved by industrial authority and presented in class.

5. Evaluation

Students were evaluated on through presentation and prepared evaluation sheet for their assessment. Marks distribution will be provided on the basis of problem identification, depth of problem, problem solving skill of students and report prepared by students.

4. Conclusions

PBL used during teaching learning process as well as assessment of students. As students contact industry people and try to solve real life problems hence it improves understanding of concepts. Course attainment significantly increased and it also improved result of course.

Acknowledgement

I would like to acknowledge RIT, Rajaramnagar for providing opportunity to participate in conference.

References

Lima, R. M., Mesquita, D., Dinis-Carvalho, J., and Sousa, R. M. (2015, July 6–9). Promoting the interaction with the industry through project-based learning. Paper presented at the Seventh International Symposium on Project Approaches in Engineering Education (PAEE’2015), part of International Joint Conference on the Learner in Engineering Education (IJCLEE 2015), San Sebastian, Spain.

Lima, R. M., Mesquita, D., Fernandes, S., Marinho-Araújo, C., and Rabelo, M. L. (2015, July 6–9). Modelling the assessment of transversal competences in project based learning. Paper presented at the Fifth International Research Symposium on PBL, part of International Joint Conference on the Learner in Engineering Education (IJCLEE 2015), San Sebastian, Spain.

Mesquita, D. (2015). O Currículo da Formação em Engenharia no âmbito do Processo de Bolonha:
Desenvolvimento de Competências, Perfil Profissional e Empregabilidade na Perspetiva dos Docentes, dos Estudantes e dos Empregadores. (Doutoramento em Ciências da Educação, Especialidade em Desenvolvimento Curricular) Universidade do Minho, Braga, Portugal.

Mesquita, D., Lima, R. M., and Flores, M. A. (2013, July 8–9). Developing professional competencies through projects in interaction with companies: A study in industrial engineering and management master degree. Paper presented at the Fifth International Symposium on Project Approaches in Engineering Education (PAEE’2013): Closing the Gap between University and Industry, Eindhoven, The Netherlands.

Moreira, F., Mesquita, D., and Hattum-Janssen, N. v. (2011, October 1–2). The importance of the project theme in project-based learning: A study of student and teacher perceptions. Paper presented at the International Symposium on Project Approaches in Engineering Education (PAEE’2011): Aligning Engineering Education with Engineering Challenges, Lisbon: Portugal.

Passow, H. J. (2012). Which ABET competencies do engineering graduates find most important in their work? Journal of Engineering Education, 101(1), 95–118.

Powell, P. C. (2004). Assessment of team-based projects in project-led education. European Journal of Engineering Education, 29(2), 221–230.

Powell, P. C., and Weenk, W. (2003). Project-led engineering education. Utrecht: Lemma.

Wihlborg, M., and Teelken, C. (2014). Striving for uniformity, hoping for innovation and diversification:
Acritical review concerning the Bologna process: Providing an overview and reflecting on the criticism. Policy Futures in Education, 12(8), 1084–1100.

Beyond 9:00 am to 5:00 pm Shift Paving Way to Beyond Books and Beyond 9.5 GPA the 3Bs to Better Teaching and Learning.

Dr. Swetha Ganeshan

[1]Mechanical Engineering, The National Institute of Engineering,
Mananthavady Road, Mysuru, 570008. Karnataka.
swethaganeshan@nie.ac.in
Track No: 2
Track Name: Faculty Development

Abstract: The best way to teach is by being a good student. What inspires a faculty today in most colleges is the number that comes on their phone message during the first week of every month. However, this can certainly be changed if the faculty of our institutions are introduced to a. modern/SMART methods of teaching, b. opportunities to give presentations and talks at institutes other than theirs (i.e. top institutes in India) and c. are provided with an opportunity to teach/guide at least few students every year from elite institutions. This will make them not only accountable in terms of how they present their capabilities but also help them perform their role in the noble profession in a more "morally motivated manner" irrespective of the quality of students in their respective institutions. The present paper provides, and elucidates further, certain strategies for inspiring and inculcating within the faculty population a need to go beyond the 9 am to 5:00 pm shift when it comes to teaching. It also provides methods that can be adopted to intelligently provoke students to go beyond books and aim beyond the CGPA goal of 9.5 each year. Some of the strategies that will be presented in this paper will include 1. Mixing strategy. 2. Connecting/Perks strategy and 3. Live problem solving that leads to presenting their solved case studies to the corresponding industry for revenue.

Keywords: Moral motivation, beyond CGPA, innovations in teaching and learning, beyond books.

1. Introduction

One of the interesting behaviour that we see amidst the teaching population in the non-elite institutions in India is the punctuality in terms of "punching in" and "punching out" their biometrics or in some cases "signing in" and "signing out" the attendance register every day. What keeps them so highly motivated to do so is their PF amount increasing at the end of each month, their ability to pay their EMI on time and most importantly have a life that is still going on. It may sound brutally rude to be so upfront, but this is a generic behaviour seen in several colleges especially considering the new bills passed by the government [1]. When we look at the other side of the coin: what motivates the students in these colleges? There may quiet well be an agreement that there is immense room for improvement. Take for instance the enthusiasm of the newly joined first-year students—prioritized by I am going to get an "B.E./BTech degree", second year students: "Well, it is nice that I won't have maths, physics and English from now on". Third year students: "I want to ensure there are no backlogs so I get placed on time in a good MNC" (irrespective of the branch of engineering) and finally the very popular final year students: "I can't wait to get out before people can find out I have no clue how to mend my car when it fails".

Both teaching and learning, have to be looked at from a different perspective especially for those in good yet not the top institutes in India. Giving importance to the profession that is known for its nobility and giving importance to the system which is known to build smart engineers who can revolutionize technology is essential. Why then is there an absence of such an essentiality? Could there be means to motivate the two sides of the same coin to compete with each other in terms of quality? Below are a few strategies that could be considered for further analysis and implementation.

2. Strategies for faculty improvement:

A sense of ownership in one's routine and a sense of accountability in one's deliverables ensures promising outcomes-be it a business or an educational institution. The points mentioned within this section are based on the hypothesis that "While teaching is a noble profession, applying a business approach towards faculty improvement program can bring about moral motivation within them". As is being addressed in the next segment for strategies to inspire students to go beyond books, here we will look at a couple of ways to inspire the faculty population to go beyond the 9:00-5:00 pm shift.

Giving the faculty population at tier 1 engineering colleges the opportunity to teach/stay as a visiting professor in one of the elite institutions in India is a means to ensure that a "wake-up" atmosphere is generated within the home institution. Providing a scheme wherein professors excelling in innovative teachings and capable of bringing about quality education in the students are awarded with an opportunity to become a visiting teaching professor every summer at the top tier institutions is what is being recommended here. While this sounds very lucrative, who is going to give them the opportunity and who is going to fund them? are the next obvious questions. It is certain that there are emeritus faculties present in every IIT or NIT. Coordinating with them and creating this segment wherein a specified number of teachers from tier 1 colleges across the country can be sent to the top tier colleges every summer to teach the students is a possibility. And likewise selected faculties from the top tier colleges (IITs/NITs/IIScs) can be sent to tier 1 colleges each summer to teach the students. This strategy is what can be called as “Cross-breeding”. The faculty population would certainly want to add in their resume, the teaching they did (Visiting professor designation) at top universities and hence the question of additional pay becomes void. Rather than individuals applying by themselves and many times in vain, if the cross breeding scheme can be regulated and promoted by institutions, there is high probability of having increased competitiveness, interest, “smart” work (in addition to hardwork) and the motivation to work extra hours amidst the teachers. This leads to moral motivation, where it is not money but quality that people start looking forward to.

Following the above scheme, when teachers actually start teaching in their “dream institutes”, they get an opportunity to interact on a daily basis with both the students and staff of these reputed colleges for a prolonged 3 months (considering it is going to be in summer). This will help them grow in terms of their own teaching and research capabilities and at the same time identify areas of focus to train their own students at their home universities. Furthermore, the experience gained by the faculty can help him/her implement novel methods in teaching at his/her home university after having understood how teaching takes place at other institutes. This can be flagged under the “share and share more” theme because the teachers are expected to bring benefits to the staff and students at their home ground post such experiences. Moreover, each institute in itself can gain immense benefit through such collaborations in teaching and again, instead of individually applying and only one or two being benefitted, if the group of institutions under the tier 1 flag can team up and coordinate such a scheme, it will prove to be more beneficial and “morally” profitable.

Another factor that de-motivates many teachers in engineering colleges today is the compulsion to do non-teaching tasks [2]: administrative tasks. How can there be motivation to do such things, when the task assigned has nothing much to do “directly” with teaching or research? Well, can this be computerized? Can this be time tracked with cash awards? Can this be delegated based on work loads? These are some of the options that can be discussed further.

3. Strategies for inspiring the students to go beyond books:

One of the understandings that I personally get from the students of these smart yet not highly ranked colleges is the “giving in” mentality that says, “Well, it has to be an IIT and since we are not from there, nobody is going to care”. A self-esteem mindset accompanied by a motivation to “earn” a degree so that there is a social status in one’s family in addition to a job in one of the IT companies irrespective of whether it is a Mechanical engineering stream or even a Civil engineering stream is what seems to be driving the students these days. The first strategy that I would like to introduce herein to overcome the aforementioned psychological negative trait is as follows:

3.1 Mixing strategy (Miscibility strategy):

Remember the famous mixture distribution in probability, statistics, CAT problems? Well the same could be extended in education systems for both teachers and students. Giving opportunities for students from the non-IIT sector to take a semester course (or even a 2 months to begin with) at an IIT/IISc institute can certainly improve their motivation, quality and competitive spirit to an extent that is recognizable. Likewise, this will further instigate the already popular IITians/NITians and IIScians to fasten their belts tighter.

Consider the following equations:

X={x, y’, z,}

$$x + y^{'} + z' = X'$$

$x = X^{'} - y^{'} - z''$

With miscibility denoted as $x * y'$:

$$x * y^{'} = X^{'} + y^{''} - z' = X" - z'$$

Where $X" > X'$

X= classification set for students in India, x= students from top tier engineering colleges (0 tier); y=students from the tier 1 engineering colleges, z = students from tier 2 engineering colleges.

As per the aforementioned equation called as the *equation of psychological miscibility*, the average performance of the students can be increased by the process of mixing. However. a systematic and organized program for the miscibility between top tier and tier 1 college students is to run each summer for a period of 4years.

When students are allowed to sit in a class together, an obvious *psychological* phenomenon that is observed is “peer pressure”. This peer pressure can be both productive and destructive depending on the subject that is being pressurized. In this particular case, it is a hypothesis wherein students when put in the same class with students of higher calibre will put in extra effort to make themselves smarter if not already. Furthermore, the opportunity to be in one of the nation’s top institutes for summer will motivate the students from tier 1 college to perform better in their regular classes so that they can selected chosen to spend their summer at these colleges for a credit or two. While this hypothesis has been tested within my area of teaching and training both in industries and academia, I am hoping the education community will implement this strategy at a larger scale.

3.2 “Perks” Strategy:

The second tool to enhance the performance of the students at tier 1 or tier 2 colleges is providing them with perks. Just like in an industry, employees often wait for a Diwali bonus, or annual bonus for the company having functioned well, it is to our gain to introduce such perks in institutions for both students and teachers via non-monetary benefits. Perks for students may include but is not limited to providing an opportunity to receive one on one guidance from world renowned industrialists and academicians for research oriented higher studies. While some faculties around the country may be doing this by connecting the students to other professors for networking, in this particular case I am referring to the possibility of being personally guided by them for a research project or for higher studies. This will lead to a fee waiver eventually. Many students wish to pursue an MTech or MS either in India or abroad, therefore when such a scheme is advertised at the beginning of their freshman year, the probability of improved performance which is beyond books can be achieved. Here, the ability of the students to think and perform beyond books is what will be given priority in addition to a fair amount of importance to the CGPA.

3.3 Case study strategy:

The third category pertains to the idea of introducing management style education in engineering colleges where in a live on-going problem of a real company is given to the students to solve within their 4 years of stay at the respective institutes. The gain here is: Not only will the students be able to practically apply what they have learned but also be able to give the solved case to the concerned industry in return for a % of revenue that has been generated because of the solution provided by the students. Furthermore a lucrative job awaits them considering their smartness in being able to solve a real time problem and their capability in saving major financial losses to a company. This happens in many management institutions and there is no harm in introducing it in engineering colleges. This is different from an internship program where in a student works in an industry for a short period of time and learns from the industrial experience. In the 'case study' category, the student is given 4 years during his B.E. program to solve a real time/practical industry problem at a financial level thus making him capable of brining technological changes that ends up in a better profitability.

References

1) https://economictimes.indiatimes.com/jobs/are-you-teaching-in-an-engineering-college-your-job-may-be-at-risk/articleshow/64778053.cms
2) Vimala Ramachandran. (2005), Why school teachers are demotivated and disheartened, Economic and Political Weekly, Vol. 40, No. 21 (May 21-27, 2005), pp. 2141-2144 Published by: Economic and Political Weekly.

4. Conclusions

The current paper provides strategies for improvement of quality in both: teaching and learning sections of an educational regime. Much can be done with the support of the government to introduce these schemes at a larger scale. Regulated and compulsory implementation of '*cross-breeding*', '*perks'* and '*miscibility'* can surely bring about an admissible amount of change in the current education system. Introducing the "share and share more" scheme along with "case studies" can bring about a sense of moral accountability and responsibility respectively amidst the staff and students.

Acknowledgement

I thank the conference coordinators for giving me the opportunity to share my thoughts for innovative teaching and learning.

Quality Enhancement of Teaching

Dr. Preeti Bhamre[1], Tanuja Date[2]

[1]Information Technology, KKWIEER, Nashik
[2]Electrical Engg., KKWIEER, Nashik
[1]pdbhamre@kkwagh.edu.in
[2]tndate@kkwagh.edu.in
Track No: 2
Track Name: Faculty Development

Abstract: Today, in most of the private engineering colleges, a fresh post-graduate is typically recruited as an entry level teacher. Being a fresh post-graduate, he/she typically does not have any exposure to teaching field as a profession. Although every individual learns from many teachers right from primary schooling to engineering education and many teachers may have influenced an individual in certain good and bad ways, an individual never realizes while learning, the qualities which contribute in making a capable teacher. An individual after being recruited is expected to teach in class from the first day of appointment. He/she therefore has no time to possibly make an attempt to understand and develop the basic qualities needed for effective teaching. Teaching in an engineering college is probably the only profession in which no formal teacher training is provided to an individual. It then becomes the sole responsibility of an individual to groom himself/herself towards becoming an effective teacher. Thorough preparation of the technical content to be taught and effective delivery in class, handling both aspects at the same time, is therefore a challenge for an individual entering in teaching profession. In an attempt to support an individual in addressing this challenge, the Internal Quality Assurance Cell (IQAC) of our institute has been executing a rigorous induction training for all new teachers for the last two years. The training is implemented in five phases, with a formal feedback to individual teacher at each level. This paper discusses each of these training phases in detail, with desired objectives and derived outcomes.

Keywords: Flipped Learning, MOOCs, LMS, Moodle, Active Learning .

1. Phase wise details of Induction Training

The induction training was introduced in the year 2016-17 for 40 newly joined teachers,. In the subsequent academic year i.e.2017-18, 30 new teachers were trained. The objectives of these five phases of induction training were as follows –

Phase –I : To explain the basic roles and responsibilities of a teacher in an Engineering institute.

Phase -II : To understand the level of teaching ability of every individual teacher and to provide suggestions for improvement.

Phase -III : To demonstrate a model lecture to enable grasping of good teaching qualities.

Phase –IV : To observe the teaching performance of every individual teacher in the class.

Phase – V : To demonstrate various techniques of Flipped learning for enhancing teaching-learning process.

2. Phase I of Induction training – Roles of an Engineering teacher

The first phase of induction training involved lecture sessions of one hour by Head of institute/departments and some of the senior faculty members. The various topics covered in this phase of training are listed in Table 1. Depending on every topic, a brief feedback form was designed to understand whether the objectives of each lecture topic were achieved or not. Table 1 also enlists the typical comments about these topics as mentioned by the participants in the feedback form.

Table 1. Details of Lecture Sessions of Phase -I

Sr. No.	Day	Topic for Induction lecture	Typical Comments
1.	1	Know your institute	Role of Engineering teacher was understood. Information about learning styles was found useful.
2.		Role of teachers in institutional building	Understood the duties of teacher to be carried out effectively in initial years like planning of lectures, improving teaching learning process (TLP) and understanding student teacher relationship.
3.		Teaching learning methods / approaches	Emphasis on teaching of conceptual and intellectual stimulating content for joyful learning. Ways/Methods to break monotony of lectures.
4.	2	Active Learning	Importance of adopting various learning strategies
5.		Audio Visual Aids / Multimedia	Use of audio-visual aids like Java applets increase level of attention, interest,

			retention and transfer of knowledge
6.		Content / Knowledge Management	Sharing of knowledge aids in group learning activities
7.		We are teaching. Are they learning?	Causes of mismatch in teaching and learning
8.	3	Applications of Mathematics in Engineering disciplines	Relevance of various mathematical tools in real life applications.
9.		Assessment	Understanding about evaluation strategies to be adopted by teachers.
10.	4	Student evaluation of teaching – a learning tool	Identification of teaching parameters of feedback from students. Objectives of student feedback mechanism for continuous teaching improvement.
11.		Effective Group Activities	Collaborative learning strategies were discussed with example of master student program.
12.	5	Use of ICT tools	Demo of Google Classroom and Use of MOOCs
13.		Project based learning	Discussion of ideas for project based learning

3. Phase II of Induction training – Lecture recording/observation by senior faculty members

In the second phase of induction training, each participant was asked to prepare any topic of a subject of his/her choice and deliver the same for about 20 minutes. The delivery of this topic was observed by a pair of senior faculty members, one from the department to which the participant belonged and the other from a different department. The two senior faculty members observed these 20 minute sessions and gave feedback on four aspects related to teaching. These four aspects were –

1) Organisation of content during the lecture time.
2) Teaching style
3) Interaction during lecture
4) Instructional materials used during lecture.

The feedback was recorded on a five point scale for each participant and was discussed by the senior faculty members with each of them. The 20minute lecture session was also video recorded and provided to individual participant for self assessment and improvement.

4. Phase III of Induction training – Observation of a model lecture

In the third phase of the induction training, the participants were asked to observe a model lecture of another senior faculty in their respective department. All participants were asked to record their observations about this model lecture on following aspects -

1) Coverage of contents

2) Teaching tools used

3) Use of real world examples & applications

4) Clarity of communication

5) Simplification of concepts

6) Encouragement for student participation during lecture

7) Handling of questions/doubts raised

8) Class control

The participants were asked to identify those aspects which they needed to incorporate for improvement in their teaching.

5. Phase IV of Induction training – Observation of lecture in class

In the fourth phase of the induction training, the lectures of these participants were observed in regular class after about one and half month of teaching. A feedback on the same four aspects of teaching, similar to Phase II was collected from senior faculty members who observed their lectures. The feedback of Phase II and Phase IV were compared for observing incremental improvement in individual teaching performance. Figures 1 to 4 show the comparisons of four important parameters for those participants who completed the training successfully.

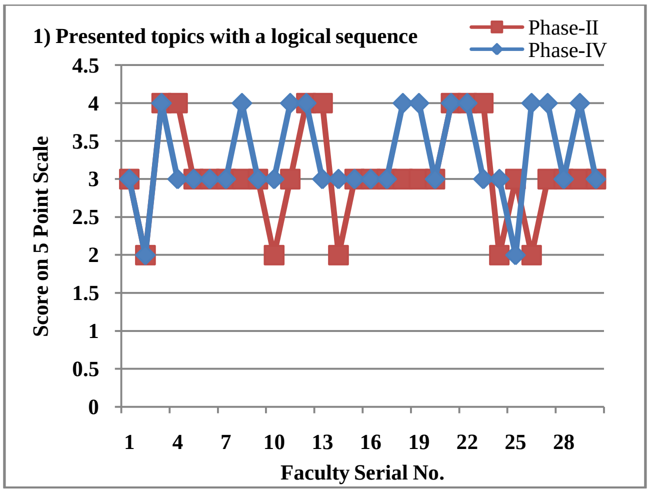


Fig. 1 Comparison of Parameter 1of Phase II and IV

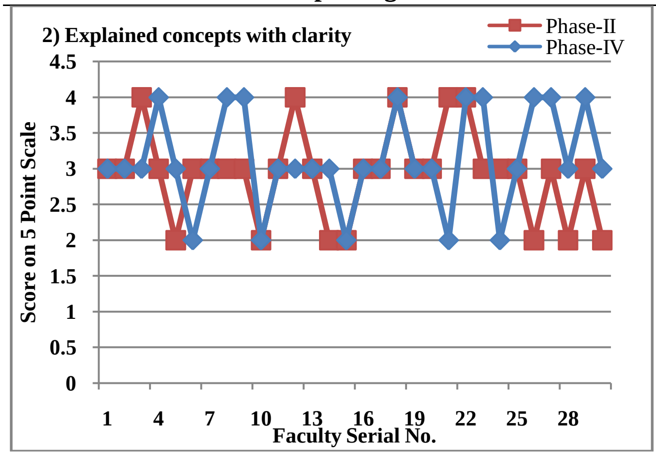


Fig. 2 Comparison of Parameter 2of Phase II and IV

6. Phase V of Induction training – Workshop on Flipped learning

The fifth and final phase of the induction training was one day workshop on Flipped learning by experts from other institutions. Following aspects were covered in the workshop-

- What is Flipped Learning
- Basic Principles of Flipped Learning
- How to Flip the Class
- In-Class Activities (Cooperative Strategies)
- Out of Class Activities (Videos, Presentations etc.)
- Assessment strategies
- Learning Objectives (Taxonomy)s
- Group work on preparing Learning Objectives for Out-of-Class Activities
- Group work on Planning of In-Class Activities
- ICT Tools for In-class and Out-of-Class Activities – Blog, Moodle Learning Management System (LMS)
- Many other ICT tools (Padlet, Poll everywhere, EdPuzzle BlendSpace, TestMoz etc.)
- Setting up Higher Order Objectives and planning relevant group activities using Cooperative Learning Strategies

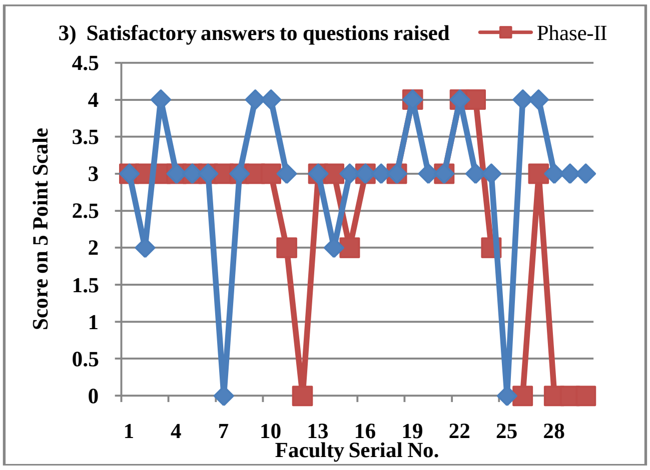


Fig. 3 Comparison of Parameter 3of Phase II and IV

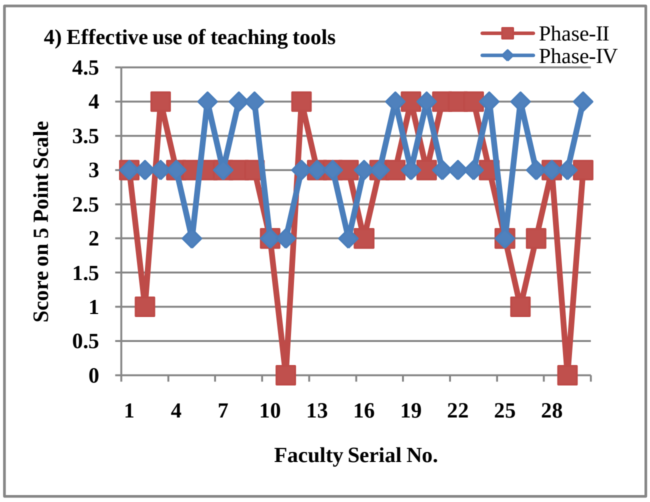


Fig. 4 Comparison of Parameter 4 of Phase II and IV

7. Impact of Induction Training and Conclusion

Feedback was collected from all participants to understand the manner in which the training had helped the participants to improve their teaching abilities. Figures 5 to 10 exhibit the impact of the training.

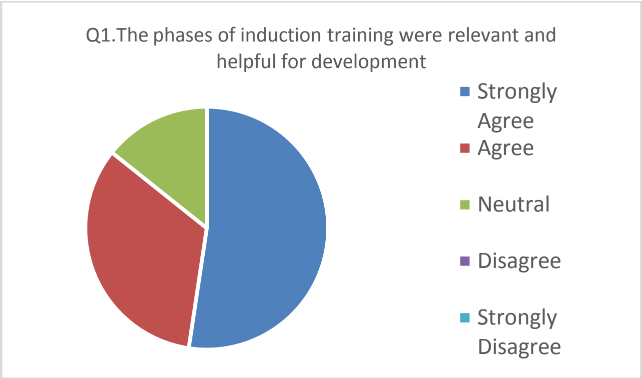


Fig. 5 Feedback Analysis – Relevance of training

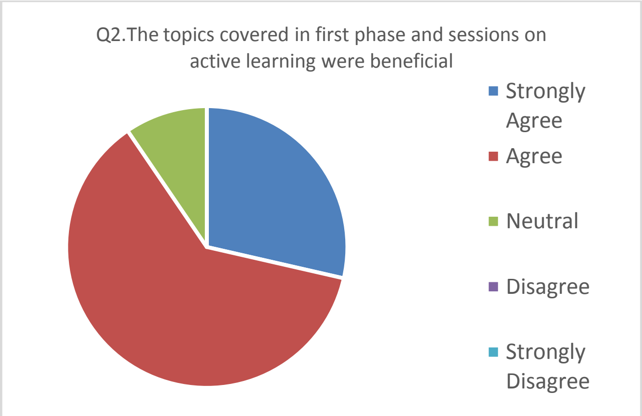


Fig. 6 Feedback Analysis – Active Learning

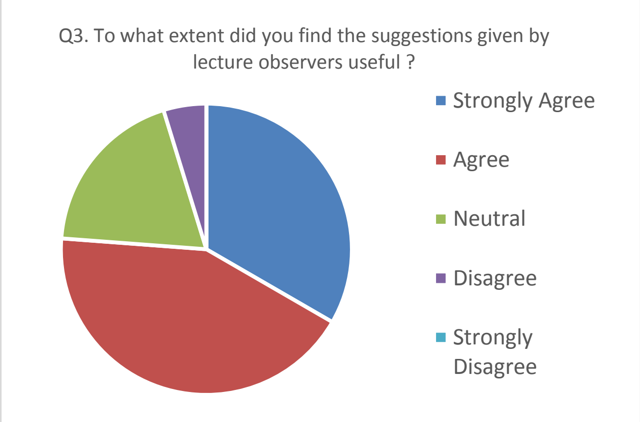


Fig. 7 Feedback Analysis – Usefulness of Lecture Observation

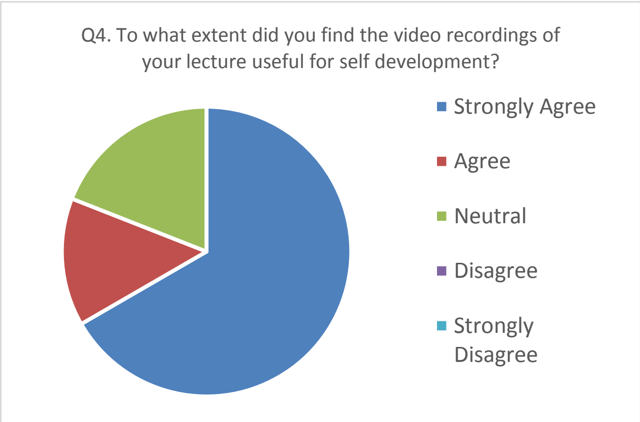


Fig. 8 Feedback Analysis – Usefulness of Video Recording of lecture

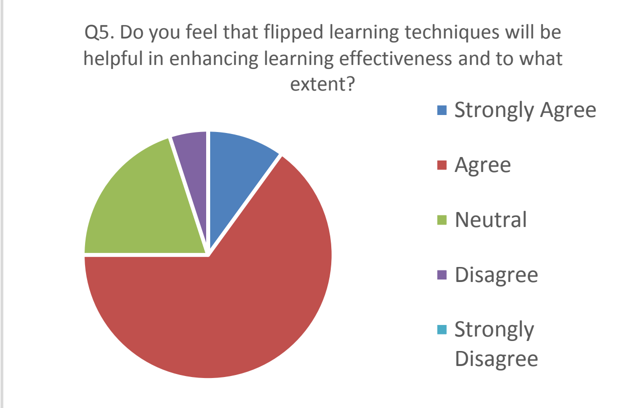


Fig. 9 Feedback Analysis – Usefulness of Flipped Learning

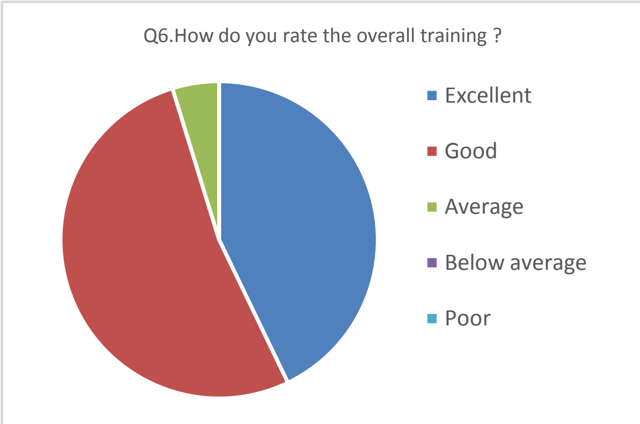


Fig. 10 Feedback Analysis – Overall training

By observing the feedback analysis of various stages, it can be concluded that the induction training for newly joined teachers has helped them in a significant manner for improving the overall teaching learning process.

Acknowledgement

We are extremely thankful to Principal and Management of our institute for providing us the opportunity to conduct the induction training for two consecutive years.

Factors Influencing the Quality of Higher Professional Education

V. N. Chavan[1]

[1]K. K. Wagh Institute of Engineering Education and Research, Nashik
Track No : 3
Track Name : Quality in Education

Abstract:
All the authorities, officers, technicians & workers should agree that either raw material or operating system is poor a product is ultimately have poor quality & have no value in market. The raw materials as well as operating system are equally important in manufacturing good quality product. In higher professional education raw material is aspirants after 12^{th} science education is of poor quality due to educational malnutrition which is consequence of bad habits of study, readymade notes, ratta, incomplete and/or selfish teaching or guidance, unawareness about practical knowledge due to tie up culture of coaching classes & junior colleges, poor basic concepts up to 12^{th} ,exam & marks oriented preparations, free hand marks donation at board exam and school level, inhabitual of reading & writing skills.
If a tree is provided wrong or incomplete nutrients in spite of necessary & useful from the start then it will suffer malnutrition and we cannot expect delicious, sweet& juicy fruits from it and not the better market also.
Quality education is need of each member of society not only from old days but also now days; rather now it is must. All we easily say that there is a period of saturation in all fields but not only industries but also government and semi government sector says that aspirants having poor quality regarding skills, knowledge, understanding, basic concepts, language, curiosity, thinking ability, confidence and tolerance.
It is easy to achieve good quality raw material for that it is necessary not only to think but also to work from root taking into consideration educational malnutrition; proper nutritional treatment through good quality operating system having each part of good quality and work from heart. The education farming method should be imparted in which proper time careful and good cultivation, proper seeding and feeding, taking care pests and atmosphere. This is most essential from pre-primary and primary education. To create awareness in parents & students before admission Process and at the time of admission about importance of higher professional education. for good quality of higher professional education your operating system should be of good quality .Each part of your good quality operating system must work from heart through education farming make easier the traditional difficult subject from first year to last year through teaching , develop confidence of success in first year students of higher professional education , develop technical skill & interest for needful and excellent projects through actual practice , create awareness in teaching and non teaching staff to develop pattern for excellent success.

Key words:
Improper teaching learning at school level from childhood, bad study habits from childhood, non-psychological study methods, lack of interest, educational malnutrition, poor quality of students

Introduction:
Educational psychology gives guidelines to handle individual for its education as per its age, need and interest to develop its life positively. But from last 8-10 years it is found that no psychological principles are applied to develop the individual even from lower stage in spite non psychological methods are bombarded which are twisting Indian human educational psychology causing educational malnutrition. As man is habitual animal and if it is treated with bad habits and suffering from educational malnutrition then it is difficult to handle with natural and useful habits though the practitioner or teacher is expert with complete knowledge and experience of psychological principles. Therefore now a days the raw material for higher professional education is poor hence the quality of higher professional education is badly affected; only parents are responsible for this due to their unawareness.
At present there are many researches about educational psychology: students brainpower (Julie L.P.Jessop**)**, Individuality development *(*L.V. Menshikova**),** Coaching tools **(**Jennifer L. Groh), Psychological crisis (Liu Ying, Li Zhixiang, Sun Mengyang, Huang Manling); but no one worked on the facts that why quality of aspirant of higher professional education is of poor and not able to synchronise with the requirement, syllabus, criteria and responsibilities towards society and nation.

Method: Group and individual counselling
While direct discussion with students and parents for their different difficulties in group and individual counselling session in city as well as rural areas students and parents frankly shared their study habits. In group counselling common as well as personal difficulties were shared by students; then through discussion reasons for the same are searched and those are guidance got from teachers & seniors during their education, meaning of education they know etc. In personal counselling ideal personality he/she influenced, favourite subject, relative, food or dish, program etc., fathers & mothers background, parents

expectation, target, goal of life and about surrounding world etc. points discussed. It is found that there are near about146 different difficulties the Indian society suffering from; some common are listed below,

I. Indian society is suffering from these common problems

1) Situation of unemployment **2)** Poor status of education- who is responsible? **3)** Problems in education system suffered by students and parents **4)** Heavy failure in higher education& reasons for it **5)** Is percentage of marks from childhood means education **6)** Tremendous tension at the time of exam faced by students & parents and its effects **7)** Depression is the critical problem day after day. **8)** Parenting, culture, moral values and sanskar found missing **9)** Quality of education is falling or of educator ? who is responsible. **10)** whether education is faulty. **11)** Uses and side effects of technology. **12)** Whether parents are unknown in developing their ward from childhood? How? **13)** Is counseling necessary to both student & parent? Who will take initiative? **14)** Do the parents & students know, what is the competition on tomorrow? **15)** Lots of students score above 80%marks but not succeed in higher education. **16)** Do the parents & students know, what is education and what should be purpose of education? **17)** Students work is only exam oriented. **18)** No target or goal in front of students in spite they follow actors, actresses and fashions through movies & serials.

Many social organizations and youth foundations working at different level conduct seminars, camps, workshops etc by brain trainers, life coaches, career counselors or successful person. The educationist write columns in newspapers and deliver seminars; but no one taken initiative to create awareness in parents and students about target, goal, meaning of education and how to success in career to develop not only future but also about responsibility towards society.

II. Reactions of external evaluating systems:

1) HR experts:
It is found that degree holders having lack of skills, knowledge, capability, confidence & interest; while only degree is completed and expect luxurious job with heavy salary.

2) Campus interview panel:
If we need 50 candidates in campus but we get nearly 9-10 eligible & skilful candidates. Maximum candidates unable to write even application for job. Lack of basic knowledge & practical knowledge.

3) Educationist:
Parents are in competition for higher percentage of marks through heavy charging coaching classes for their status in society and treating their children as marks producing & ratta machine; further push their ward forcefully into higher education according to their dreams. Students are mugging up notes & model paper solutions. Work of students is only exam and marks oriented not knowledge, concept & skill oriented.

4) Education survey companies:
Aspiring minds survey shows 4.92% computer engg. Graduates are eligible for job remaining nearly 95%completed degree through ratta only. Such many survey showing critical conditions of graduates in India.

III. Problems suffered by students in Indian society:

1) Finding no interest in reading books, attending lectures & practicals.
2) Cannot study on the day on which the topic is taught.
3) Study is possible only at the time of final exam through readymade notes & ratta using full night.
4) Having no confidence of complete study till the sharp time of paper.
5) Tremendous tension at the time of exam (paper) due to lack of confidence & short time memory.
6) Much confusion during paper; cannot understand exact meaning of question & its correct answer.
7) It was not only bombarded but also cultured that, 'learn this, repeat this, read & repeat this' from childhood. Therefore understand concepts but cannot express; hence rutta so obviously loosing memory power day by day & get depressed.
8) Along with English medium (CBSE, ICSE etc.) students poor in English language & its basics; Complete basics up to 12^{th} are totally poor though well-known coaching institutes were joined. Students having better marks also qualified for JEE advance &NEET but have poor basic concepts.
9) Up to 12^{th} no one told about importance, syllabus, problems and competitions in higher education.
10) Parents are interested in percentage of marks only & ready for heavy expenditure following advertisements only.
11) Badly addicted to mobile usage. Not interested in internal tests and if those are compulsory then come only for attendance or try for copy or it is necessary to bunk lectures & practicals one day before the test for getting success.
12) Students with marks more than 90% at SSC found failure at 12^{th} or in higher education or after graduation. (It is due to free hand marks donation system in boards & university exams also.)

IV.Non-Psychological methods and their effects on individual of Indian society

Effects of Rutta :

Rutta means study (learning by heart) without understanding or mugging up notes & question- answers. This method is forcefully treated from childhood (from Jr. K.G.) which is the age of natural development and to culture Indian traditions ,moral values through stories just like from Jijau to great Shivaji and free to play but ratta is cultured. As per psychological references. **1)** It causes tension on mind & brain. It causes loss of interest in study. **2)** It is started almost from childhood also it is forcefully, dangerous & cruel hammering on growing little brain and obviously twisting of growing little brain. **3)** It causes loss of memory power day by day and memory become short time. **4)** loss of creativity, curiosity, interest, understanding & concentration. **5)** As age raises difficulty level of syllabus also rises then there are limitation on ratta and loss of confidence.

Effects of readymade notes:

1) Students turn away from text books, meaningful reading & writing skills. **2)** If language of question is changed student gets confused & get tensed. **3)** Students become lazy for study till the day of exam and lose confidence and lastly keep the target of passing only. **4)** Loss of creativity, thinking ability, interest, understanding, reading & writing skills, temper & tolerance. **5)** Get addicted towards mobile and other type of entertainment due to lot of spare time available.

Similarity in digestion and natural study method

Food Digestion	**Natural study method**
1)Eating nutritious natural food (No fast food)	**1)**Reading the reference books or text books recognized by board or university for basic concepts(Nutrients)(No readymade notes)
2)cutting food into fine pieces and mixing of saliva	**2)**Read word by word, sentence by sentence and use our ideas to understand meaning
3)In stomach digestive juices are added to convert it into digestive form	**3)**Prepare self notes as per understanding in own language into simple form.
4)Necessary components absorbed by small intestine used to develop different cells of body for better strength.	**4)**Understanding all basic concepts and their applications to develop knowledge bank for better memory & confidence.

Result and Discussion

Educational Malnutrition

In usual malnutrition economically poor not getting nutritious food on the other hand economically strong & higher living standard not eating nutritious food due to fashion of hoteling and status. Therefore they suffer from deficiency in vitamins, minerals, proteins and fats hence unable to face any disease and infection due to poor immunity.

The educational malnutrition is similar; economically poor people admit their ward in ZP or corporation school or govt. granted schools with poor educational quality; while economically strong & higher living standard due to their status admit their ward in the schools with heavy fees & again coaching remain away from self study, meaningful reading, writing, practical skills and only culture by ratta through readymade notes. Both parents not knowing actual meaning of education. Therefore they suffer from deficiency of memory power, skills, language, creativity, curiosity, thinking ability and confidence hence unable to face examination causing failure due to poor quality.

If the patient is under observation and after few days doctor says that patients body is not responding to any medicine or technology though it is advance technology; similarly patient of malnutrition finds no absorption of nutrition. Then though there is modern and advanced technology available will not work at all; this means to work from root is necessary and to create awareness in parents is must for this purpose.

Cunclusion

Educational malnutrition shows similar effects; once student is victim of malnutrition suffers difficulties in adaption of any new or advanced technique hence the poor quality.

References:

1. Counselling and Development Centre, “Reading Skills for University: 4. Critical Thinking,” 2001, retrieved January **2,** 2002, from the World Wide Web:http:l/www.yorku.cdadmin/cdcdc/lsp/read/read4.htm**.**

2. DeCuir-Gunby, J. T., & Schutz, P. A. (2014). Researching race within educational psychology contexts. *Educational Psychologist, 49*(4), 244–260.

3. W. Doyle & K.Carter, Educational psychology and the education of teachers: a reaction. Educational Psychologist, 31, 1, 23-28(1996).

Best Practices for Improving Quality of Higher Education Institutes

Chandan Krishna Mukherjee[1]

[1] Mech. Engg. Dept., SSBT's College of Engg. and Tech., Bambhori, Jalgaon – 425001
[1] Email :- ckm.jalgaon@gmail.com
Track No : 3
Track Name : Quality in Education

Abstract :- In a highly competitive work environment, large number of students passing out from numerous higher education institutes are neither able to find proper employment in public/private sector nor able to establish themselves as entrepreneurs. This has led to discontent and disillusion amongst the youth community as well as substantial reduction in institutional intake to the extent that many institutes are on the verge of closure. Hence it has become imperative that all senior personnel of this industry must indulge in serious introspection and identify means of improving the quality of education and employability of the pass-out students. Relevant facts, observations and views have been presented in this paper. While most of the discussion is general in nature, emphasis is on the state of institutes in Maharashtra.

Keywords:- Nptel, PBAS, interaction with industry, students and parents

1. Introduction

Economic Scenario :-

India has a current population of about 136.6 crores [1] and is considered as the world's 5th. fastest growing economy. While average growth rate in 2013-17 was about 7.15 %, estimated growth rate in 2018-19 in GDP at current prices is 12.33 % and Per Capita NNI is 11.1 %. There was exceptionally good performance in key sectors like Construction, Coal mining, Banking, Manufacturing, Commercial Vehicles, Railways and Surface Transport. Speaking of the engineering industry, there has been significant growth in those related to capital goods, electrical equipment, machine tools, construction equipment and engineering exports. Future appears brighter due to set-up of new SEZ, Delhi Mumbai Industrial corridor, Make-in-India and 100% FDI policy [2].

Higher education in India :-

To educate this huge population and sustain the high economic growth, there are 687 autonomous institutes and 907 universities (48 Central, 399 State, 334 Private, 126 Deemed) in the country having UGC approval as on 31st. March 2019 [3], running distance education programs and giving affiliation to thousands of institutes of these, 94 institutes (including all IITs, NITs, IIMs and AIIMSs) have been designated as institutions of National importance by Ministry of HRD [4].

Table 1A. : AICTE approved institutes in AY 2018-19 [5]

All India data	AICTE approved Institutes			Full-time Faculty Lakh	Sanctioned Intake Lakh
	(-)	(+)	Total		
Dip Engg. Institutes	14	60	3,779	1.20	11.25
UG Engg. Institutes	11	84	3,124	3.38	14.05
Management Institutes	24	86	3,118	0.46	3.74
Dip. Pharm. Institutes	-	300	1,078	0.06	0.67
B. Pharm. Institutes	2	119	1,214	0.27	0.94
Total	**54**	**545**	**10,418**	**5.87**	**33.92**

Table 2A. Admission and Placement Status in AICTE approved institutes in AY 2016-17 [5]

All India data	Admission Status			Placement Status		
	Intake Lakh	Admit Lakh	%	Pass Lakh	Placed Lakh	%
Diploma Engg. Institutes	12.45	7.05	56.6	5.23	1.78	34.0
UG Engg Institutes	15.57	7.86	50.4	7.82	3.63	46.4
MBA Institutes	4.13	2.35	56.9	1.80	1.06	58.9
Dip. Pharm. Institutes	0.39	0.34	87.4	0.21	0.07	31.6
B.Pharm Institutes	0.85	0.62	73.1	0.40	0.17	44.2
Total	**37.03**	**19.54**	**52.8**	**16.74**	**7.20**	**43.0**

The country has almost 10,500 AICTE approved institutes, employing 6 lakh faculty and having sanctioned intake of 34 lakh, more than 90% of which are for engineering, pharmacy or management courses, but admission is only 53 % and placement is only 43 % [Tab–1A, 2A] [5].

Scenario in Maharashtra :-

It has a current population of about 11.6 crore, constituting 8.5 % of Indian population, but has 15 % of the institutes . It has about 1,600 AICTE approved institutes, employing

ISBN : 978-93-88441-93-3

69,000 faculty, with sanctioned intake of 4 lakh which is significantly high, being 34.5% of the state population,. There is a high proportion of SC/ST/OBC category candidates, availing huge educational subsidy from State govt. However, admission is marginally better and placement is significantly lower than the national average [Tab–1B, 2B] [5] .

Table -1B : AICTE approved institutes in AY 2018-19 [5]

Maha-rashtra data	AICTE approved Institutes			Full-time Faculty	Sanctioned Intake
	(-)	(+)	Total		
Dip Engg Institutes	4	1	423	17,682	1,33,047
UG Engg Institutes	1	6	363	34,622	1,44,121
MBA Institutes	1	7	370	5,630	51,713
D.Pharm. Institutes	-	22	233	3,726	17,780
B.Pharm. Institutes	-	33	318	1,852	19,949
Total	**6**	**61**	**1,556**	**68,632**	**3,99,760**

Table – 2B : Admission and Placement Status in ICTE approved institutes in AY 2016-17 [5]

Maha-rashtra data	Admission Status			Placement Status		
	Intake Lakh	Admit Lakh	%	Pass Lakh	Placed Lakh	%
Dip Engg Institutes	1.69	0.74	43.5	0.65	0.11	16.2
UG Engg Institutes	1.56	0.88	56.6	1.19	0.39	32.7
M.B.A. Instiitutes	0.52	0.35	67.4	0.27	0.18	67.1
D.Pharm. Institutes	0.15	0.15	97.1	0.08	0.02	24.2
B.Pharm. Institutes	0.12	0.11	93.2	0.08	0.03	36.3
Total	**4.43**	**2.39**	**54.0**	**2.43**	**0.79**	**32.3**

Higher education institutes offer professional courses and are the backbone of our economic growth. However, figures reveal that survival of a significant number of AICTE approved institutes, particularly those in Maharashtra, are severely threatened due to low placement and admission. Hence there is utmost need for detailed analysis and serious introspection by all stakeholders and policy makers to identify the root causes and implement long term solutions.

2. Importance of improving Quality of Institute

Parents, as a major stakeholder, expect appropriate placement of their wards with adequate remuneration on completion of a course. If parents are disappointed, as reflected by the low placement figures, they would be reluctant to admit their wards in future, resulting in even lower admission position. So, low placement is the most probable cause for low admission. In the NBA / NAAC accreditation grading and institute ranking processes, both placement and admission status is considered. To ensure higher probability of placement, parents invariably prefer to admit their wards in institutes having higher grade / rank. So, institutes with lower grade / rank have low admission, begin to lose their financial viability and have to resort to survival strategies or go for downsizing / diversifying / closure.

The industry is another major stakeholder, providing employment to pass out students. There is no market recession / lack of job opportunities, rather there is rapid industrial growth and consequential increased job potential. However, it requires technically competent, highly efficient, matured, dedicated and responsible professionals; in a highly competitive, free – market economy, the industry cannot risk recruiting incompetent staff. The higher education institutes are responsible for transforming newly admitted students into such competent professionals, irrespective of their socio-economic background. Better the quality of an institute, more effectively, efficiently and consistently will it succeed in demonstrating such transformation in its students. If interviewers are convinced that pass-out students have the requisite skills and if after recruitment these students perform well in the industry, the market reputation and goodwill of that institute will progressively increase. Thereafter, the industry would be willing to give on-campus / off-campus job offer with better pay package to pass-outs of that institute. Increased employability will lead to more admissions, better NBA/NAAC accreditation grade, higher institute ranking and further increase in market goodwill.

Thus, improving quality of an institute is the key to ensure good placement, higher admission and better ranking. We may thus conclude that all higher education institutes, particularly those which are liable to close down, need to make a conscious effort in order to improve their quality.

3. Factors affecting Quality Improvement

The quality of a higher education institute is reflected by the consistency and efficiency with which it is capable of imparting requisite skills to its students, developing their overall personality and transforming them into employable professionals. This depends on the following factors :-

- Curriculum as per industry requirement
- Faculty competence
- Infrastructure facilities of the institute
- Quality of student and their parents
- Quality control measures by institute

Curriculum :- The work environment in PSU , MNC and various private sector organizations are quite different. However, the professionals employed therein have a lot of common characteristics with regard to technical competence, managerial skills and work attitude. The curriculum should be designed accordingly to ensure that after successful completion, the student will acquire the desired characteristics and become acceptable by the industry.

Faculty:- They are primarily responsible for transforming students into employable professionals. They should have a good academic track record and in-depth knowledge of curricular subjects to be able to properly impart requisite technical competence to students. They should also have adequate work experience, preferably in different sectors, to be able to properly mentor and motivate the students for acquiring requisite work attitude and managerial skills.

Infrastructure facilities :- Institute should provide aesthetic hostel, clean bathroom and drinking water, geysers in cold weather, hygienic mess, canteen, fire fighting and first aid, medical, security, recreation, sports, library, classroom, seminar hall, auditorium etc. facilities to ensure a conducive environment for students. Computer centre with latest soft-ware packages and trained staff, wi-fi connectivity, well equipped laboratories /workshops with competent technicians are essential for developing technical competence of students. Teaching aids like OHP, LCD, video conferencing helps in teaching and better conceptualization by students.

Student and their parents :- Students usually come from different cultural and socio-economic background, with varying conceptualization and learning capabilities. It is imperative that they should have a growth mindset, be focused on their career objectives, be self-motivated and willing to work hard.

Parents should constantly encourage their wards to exert themselves and monitor their progress through regular interaction with faculty. They should reprimand them for any reported act of indiscipline/misconduct. For genuine cause for absenteeism, they should notify the institute at the earliest and seek prior permission on behalf of their ward.

Quality Control :- Institutes must be quality conscious, seek continuous improvement and ensure that quality is not being compromised at any cost. They should adopt appropriate quality control measures to monitor ethical and moral code of conduct of faculty and students regarding discipline, timely conduction of theory and practical classes, regular attendance by students, conduction of exams, standards of paper setting and paper checking.

4. Best Practices for Quality Improvement

Apart from the institutions of National importance, a significant number of govt. unaided premier institutes like BITS Pillani, BIT Mesra and COE Pune have better NBA/NAAC accreditation grade, higher institute ranking and full admission. Students from these institutes usually get lucrative placement prior to course completion and perform well in competitive exams. Some of the notable best practices adopted by these premier institutes are :-

Faculty :- They recruit best quality expert faculty from the market by offering higher salary/perks. The faculty members usually have excellent academic record from premier institute with work experience in reputed organization and foreign exposure. This is to establish the credibility of their competence to properly mentor and transform students.

Infrastructure :- They usually have a well decorated campus with residential facilities for most of the staff and compulsory hostel accommodation with all modern amenities. Their laboratory is well equipped with latest state of the art equipment and experienced technicians; they engage specialist professionals for marketing, campus placement, sports and cultural activities; provide latest teaching aid, wi-fi internet connectivity,. This is designed to ensure requisite transformation and overall personality development of the student.

Student Quality :- They usually charge considerably higher fees and follow stringent admission procedure (written exam, GD, personal interview) to attract students who are well focused, self-motivated , having good learning capabilities and decent background.

Curriculum :- They follow syllabus and textbooks in keeping with international standards and industry requirement. They encourage students to undergo vocational industrial training during inter semester vacation, compulsorily undergo 3 mth internship in reputed organizations, regularly invite top officials to deliver expert lecture and motivate students. This ensures development of professionalism in students.

Quality Control :- Their academic calendar is prepared well in advance, has less holidays and short vacation to ensure adequate coverage of syllabus. Theory and practical classes are conducted regularly as per time table. They are strict about attendance and weekly assignment submission. End semester exams are usually tough with strict marking; ensuring that students are regular, disciplined, hard working and technically competent.

5. Barriers to Quality Improvement

Most of the institutes having lower lower grades/ranks do not follow the best practices specified above. They are unable to provide good quality faculty and infrastructure due to financial constraints, low fees and less admissions. They usually recruit pass-outs from own/neighbouring institutes and residing nearby. However, they serve an important social purpose of making education available to all sections of society in their region. So, in order to improve their quality to acceptable standards, NBA, NAAC and AICTE have prescribed certain norms and guidelines, some of which are discussed below :-

a) Since faculty of these institutes are found lacking in core competence and industrial work experience, they are required to upgrade their qualifications, undergo FDP/STTP preferably conducted by IITs/NITs, participate in NPTEL online certification courses, present paper in conferences preferably organized by IITs/NITs as well as participate in industry-institute interaction in order to enhance their technical competence to acceptable levels.

b) Institutes can undertake Govt. aided research projects/Industry sponsored projects and subsequently obtain patent; in order to generate funds to upgrade/update their laboratory. They are also required to satisfy other norms like student/teacher ratio, area of class room, lab, library etc. within a stipulated time frame.

c) Institutes have been asked to increase industry-institute interaction in the form of industrial visit, guest lecture, expert lecture, motivational lecture.

d) AICTE has already issued model syllabus and asked the various universities to make appropriate changes in their existing syllabus. Specifically, they have asked for incorporation of induction program, inclusion of humanity and social science subjects like Indian constitution, Biology, Economics etc. for overall development of the student.

e) The institutes are required to conduct alumni meet, parent meet, student feed-back in order to identify their shortcomings and areas for improvement. They are also required to conduct performance appraisal of their faculty based on specific criteria (PBAS).

Institutes are trying to implement these guidelines, but with limited success. Many institutes still do not have adequate laboratories/workshop or requisite staff to conduct classes. Large proportion of the faculty exhibit a fixed mindset and reluctance to any type of change. They are willing to attend conferences, FDP and STTP offered by home institute/nearby institutes but avoid interactions with IITs/NITs. They seem reluctant to appear for NPTEL online certification courses [Tab-3] [6], probably due to fear of exposing their shortcomings and consequential rebuke.

Table – 3 : Statistics of some NPTEL online courses in AY 2018-19 [6]

Candidate Particulars		**Course Title , course Id code and exam date**		
		Engg Metrology noc18-me62 Oct 2018	Fundamental Of Mfg. Processes noc18-me51 Oct 2018	Material Sc. and Engg noc19-mm01 Mar 2019
No. Enrolled	Maharashtra	882	813	147
	Total	5327	6424	1289
No Regd in Exam	Maharashtra	53	46	34
	Total	1251	1375	449
Pass Total		1175	1084	367
My score and rank		97 % in top 1% 2nd.	91 % in top 1 % 4th.	75 % in top 2 % 6th.

Table-3 (contd.)

Candidate Particulars		**Course Title , course Id code and exam date**		
		Th and Practice of NDTesting noc19-mm07 Mar 2019	Financial Institutions and Market noc19-mg05 Apr 2019	Enhancing Soft Skill and Personality noc19-hs22 Apr 2019
No. Enrolled	M'rashtra	62	268	1221
	Total	954	2897	13690
No Regd in Exam	M'rashtra	17	79	NA
	Total	286	1119	NA
Pass Total		232	871	10466
My score and rank		75 % in top 5 % 10th.	67 % in top 5 % 37th.	94 % in top 2 % 195th.

P.N. :- Only about 15 % of total candidates enrolled / registered were faculty , remaining were students

There is a general tendency to be lenient regarding attendance, allocation of term marks, internal assessment, paper setting and paper checking in order to obtain good comments from students and have higher pass percentage in university exams. All these activities effectively enhances indiscipline, de-motivates students from performing better and ultimately lowers the quality of the institute.

6. Looking Ahead

Radhakrishnan Commission (1948-49) had stated that education should relate to the life, need and aspirations of the people. It should help the country achieve increased productivity, accelerated process of modernization and simultaneously help cultivate social, moral and spiritual values among the youth. Their recommendation as well as those of Kothari Commission (1964-66) was the framework for forming National Education Policy (1986) and Action Plan (1992). The Parliamentary Standing Committee on HRD, in its 172nd. Report had stated that higher education institutes must become globally competitive. They have recommended greater use of information and communication technology (ICT), inclusion of interdisciplinary subjects in curriculum and development of integrated courses as per need for national development with international benchmark, expansion of UGC's inflibnet system, faculty development program and refresher courses by institutes of repute, inter-university interchange and linking with international institutes to enhance research etc. [7]

Working group for higher education was set up in 2005 by Planning Commission to frame guidelines for XI th. Five yr. plan. National Knowledge Commission under the chairmanship of Sam Pitroda was set up in 2007 by then PM Dr. Manmohan Singh. Yashpal Commission was set up in 2009 by then HRD minister Mr. Arjun Singh. They have raised several issues and given separate sets of recommendations. These have sparked much debate among academicians and administrators [8]. With the dynamism exhibited by BJP government since 2014, a lot of developmental activity is expected in the near future.

7. Conclusion

By improving quality of higher education institutes, their market reputation can be impoved. This would result in enhancing the placement prospects of pass-out students and increasing the number of admissions of the institute. Contrarily, failure to do so would result in low admissions, leading to loss of financial viability of the institute, down-sizing / pay cutting and ultimately its closure. To ensure survival of the institute and job security of employees, administrators and faculty members must refrain from indulging in short-cut / evasive tactics and try their level best to improve the quality through honest hard work.

References :-

1.http://worldpopulationreview.com/countries/india-population/

2.http://statisticstimes.com/economy/gdp-growth-of-india.php ,
http://mospi.nic.in/sites/files/press_release/2018-19.pdf https://www.ibef.org/industry/-analysis-presentation

3.https://www.ugc.ac.in/oldpdf/Consolidated%20Universities.pdf

4.https://mhrd.gov.in/institutions-national-importance

5.http://www.facilities.aicteindia.org/dashboard/aicte.php

6.https://nptel.ac.in/noc/individual_course.php?id=noc18-me51 ,
(also me62 , noc19-mm01 , mm07)

7. https://www.aicte-india.org/higher_education_xiplan.pdf

8. Shekhawat S.P. et al. (2019) : Engg. Education System in Modern India : A Paradigm Shift, JEET 32(3) 27-30

World Peace Component for Life Transformation: Practices and Feedback

Sachin Shankar Gadekar[1], Dr. Bhagawat Ishwar Biradi[1], Sheetal Vij[2]

[1]Assistant Professor, Faculty of Peace Studies MIT World Peace University, Pune
Assistant Professor, Dept. of Computer Engineering
Track No : 3
Track Name : Quality in Education

Abstract:
This paper has been divided into three parts. The first part highlights some challenges and various aspects in higher education related to value education and preparing students for life along with academic growth. It also talks about the need of incorporating ethical aspects to cater to the wider perspective as an outcome of education. After a brief introduction, it focuses on certain modules implemented by MIT-WPU, Pune to carry out this Himalayantask.
The second part of the paper deals with the World Peace Component modules being offered with a different approach to address and understand the problem. It also throws light on the pedagogy/methodology of delivering these modules in the most practical and simple ways.
In conclusion, this paper validates the practice of World Peace Component in the form of feedback collected in written and on Enterprise Research Planning (ERP) as well by the students. It also points out the mission and vision being accomplished with such unique practices. Finally, it comments on the innovation and need for more research in the same domain to cater to the student community at large.

Key words: World Peace Component. Pedagogy, Feedback, Student Community

Introduction:

'The union of science and spirituality alone will bring harmony and peace to humanity' – Swami Vivekananda

Swami Vivekanda has rightly said that the two driving forces (Science and Spirituality) of the world could only bring peace to it. Dr. Vishwanath Karad MIT World Peace University has been working under the same principle since its inception. This statement has been the roadmap behind four decades of excellence in education by MAEER'S MIT. Quality education along with academic excellence in technical field has equally been supported by value education and ethical orientation.

'To reach peace, we have to teach peace'. Without peace, mankind cannot achieve true progress in any sphere, be it material, moral or spiritual. Peace is an integrative and all-embracing subject. Peace begins with the individual and spreads to the family, to community, to the nation, and to the whole world. With this understanding in mind, all the peace subjects in the syllabus are specifically designed, which will in variably help one move from ***'peace within'*** to ***'peace without'.*** 'Peace within' mean sour own inner peaceful state of mind; 'peace without' means peaceful co-existence amongst all sections of the society and among all nations of the world and its people.

Key Objectives of the Peace Program:

1. To orient students with pro-peace values, skills and attitudes necessary to become wholesome individuals and responsible citizens of the society.
2. To help restore the lost balance between the emotional and intellectual development of students.
3. To develop a more spiritual, philosophical yet pragmatic approach to understand and effectively respond in dealing with the modern day challenges of life.
4. To introduce students to our ancient texts and scriptures, uniqueness so four culture and heritage, and some of the most prominent schools of Indian philosophy.
5. To develop the character and the personality of students in such a way that they will be able to realize their full potential and contribute to the well-being of the community.
6. To make students understand deeply that character is more important than personality and *'life based on fundamental principles and truths alone can bring long term joy, happiness and mean in ful living'.*
7. Toearnestlyremindeveryoneaboutourcommonhumanity,that'***thewholeworldisonefamily'***
– Vasudhaiv Kutumbakam.
8. To imbibe strategic and administrative skills development holistically via learning various life skills of Kings, Saints/Sages and Philosophers and also conflict resolution, stress management, enhancing Emotional Quotient, Physical Quotient, Spiritual Quotient and towards learning basics of Adversity Quotient.

Methodology:

World Peace Component for Life transformation:

The World Peace Component for Life transformation has been the mission of the founder president Prof. (Dr). Vishwnath Karad since 1983. It has been an integral part of the system ever since. The very year of autonomy i.e. in 2017, in the form of state university MIT World Peace University launched its ambitious project of bringing technology, modern world view and spiritual insights together.

The project is to orient students for life transformation. There are seven modules to be taught. The most important part is methodology. The sessions are clubbed with a blend of modern on text and ancient pure thoughts. Students get to learn about Saint, Sages and Philosophers such as Socrates, Platoaswellas Saint Dnyaneshwara.

Faculty of Peace Studies under MIT World Peace University has successfully delivered the communication and human dynamic module and Science and Spirituality. It is now ready with the Module of Indian Culture and Heritage. Keeping in mind the Sustainable Development Goals, the Peace Program teaches the students harmonious communication, team dynamics, and content through our rich Indian heritage to empower them to lead thought provoking dynamic lives.

MIT World Peace University provides the Faculty a curriculum that is designed and detailed out with extensive workbooks, PPT'S and cue cards for standardized delivery. In accordance to our new role as World Peace University, along-side core content, 'The Peace Program' is intrinsically blended in all the study disciplines across the University. It is now a nintegralpartofall our academic delivery. Our goal is to transform students into responsible citizens of the world who are physically fit, mentally alert, intellectually sharp and spiritually elevated. In fact, the Peace Program is going to form the very DNA of our progressive University.

MIT Group of Institutions has always thought ahead of time and has taken lead in many areas to imbibe in young minds *'The Universal Values'* which is utmost necessary to mould them as better human beings for the future.

Details of the Dynamic Modules:

There are seven modules as follows:

1. World Famous Philosophers, Sages/Saints and Great Kings,
2. Human Dynamics and Peace in Communications,
3. Yoga – for Wining Personality,
4. Study of Ancient Texts, Philosophy of Science and Religion/Spirituality,
5. Indian Tradition, Culture and Heritage,
6. Humanities – Ethical, Moral and Social Sciences,
7. Scientific Studies of Mind, Matter, Spirit and Consciousness.

The class engagement policies are core of the course. It focuses on Audio-visual presentation, uniformly designed PPT's for every lecture, Two to three short videos in PPT's. It also encourages students' participation like role play, inviting them to present their views, question and answers and concludes with 'take home messages' from each lecture.

Feedback and success stories:

This initiative has always been under development. A majority of students have liked the program. A significant number of them have appreciated in written feedback. This feedback is conducted after every trimester. Here, a glimpse of feedback of session 2018-19 trimester number two is presented. The extensive feedback gives a boost to the team to do better each time.

Table 1. Feedback Analysis for Peace Contents (collected in March 2018-19 Trimester 1 and 3, WPC1, WPC2, and MBA (WPC 4)

Total Feedback forms collected	878	100%
Total Positive	738	84.1 %
Total Negative	70	8.0 %
Neutral	70	8.0 %

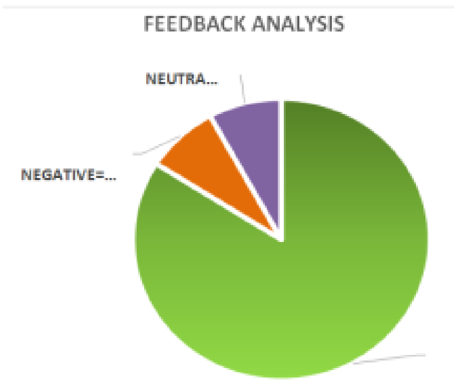


Table 2.Feedback collected: (school -wise)

Name of the School	Total feedbacks	Positive Feedback	Negative Feedback	Neutral
Faculty of Science (PG)	102	100	02	00
Mass media and Journalism	28	19	05	04
Photography (B.A.)	12	09	01	02
Faculty of Sci.UG (BCA)	29	16	06	07
Polytechnic (Integrated)	40	31	04	05
Faculty of Management (PG)	42	40	00	02
B. Design	35	35	00	00
FY B.Sc. Economics	29	21	02	06
Liberal Arts (UG)	10	10	00	00
Faculty of Management (UG)	85	69	08	08

Faculty of Engineering(B. Tech)	346	286	34	26
B.Com (Ecommerce)	45	40	3	2
Faculty of Pharmacy	50	39	5	6
Faculty of Engineering(M. Tech)	25	23	0	2

Conclusion:

Thus, the paper concludes that World Peace Component for Life transformation; Practices and feedback at MIT-World Peace University, Pune has been an ambitious and unique project carried out by MIT-World Peace University.

The feedback collected has proven each time the positive impact and change being seen in students. Right from the acceptance of World Peace Componentinanac ademic discipline to accept in gitas a tool of transforming lives has been an interesting journey for students of the University. However, the practices on going are currently for internal level of an individual. It works for personal life and positive thinking. The department would like to take this forward to interpersonal level and finally to inter social level that is the real task of conflict resolution for aspiring national leadership among the youth.

References:

- Standard Operating Procedure (SOP) , Faculty of Peace studies, MIT-WPU, Pune
- Course Structure, Faculty of Peace studies, MIT-WPU, Pune
- Minutes of the Meeting, Board of Studies, Faculty of Peace studies, MIT-WPU, Pune
- ERP statistics, ERP MIT-WPU, Pune
- Feedback forms collected from all academic schools.

Academic Audit - A Tool for Quality Enhancement in Teaching-Learning Process in Higher Education Institutes

Khan Tabrez[1], Magar R. B[2], Ansari Zakir[3], Shaikh Afzal[4]

[1,2,3,4]Anjuman-I- Islam's Kalsekar Technical Campus, New Panvel, Maharashtra, University of Mumbai
[1]*hod.co@aiktc.ac.in,*[2]*hod.ce@aiktc.ac.in,*[3]*hod.me@aiktc.ac.in*,[4]*hod.et@aiktc.ac.in*
Track No: 3
Track Name: Quality in Education

Abstract: Academic audit is a methodical and scientific process of designing, implementing, monitoring and reviewing the quality in academic systems in higher education. The academic audit provides a strategic planning and its implementation for the teaching –learning activity in the institute. In order to ensure quality and effective curriculum delivery, in teaching-learning, quality assurance system like Internal Academic Audit (IAA) system is very much essential. This paper aims to discuss the effective implementation of IAA in the technical campus situated in Panvel, Maharashtra. Academic Audit is done thrice during the term as Pre Term Audit- before the commencement of the term, Mid Term Audit- during the mid of the term and Post Term Audit- after the term end. Total thirty four numbers of input parameters are identified based on which academic audit is carried out. For every single parameter in the audit format, the course owner is evaluated for complete, partially complete and incomplete status of that parameter as per defined rubrics. The score of all the parameters is converted to a scale of 5 which would become the score of that course owner and would be used for appraising the concerned course owner. The reports of the Pre Term, Mid Term, and Post Term audit would be kept with the audit team and the necessary corrections would be conveyed to the respective course owners at the time of the audit. It was observed that after the introduction of the aforementioned process, the academic files of all the faculty members were found complete in all respects and quality of assignments, teaching learning and evaluation process was improved significantly.

Keywords: Internal Academic Audit, Quality, Higher Education, Rubrics.

1. Introduction

The success and growth of the higher education institute relies on the continual improvements in its academic, research and practice. For any higher education institute, teaching learning process is a backbone and a timely and effective scrutiny or audit of same may ensure a constant and qualitative development of teaching learning process. An Academic audit is a methodical and scientific process of designing, implementing, monitoring and reviewing the quality in teaching learning process in higher education which in turn ensures the qualitative improvements in same.

As illustrated by David Dill, as oppose to accreditation programs, various student assessment techniques, and program review processes, the academic audits checks deeply into the heart of the academic enterprise. They test whether institutions and their faculties in fact honour their public responsibility to monitor academic standards and improve teaching learning (Dill, 2000, Mart land and Kulkarni, 2011, Dill et al, 1995, Garvin, 1991).

A robust, effective and transparent academic audit shall lead to desired accounting towards the teaching learning process eventually moving towards constant improvements in the academic of the institute. It ensures a systematic and defined procedures based documentation of the entire process. It instils a sound confidence and faith among all the faculty members regarding implementation of same audit process for all without any discrimination based on seniority, experience, post, or any other factor of bias.

2. Process

The presented academic audit process was conceptualized, designed, implemented and revised at the Anjuman-I-Islam's Kalsekar Technical Campus (AIKTC), New Panvel, Navi Mumbai, Maharashtra, India. Initially, the academic audit was a flat and simple process with the checking of Academic file for few academic records like teaching plan, practical plan, attendance, continuous assessment, test papers, and test marks. With the advent of Outcome based Education (OBE), the entire process of academics is revamped and so the need of its audit's revamp emerged. Inline with the requirements of OBE, the academic audit process was modified and the new formats with required rubrics were created. The first major change was making the academic audit inter-departmental. An academic audit committee were formed with multiple teams, each comprising of three members from different departments, one of which is Head of Department who acts as convener. The audit was held twice a semester ensuring that the visiting academic audit committee have all the members from different departments and none of them belongs to visited department. The 28 number of parameters were considered for the academic audit with different pre-decided weights. Each parameter was mapped to related NBA criterion. The expected defined format along with the Program-level file location of the record for the parameter are specified against that parameter title. The parameters were categorized into:

- Common
- Theory specific
- Practical specific

Common parameters are applicable to all course types. Theory specific parameters are applicable to courses with theory. Practical specific parameters are applicable to courses having laboratory or practical. Such categorization of the parameters eased the auditing work of the academic audit committee. Table 1 shows the academic audit format

Table 1. Academic Audit Format

Sr. No.	Parameter	Weight	Score (0/1/2)	Weighted Score
Common				
1.	Academic Calendar - Program	1		
2.	Teaching Load (Office Order)	1		
3.	Syllabus Copy	1		
4.	Content beyond syllabus	2		
5.	Time Table	1		
6.	Roll List with Contact details	1		
7.	Working Days Calculator	1		
8.	Vision, Mission, POs, PEOs and PSO(s)	2		
9.	CO Review	2		
10.	CO-PO Mapping	3		
11.	Mapping of the content beyond syllabus with PO(S)/ PSO(S)	2		
12.	Target and Attainment Approval	2		
13.	AO-CO Mapping	2		
14.	Attendance Sheet (TH-PR)	2		
15.	Assignment / Question Bank	1		
16.	Students Attendance Summary Sheet	1		
17.	R- Score and Attainment Analysis	2		
18.	Course Exit Survey (Google Forms Report)	1		
19.	Course Closure report	2		
Theory Specific				
20.	Teaching Plan	3		
21.	University QP (Last 4 To 5 Exams)	1		
22.	Unit Test QP	2		
23.	Unit Test -I Marks	2		
24.	List of Slow Learners.	2		
25.	Remedial Class Record (Time Table/Planning)	2		
26.	Unit Test -II Marks	2		
Practical Specific				
27.	Practical Plan	3		
28.	Continuous Assessment Sheet (TW)	3		
TOTAL				
Conversion on a Scale of 5				

The following two rubric were designed to complete the academic audit:

1. Score Rubric:

The score rubric provides the score value for the audit parameter depending upon the completion status of the concerned academic record(s). If the required record is not available then the score is 0, if the record is available but incomplete then the score is 1 and if the record is available and complete then the score is 2. Table 2 shows the rubric for Scores.

Table 2. Score Rubric

Score Rubric		
Sr. No	**Point**	**Score**
1	No Document	0
2	Incomplete Document	1
3	Complete Document	2

2. Weight Rubric:

The weight rubric provides weights to different parameters. The weight is assigned to the parameter depending upon its level of importance. Table 3 illustrates the weight rubric.

Table 3. Weight Rubric

Weight Rubric		
Sr. No	**Point**	**Value**
1	Minimum	1
2	Moderate	2
3	Maximum	3

During the academic audit, the committee member gives a score to a parameter depending upon the completion status of the concerned academic record(s), the given score is multiplied the assigned weight of that parameter and the weighted score is calculated. The weighted score of all the evaluated parameters were summed to get a total, which is then converted on a scale of 5 to get the final score out of 5.

3.Revision Version 1 (v1)

After one cycle of the above mentioned academic process, it was realized that two audits per semester shall be changed to three audits per semester, viz. Pre-Term audit, Mid-Term audit, and Post-Term audit. The new academic audit format parameters were accordingly categorized into:

- Pre-Term Audit
- Mid-Term Audit
- Post-Term Audit

Another major change was the revision of Weight Rubric to address the issue of non-compliance. The weight rubric was revised as shown in table 4:

Table 4. Weight Rubric– Revised (v1)

Weight Rubric		
Sr. No	**Point**	**Value**
1	Minimum	1
2	Moderate	2
3	Maximum	3
4	Non-Compliance in CA-1 (Current Audit – 1)	-1
5	Non-Compliance in CA-2 (Current Audit – 2)	-2

One parameter as Non-Compliance in CA-1 (Pre-Term Audit) with a weight of -1 was added into the Mid-Term Audit section to address the non-compliance(s) of Pre-Term audit. Likewise two parameters, viz. Non-Compliance in CA-1 (Mid-Term Audit) with a weight of-1 and Non-Compliance in CA-2 (Pre-Term Audit) with a weight of -2 were added into the Post-Term Audit section to address the non-compliance(s) of both Pre-Term and Mid-Term audits. Finally the average of all the three audits were converted on a scale of 5. The Term-End presentation was added as a last parameter having a score value of 5, where every course owner was supposed to present his/her efforts and contributions towards parameters like Result Analysis, Mentorship, Utilization of Practical sessions, Quality of Assignments, Academic and Extra-academic achievements, Publications/STTP/FDP, Involvement in Accreditation process, and Unit Test Question Paper Audit on a total scale of 5. The presentation was delivered in presence of concerned Head of Department and the audit committee convener, who would collectively evaluate the presentation. Table 5 shows the revised academic audit format.

Table 5. Academic Audit Format – Revised (v1)

Sr. No.	**Parameter**	**Weight**	**Score (0/1/2)**	**Weighted Score**
Pre-Term Audit (One Week Prior to Commencement)				
1.	Academic Calendar - Program	1		
2.	Vision, Mission, POs, PEOs and PSO(s)	2		
3.	Teaching Load (Office Order)	1		
4.	Syllabus Copy	1		
5.	CO Review	2		
6.	CO-PO Mapping	3		
7.	Content beyond syllabus	2		
8.	Mapping of the content beyond syllabus with PO(S)/ PSO(S)	2		
9.	AO-CO Mapping	2		
10.	Target and Attainment	2		
11.	Time Table	1		
12.	Working Days Calculator	1		
13.	Roll List with Contact details	1		
14.	University QP Analysis (Last 4 Exams)	1		
15.	Teaching Plan	3		
16.	Practical Plan	3		
TOTAL				
Conversion on a Scale of 5				

Mid-Term Audit (During UT-1)				
1.	Attendance Sheet (TH-PR)	2		
2.	Assignment / Question Bank	1		
3.	Unit Test QP	2		
4.	List of Slow	2		
5.	Remedial Class Record (Time Table/Planning)	2		
6.	Continuous Assessment Sheet (TW)	3		
7.	R- Score and Attainment Analysis (Last Sem)	2		
8.	Non-Compliance in CA-1 (Pre-Term Audit)	-1		
TOTAL				
Conversion on a Scale of 5				
Post-Term Audit (One week after OR/PR Exams)				
1.	Attendance Sheet (TH-PR)	2		
2.	Assignment / Question Bank	1		
3.	Unit Test -I	2		
4.	Unit Test -II	2		
5.	Students Attendance Summary (Course wise)	2		
6.	Continuous Assessment	3		
7.	Course Exit Survey (Google Forms)	1		
8.	Course Closure Report	2		
9.	Non-Compliance in CA-1 (Mid-Term Audit)	-1		
10.	Non-Compliance in CA-2 (Pre-Term Audit)	-2		
TOTAL				
Conversion on a Scale of 5				
Average of Pre-Term, Mid-Term and Post-Term Audits				
Term End Presentation (On a scale of 5)				

4. Conclusions and Future Scope

After the implementation of the revised academic audit process, the following observations were made by the audit committees:

- The academic files containing the defined academic records of almost all the course owners were up to date.
- The records were found updated on timely basis due to the inclusion of Non-Compliance parameter in the audit format.
- The three audits per semester ensured timely planning, timely execution and timely completion of the academic process.
- The linking of final score with the appraisal system has garnered due importance to the entire academic audit process.

The future scope for the academic audit process is to implement the qualitative approach since the current system is more of quantitative type. The combined quantitative and qualitative approach shall lead to robust, effective and more transparent academic audit ensuring continual improvements in the teaching learning process of the higher education institute.

References:

Dill, D. D., (1992) Quality by Design: Toward a Framework for Academic Quality Management. Higher Education: Handbook of Theory and Research, pp. 37-83 (New York: Agathon Press, Inc.).

Mart and, T. Telsang. and Dr. Mrs. Sushma, S. Kulkarni. (2011) Academic Audit - A Tool For Enhancing Teaching-Learning Effectiveness, The Journal of Engineering Education.

Dill, D. D., Massy, W. F., Williams, P. A., and Cook, C. M., (1995) 'Accreditation and Academic Quality Assurance: Can We Get There From Here?' Change, 28(5), pp. 16-25.

Garvin, D., 1991, 'How the Baldrige Actually Works', Harvard Business Review (November! December), pp. 80-95.

Quality Assessment and Improvement in Higher Education in India: A Literature Review

Nitin Lokhande[1], Vilas Jadhav[2]

[1,2] Department of Instrumentation and Control, Pravara Rural Engineering College, Loni
[1]nnlokhande@gmail.com

Track No: 3
Track Name: Quality in Education

Abstract: Higher education plays important role in youth life. The higher education in the 21st century plays vital role in youth life in terms of life style, health, economy and such many things so that youth can present themselves to society in different role. To face the challenges of world and fulfil the changing needs of society continual improvement in higher education is an essential step. Government is playing key role in higher education through building new policies and by providing the financial support. This paper presents review of the different factors of quality of education and steps taken to improve the quality of higher education and assessments of quality initiatives.

Keywords: Higher Education, Quality Improvement, Quality Assessment.

1. Introduction

Education is the most powerful weapon which we can use to change the world, as quoted by former president of South Africa Nelson Mandela. In each nation, education is helpful for the personal, social and economic development of the nation. Indian education is provided at different levels with distinct learning objectives;

A. Primary Education

Main objectives of primary education are;

- **a.** Know how to distinguish right from wrong.
- **b.** Develop an interest in reading and to cultivate a habit of reading.
- **c.** Everyone can communicate with their mother tongue.
- **d.** To develop independent learning skills.
- **e.** Lead a healthy lifestyle.
- **f.** Develop an interest in physical activities

B. Secondary and Higher Secondary

Main objectives of secondary and higher secondary education are;

- **a.** Develop positive values and positive attitude
- **b.** Develop the ability to interact with society
- **c.** To know the responsibility of citizen for national identity
- **d.** Develop ability to planning and implementation
- **e.** Lead a healthy lifestyle.
- **f.** To inculcate the qualities needed for living congruously and efficiently with society

C. Tertiary level Higher Education

It includes undergraduate and Post graduate education, main objective are;

- **a.** Imparting employment skills
- **b.** Provide opportunities for adult lifetime learning to enable individuals, employers and nation.
- **c.** To promote the general powers of the mind.
- **d.** Advance the people learning and research.
- **e.** To promote culture and high standards in all aspects of society
- **f.** To serve local and regional communities, as well as national interests at home and abroad.

There are 864 Universities, 40026 Colleges and 11669 Stand Alone Institutions provides various types of higher education in different rural and urban part of India. Enrollement in Higher education in India is 25.2%, which is calculated for 18-23 years of age group.

To nurture this age group in proper direction, continuous improvement in education is essential. Major target of higher education is to enhance employability skill to develop the life of individual and therefore development of nation.

2. Higher Education System in India

Higher education is tertiary level in Indian education system includes certificate and diploma programs, undergraduate, post graduate and doctoral degree programs. Further these higher education institutions categorized in 3 broad categories i.e. universities, colleges and stand alone institutions.

The main category of university and university level institutions are central universities, state universities, deemed to be universities and university-level institutions, institutions of national importance, institution under state legislature act. The framework of Higher education system comprises of policy making, regulation and accreditation as shown in figure1.

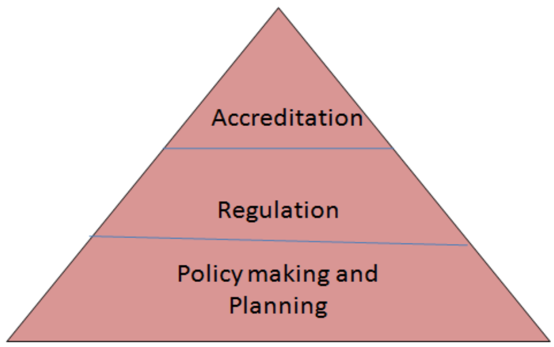


Fig 1. Framework of HEI

Indian Higher Education Policy planning bodies are listed below;

1) **Department of Higher Education, MHRD :**
Department of higher education of Ministry of human resource development is playing key role for overall development of higher education in country. It responsible for planning the policy for universities, college and institutions which are providing higher education in country located at different corners of India. It brings reforms in education system as per situation arises. MHRD setup the various apex bodies in country to provide quality education.

2) **AIU:**
Association of Indian Universities established in 1925. Main objective of this association is coordination and mutual consultation, acts as representative of universities. It works as bridge between universities and central, state government.
Indian Higher Education Regulatory bodies are listed as below;

a) **UGC:**
University Grant Commission came into existence on 28th December 1953 and become a statutory body of Government of India by parliament act 1956. UGC with universities takes all steps for the maintenance of standards of teaching learning, research and promotional activities. Major role of UGC is to provide funds to universities, colleges determine and maintain ethics in institutions. UGC is working as connection between central, state government and institutions of higher education.

b) **AICTE:**
All India Council for Technical Education came into existence in November 1945. It is apex advisory body for technical education in India. In 1987, AICTE is given statutory status by parliament act. It is responsible for planning, coordinated development in technical and management education in India. It also plays role in planning and maintenance of norms and standard for higher education institutes. It has different bureaus and boards for smooth functioning.

c) **MCI:**
Medical Council of India was established in 1934 under Indian medical act for establishing and recognizing the uniform standards of higher education in medicine. Major role of authority is to maintain standards and recognition of medical education.

d) **PCI:**
Pharmacy Council of India came into existence on 4th March 1948. It ensures and maintains the standards for pharmaceutical education. Main objective of PCI is regulation of profession and practice of pharmacy.

e) **BCI:**
Bar Council of India was established by Parliament under the Advocates Act, 1961. It sets the standard, grants the recognition in law education.

f) **NCTE:**
National Council for Teacher Education came into existence on 17th August 1995.Objective of the NCTE is to plan and coordinate development of the teacher education system throughout the country.

g) **ICAR:**
Indian Council of Agricultural Research established on 16th July 1929. It is the apex body for co-ordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country.

h) **ICMR:**
Indian Council of Medical Research is established 1911. It is apex body of formulation, coordination and promotion of biomedical research. It is funded by department of health and family welfare.

i) **ICSSR:**
Indian Council of Social Science Research (ICSSR) was established in the year of 1969 by the Government of India to promote research in social sciences in the country. It promotes the research in field of social sciences in the country by providing grants for projects, fellowship, international collaboration and publications.

j) **CSIR:**
Council of Scientific and Industrial Research established on 26th September 1942.It is research and development organization in the field of science and technology. It provides the innovative technology solutions through nurturing research. Indian Higher Education accreditation bodies are listed as below;

1) **NAAC:**
National Assessment and Accreditation Council is established in 1994 as UGC autonomous body. It is applicable for colleges and universities to know its strengths, opportunities, weaknesses through an informed review process by authority. NAAC accreditation determines the quality of the institute in terms of education, infrastructure, research, teaching and learning etc. It identifies shortfalls and provides suggestion for improvement in it.

2) **NBA:**
National Board of Accreditation, India was established by in the year 1994 by AICTE. It is established for evaluation of quality of education in technical institution through standard mechanism.

3. Factors affecting the Quality in higher education

Quality of higher education continuously degrading in India, since last two decades, due to it unemployability rate rapidly increased. Continuous decline in quality of higher education in country is because of many factors such as lack of funds, privatization of education system, quality of enrolled student, teaching –learning process, infrastructure facilities, and quality of teacher and research innovation.

1) **Lack of funds to HEI-**
Non-financial support adversely affects small and rural educational institutions which in turn for self financing courses causes high tuition cost.
2) **Privatization of Education System –**
Due to privatization of higher education system, many time cost of education is very high. Though people deserve for education but cannot afford the cost of education. Non meritorious students may enter in systems.
3) **Academic Administration-**
The academic administration of institute play important role in its functioning and its responsibilities includes policy planning, implementation and control on function which affect directly or indirectly.
4) **Quality of Enrolled students-**
Students learning experiences, ability and their background in previous step education system also affect.
5) **Teaching-Learning process-**
Good quality instructor and good learning system always creates quality students. Trained and qualified teacher is backbone of quality education In many institutions lack of qualified and experience trainer.
6) **Infrastructure facility-**
Many of private education institutions not providing adequate infrastructure facility such as equipped laboratories, library and basic required infrastructure to run institutes.
7) **Structure of Curriculum-**
In many of universities and institution curriculum is not employability skill oriented and not provide flexibility in curriculum selection.
8) **Research and innovations-**
There is lack of research and innovations in higher education system. Research is limited to universities and standalone institutes.
9) **Curriculum structure-**
If curriculum of institutions not fulfilling needs of changing requirement of society, then it affects quality of higher education system.
10) **Industry Institute Interaction-**
Lack of Industry Institute Interaction also declined the quality of higher education.

4. Steps taken for improvement in quality education

1) **Financial support-**
In recent years, great concern has been expressed about lack of infrastructure facilities for imparting good quality higher education and conducting advanced research. Science and Technology department of government of India supports for infrastructure, laboratory and research.
2) **Industry Institute Interaction –**
Strengthen the industry-academia tie-up; the MHRD has taken steps for setting up of an ‘incubation fund’. In higher education institute The Ministry has establish the Academia-Industry Interface Council. The main aim of this council to research quality in HEI to improve the employability skills of graduate students.
3) **Structure of Curriculum-**
UGC and AICTE has provided wide scope for students while selecting the curriculum by starting new courses, Choice based credit system, many interdisciplinary courses, short term courses, vocational programmes. This flexibility helps them to serve their interest and fulfil the goals. It also enriches the employability skills in undergraduates.
4) **Quality improvement of enrolled students –**
Govt of India initiate different policy for improvement in enrolled students through different skill oriented courses under three theme;
   a. Integrating skill development in higher education
   b. Linking higher education to society
   c. New Knowledge
5) **Teaching –Learning policy-**
Various techniques, namely, virtual classrooms, digital classrooms, digital library and its networks, industry E- learning, open education is to be implement for improve the quality of higher education. Also, problem base learning and team based learning is to be implement to increase the involvement of students in learning. Use of ICT facility for effective teaching.
6) **Research and Development-**
To encourage research and development in universities and colleges UGC has started many schemes, awards and rewards, scholarships to students and faculties under which financial support made available. Also to for master’s degree and PhD research scholars also get financial assistance under different schemes such as junior research fellowship. S. Kothari fellowships etc. Also funding is available for researcher under major and minor research programmes.

5. Assessment of quality in Higher Education

Assessment of quality in higher education now essential step to enhance the outcome of education system and provide employability skills to youth. There has been a great increase in the number of Universities and Colleges in India.

1) **NAAC:**
To check and assess the quality of these institutions, an autonomous and independent organization called The National Assessment and Accreditation Council (NAAC) was established by the University Grants Commission (UGC) of India in 1994. This apex body

asses the Higher Education University and institution in India with standard process. Evaluation and assessment by this agency includes;

- **a.** Evaluation of curricular aspects.
- **b.** Teaching Learning Evaluation
- **c.** Evaluation of research quality
- **d.** Assessment of infrastructure and learning resources.
- **e.** Evaluation of student support activity
- **f.** Evaluation of management and governance
- **g.** Assessment of best practices run by organization

The main objective of this process is to promote the research, teaching learning, student quality through innovation and best practices. So far 323 universities and 7473 colleges all over India undergo the NAAC accreditation process.

2) NBA:

National Board of Accreditation (NBA) which was set up in 1994 by AICTE, awards accreditation status to technical institutes. NBA accredits the Programs, and not Educational Institutions. Evaluation and assessment by this agency includes;

- **a.** Evaluation of Vision, Mission and Programme Educational Objectives.
- **b.** Evaluation of Programme curriculum and outcome
- **c.** Evaluation of Student performance
- **d.** Evaluation of Faculty contribution
- **e.** Evaluation of facilities and academic, technical support.
- **f.** Evaluation of Teaching learning,.
- **g.** Evaluation of Governance, Institutional Support and Financial Resources.

The main objective of programme is to develop quality conscious system which is relevant to latest market needs, provide quality benchmark targeted at the national and global level human capital in every technical education field.

6. Conclusion

In this paper we have presented the current structure of higher education system in India. We also highlighted various factors affecting the quality of higher education and steps taken by government to improve it. We have also focussed on Assessment agencies and their process of evaluation. To upgrade the quality of higher education we need to improve teaching pedagogy, bridging the gap between education and industry, more initiative for innovations and research at every institute, formation of cluster of regional colleges for research and innovations, more opportunities for stakeholder in curriculum, more infrastructure facilities for teaching and learning.

7. References

1. Tapas Kumar Sarkar (September 2012) Assessment in Education in India, SA-eDUC JOURNAL Volume 9, Number 2.
2. Heena Dawar, Seema Agnihotri, (2017) Evaluation of Higher Education In India Challenges and Suggestions, Arts and Education International Research Journal : Volume 4 Issue 2 (2017),34-39.
3. Robert V. Hogg , Mary C. Hogg, Continuous Quality Improvement in Higher Education, International Statistical review (1995) ,63,1,35-48.
4. Anju Verma, A Review of Quality Assurance In Higher Education Institutions, International Journal of Research in Humanities, Arts and Literature, Vol. 4, Issue 5, May 2016, 55-66.
5. Bharat Mishra, Gauri Shanker Kushwaha, A review of Quality Factors of Higher Education , IOSR Journal of Research and Method in Education Volume 6, Issue 5 Ver. V (Sep. - Oct. 2016), PP 62-68
6. Annual Report UGC (2017-18), www.ugc.ac.in.
7. K. K. Sharma, Seventh Report on All India survey on Higher Education 2016-17.
8. Ana Paula Cabral, Isabel Huet, Assessment of research quality in higher education: contribution for an institutional framework, 5th World Conference on Educational Sciences - WCES 2013, Procedia - Social and Behavioral Sciences 116 (2014) 1528 – 1532.
9. Younis Ahmad Sheikh, Higher Education in India: Challenges and Opportunities, Journal of Education and Practice www.iiste.org,Vol.8, No.1, 2017.
10. Maria Tsinidou, Vassilis C. Gerogiannis, Panos Fitsilis Evaluation of the factors that determine quality in higher education: an empirical study, Quality Assurance in Education Vol. 18 No. 3, 2010, pp. 227-244.
11. Pawan Agarwal, June 2006, Higher Education In India: The Need For Change, Indian Council for Research on International Economic Relations (ICRIER).
12. Goutam Kumar Kundu, Higher Education Quality: A Literature Review, Ictact Journal On Management Studies, May 2016, Volume: 02, Issue: 02, Doi: 10.21917/Ijms.2016.0037
13. Sahil Sharma, Purnendu Sharma Indian Higher Education System: Challenges And Suggestions, Electronic Journal for Inclusive Education, Vol. 3, No. 4 (Summer/Fall 2015).
14. J D Singh, Higher Education in India – Issues, Challenges and Suggestions, New dimensions and challenges, Industrial ,'Higher Education', LAMBERT Academic Publishing, Germany, 2011, Pp.93- 103. ISBN: 978-3-8465-1753-6.
15. Quality Assurance in Higher Education an Introduction, National Assessment and Accreditation Council, Bangalore India

Group Activities in Active Learning : A Path for Better Quality Education System

Deepali Javale[1], Uma Pujeri[2], Suhsila Aghav[3]

[123]MIT World Peace University, Pune
[1]deepali.javale@mitwpu.edu.in
[2]*uma.pujeri@mitwpu.edu.in*
[3]*sushila.aghav@mitwpu.edu.in*
Track No : 3
Track Name : Quality in Education

Abstract: It has been observed that from many years a traditional teaching-learning process is followed. To enhance this process active learning methods for pedagogy is the requirement for today's teaching-learning process. Also it has been observe that when it is conceptual teaching or theoretical teaching conducting active learning sessions like Think-Pair-Share(TPS) is a time consuming process. So considering this facts we have highlighted on different methods of active learning keeping group activities in mind. The methods showcased in this paper are mind mapping, mingle minds, tease the teaser and conclude the discussion. The results are generated for 2 of the methods showing that how these methods make improvement in the understanding level of student and also how teacher can tackle the time issue for concept teaching. Thus it proves that group activities are better implications for conceptual understanding.

Keywords: TPS, Mind Mapping, Active learning, pedagogy.

1. Introduction

Looking to the changing trend of teaching-learning process, the pedagogy is playing important role. Active learning methodology is becoming of utmost priority for getting more than 90 % achievement.

The initial shift started with focusing mainly on the assessment techniques. Different assessment techniques were discussed and tested for effective evaluation of student.[1]

Slowly gradually the things changed from institution centric to student centric. The pedagogy played more important role. Along with pedagogy the online ICT facilities available created a boom in the teaching learning method.[4]

Due to this it became more important for the teachers to plan such teaching methodology which will be student centric and which will satisfy the leaning perspective. This paper is one step towards the active learning methodology for teaching-learning process to be be more effective.

Here we have focused main on group activities. Four group activities are discussed here with results for one or two.

2. Related Work

Active teaching learning is the need for today's education system. Diverse, multidisciplinary education and diverse student groups are the major challenge for education system in today's era. Multiple active learning and teaching pedagogies are found effective in modern teaching learning.

We at MIT-WPU follow WPU-Teaching methods which are proved effective in terms of outcome based education and student centric teaching. WPU-Teaching Methods mainly categorized into three parts: Project Based Learning, Reflection Spots and Think Pair Share.

Project Based Learning:

PBL activities helps students to work in groups , with equal contribution and analyse the problem in-hand through. Students apply their learned concepts to solve the given problem. Project design plays vital role in solving such PBL activities.

Reflection Spots:

Reflection spots are the methods to test the learner's understanding. Reflection spots in ppt are proved as important tool for teachers to analyze their students attention, understanding towards the topic which was taught. Reflection spots are implemented using various methods such as mind maps, tease the teaser or mingle minds. Through reflection spots, students are able to apply their understanding of the lecture-topic to solve given task. This can be through of refreshment spot to student in long theoretical sessions.

Think-Pair-Share:

TPS activities are the collaborative learning method, helps students to enhance their analytical capabilities and share with peer to model the answer correctly. These methods are proved useful in problem solving with multiple possible solutions.

3. Methodology

Mindmap

While planning the theory or practical sessions, teachers may plan some mind map activities as reflection spots.

Mind map are the tools to present the understanding of concept hierarchy. Mind Maps clearly indicates the semantic meanings of connected topics, subtopics. It also represent the comparative analysis of multiple methods w.r.t the different aspects and measure.

Though mind maps are easy to draw, they are proved excellent tools to represent the entire case in small and shorter way. Mind Maps are tested for the student learning in the laboratory experimentations of professional core subjects, wherein it is expected for students to solve given experiment with the respective learned concepts applied in proper sequence step by step

Steps to draw the mindmaps:

1. Draw the shape with seed point. Consider the seed point as Main topic of the session/experiment.
2. Draw the nested shapes to represent the subtopics/next steps, and connect it to seed point.
3. Evolve the Maps, till the entire concept is represented.

Tease the Teaser

Tease the teaser is the group activity where students are given time with reference book access and internet access for some topic initiated. After some time say half and hour students from one group initiates the topic discussion. the second group students then add some features to it, then third group and so on. The process goes on with faculty as facilitator and correcting students if they are going wrong. This process continues till major points of the concept are discussed. This method is a good way to make students familiar with reference book learning and also they themselves understand the importance of healthy group discussion.

Mingle Minds

In this methodology of group discussion a broad topic is given for project work or conceptual thinking. Students get separated into group. Every group have discussion about the application of the concept or sub project topics. After some time the facilitator takes initiative to select 3-4 most common project ideas or applications of concept discussed. The students are then allowed to select any one of their choice and regroup accordingly. This step helps in group selection of their choice.

After that the group will share the mind ideas and mix them up to fulfill certain requirements given by the facilitator. Like for project idea on Automation applications, one group might have selected home automation, the second on campus automation and so on. Here the facilitator might expect different innovative ideas from students where he/she might expect different automation areas, different components, future scope and so on.

Finally after the overall discussion 3-4 different project ideas are ready with different minds mingling their ideas.

Conclude the Discussion

Conclude the discussion is somewhat similar to tease the teaser. But here the main idea is to assign one representative from every group who will summarise the points explored by their group. This summary report generated by all group will then be clubbed together to be treated as lecture notes or discussion notes.

Concluding the session is very important for any group activity to happen. So this methodology can be clubbed with any of the group discussion activities discussed above reproduced properly. Please use only Solid fill colors which contrast well both on screen and on a black-and-white hardcopy, as shown in Fig. 1.

4. Comparative Survey with traditional teaching learning system with Active learning system

No	Comparison Points	Traditional Teaching/ Learning	Active Learning
1	Learning point of view	Teacher Centric	Student Centric
2.	Understanding Concepts	In traditional teaching/learning the students were able to understand the concepts up to 75 percentage	In active learning with Mind Map, tease the teaser and Mingle mind students understanding level was increased to 90% because student understood the core concept of the subject very clearly.
3.	Result analysis	Result of the student in traditional teaching learning was average from 70 to 80 percentage.	Result of the students was increased above 90 percentage using these innovative active learning tools like mind map, tease the teaser and mingle mind which not improved students understanding level of the subject but also their analytical skills and communication skills too.
4.	Innovative activities	In traditional teaching teacher gave a problem and student came up with the solution for the problem. Problem shared may or may not be	In active learning students came a new problem and also found the solution which were current need for society

		recent one	
5.	Outcome	Outcome of traditional teaching learning helped the student to learn systematic way	Outcome of this learning made learning fun and students were able to create small product like home automation in IOT, prediction of diseases in data analytics and machine learning

5. Results

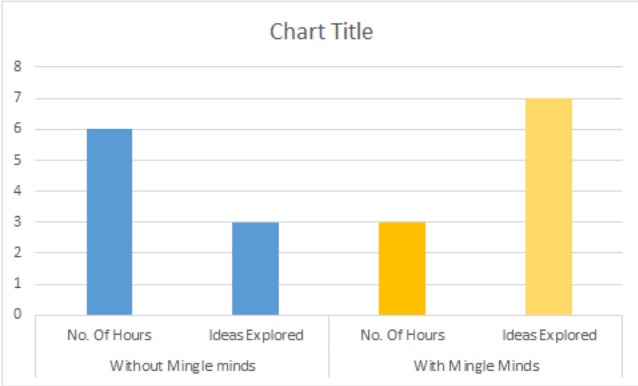
A. The Mindmap activity was conducted for 2 laboratory batches for one topic and 2 other batches did it with normal teaching learning method. The results showed,

Batch No	**Time Taken (in hrs)**	**Quiz Result (average % result)**
B1 (Mindmap)	3 hrs	76%
B2 (Mindmap)	3.15 hrs	78%
B3	5 hrs	35 %
B4	4.20 hrs	41%

The result shows that mind map activity not only shows less time taken for concept clearance but also shows increase in understanding percentage of students.

B. The second result obtained is from mingle minds method where students were asked to prepare a IoT design model for automation.
The results are as below

Without Mingle minds	No. Of Hours	6
	Ideas Explored	3
With Mingle Minds	No. Of Hours	3
	Ideas Explored	7



Conclusion:
Thus the different group discussion ideas explored show that with changing student mentality the teaching learning process also need changes. For generating interest among students for effective learning such group activities are required as compared to traditional method of teaching.

References:

Angelo TA, Cross KP. Classroom Assessment Techniques: a Handbook for College Teachers (2nd ed.). San Francisco, CA: Jossey-Bass, 1993

Barkley EF. Student Engagement Techniques: a Handbook for College Faculty. San Francisco, CA: Jossey-Bass, 2009

Lom B. Classroom activities: simple strategies to incorporate student-centered activities within undergraduate science lectures. J Undergrad Neurosci Educ 11: A64–A71, 2012.

Cynthia J. Miller, Michael J. Metz, A comparison of professional-level faculty and student perceptions of active learning: its current use, effectiveness, and barriers

Robert A Ellis, Ana-Maria Bliuc, 2019 "Exploring new elements of the student approaches to learning framework: The role of online learning technologies in student learning"

Online vs Insem Examination: Performance and Perception of Students

Archana L. Mourya[1], Suman. S. Kahandal[2], Anuradha B. Bhalerao[3], Keshav N. Nandurkar[4]

[1,2,3]Applied Science and Mathematics Dept.,
K.K. Wagh Institute of Engineering Education and Research,
Nashik 422003
[4]Principal, K.K. Wagh Institute of Engineering Education and Research,
Nashik 422003

Track No : 3
Track Name : Quality in Education

Abstract

This study assessed performance and perception of students about online examinations (OE-computer based) vs. in sem examinations (IE-Paper based).OE exam conducted for first and second year students and IE exam conducted for third and fourth year students in mid of the semester. The study was conducted among sample size of 55 students and 20 faculty members of private colleges affiliated to Savitribai Phule Pune University. The data thus collected was analysed with result analysis and questionnaire. The findings of study demonstrated co-relation between OE and IE on students performance. The study shows major difference in OE and IE performance of students. In the survey about students experience with both examinations, the students showed preference to certain aspects of OE and teachers were more positive towards IE examination.

Key word: Online exam, Insem exam.

INTRODUCTION

It is recognized that examination is used to verify, to judge and to certify certain facts**.** Examinations are student's motivation to learn more. They compel us to solidify what we have learned, study further and practice skills. Examinations determine the extent to which educational institutions have served the needs of community and society as well as it determines our logical and critical thinking.

SPPU (Savitribai Phule Pune University)introduced credit grade based performance and assessment system from the academic year 2015-16 .Each BE programme is of 4 years (8 semester) duration .The minimum number of credits required by a student for completion of programme is 190.For first and second year there shall be online examination of 50 marks of 1 hour duration .Question will be asked from unit 1 to 4 called as phase I. Phase II shall be written examination of 50 marks of 2 hours duration. Question will be asked from all 6 units. Exam shall be conducted at the end of semester.

For third and fourth year students, Phase I shall be theory examination of 30 marks of 60 minutes duration. Question will be asked from unit 1 to 3 of the subject called as in sem exam. While phase II shall be a theory exam of 70 marks of 150 minutes duration. Question will be asked from all the unit of the subject called end sem exam. The marks obtained in in sem and end sem are considered together to calculate the grade of course.

This paper presents results of comparative study for performance and perception of students about online vs in sem examination of private colleges affiliated to Savitribai Phule Pune University. In this paper, "online exam" is an exam that is computer based with connection to a network and it consists of multiple choice questions of 1 and 2 marks. The in sem exam is traditional paper and pen exam that requires students to write the answer consisting of descriptive questions. This research paper gives results of survey about performance and perception of students about online and in sem exam: which is more effective evaluation tool, and which is more satisfying to the students.

LITERATURE REVIEW

Jamil, Tariq and shami conducted an experimental study to compare computer based and paper based examination. In this study, responses and views about questionnaire from 30 teacher including 12 females and 18 male, were collected and discussed with the experts.

It was concluded that they agreed that the computer based examinations saves time.

Majdi and Islam conducted survey between students of computers and information technology with major in computer science and students of education and arts with English major. They were given both a paper based and online exam. The Moodel learning system quiz was used for examination. It has features to upload various learning resources and assign different activities. Moodle exam allow options of timing, shuffling of questions, automatic grading and other interesting options. The paper exam manually graded and handed to the students, while online exam automatically evaluated and students can view their result after exam. A questionnaire was then distributed to all students to verity students satisfaction and experience of the exam. From this, they concluded that the type of exam do not play significant part in the performance of students but students preparations were major part for positive evaluation.

THE STUDY

METHODS:

Data was collected for sample size of 63 first year and 53 third year engineering students who appeared OE in first year and IE in third year. Analysis was carried out using paired t-test and Regression analysis.

A paired t-test is used to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample.

The paired sample *t*-test, sometimes called the dependent sample *t*-test, is a statistical procedure used to determine whether the mean difference between two sets of observations is zero. In a paired sample *t*-test, each subject or entity is measured twice, resulting in *pairs* of observations

x =OE result, y = Theory result and u=IE result, v= Theory result

To test the null hypothesis that the true mean difference is zero, the procedure is as follows:

1. Calculate the difference (di = yi −xi) between the two observations on each pair,
2. Calculate the mean difference, $\overline{d}$
3. Calculate the standard deviation of the differences, s_d , and use this to calculate the standard error of the mean difference, $S.E.(\overline{d}) = \frac{s_d}{\sqrt{n}}$
4. Calculate the t-statistic, which is given by $T = \frac{\overline{d}}{S.E.(\overline{d})}$

Under the null hypothesis, this statistic follows a t-distribution with n−1 degrees of freedom.

5. Use tables of the t-distribution to compare your value for T to the t_{n-1} distribution. This will give the p-value for the paired t-test.

We used pair t-test to compare impact of OE and IE on students performance in TE. The mean difference between OE and TE (μ_{d_1}) is zero. Null hypothesis H_0: μ_{d_1} =0 .

The mean difference between IE and TE (μ_{d_2}) is zero. Null hypothesis H_0: μ_{d_2} =0 .

Table I: Paired t-test statistical results for OE and TE

OE and TE		
Subject	**t_{cal}**	
M-II	9.6659	reject H0
CHEM	3.676	reject H0
BEE	6.2416	reject H0
EM	10.1063	reject H0
BME	3.9953	reject H0

Table II: Paired t-test statistical results for IEandTE

IE and TE		
Subject	**t_{cal}**	
AMA	10.22	reject H0
EM II	2.35	reject H0
Power Elect	-1.289	accept H0
EITM	-1.55654	accept H0
ITM	3.0735	reject H0

The pair t –test result (Table I) showed for OE and TE null hypothesis was rejected for all subjects. Hence at 5 % level of significance it can be concluded that for all subjects average marks in OE are significantly greater than average marks in TE. Table II showed for IE and TE null hypothesis was accepted in two subjects and rejected in three subjects with less margin. Hence at 5 % level of significance it can be concluded that for two subjects there is no significant difference in IE and TE average marks.

Another used test is Regression analysis to compare the results. R-squared is a statistical measure of how close the data are to the fitted regression line. It is also known as the coefficient of determination, or the coefficient of multiple determination for multiple regression.

The definition of R-squared is fairly straight-forward; it is the percentage of the response variable variation that is explained by a linear model.

R-squared = Explained variation / Total variation

R-squared is always between 0 and 100%:

- 0% indicates that the model explains none of the variability of the response data around its mean.
- 100% indicates that the model explains all the variability of the response data around its mean.

In general, the higher the R-squared, the better the model fits your data.

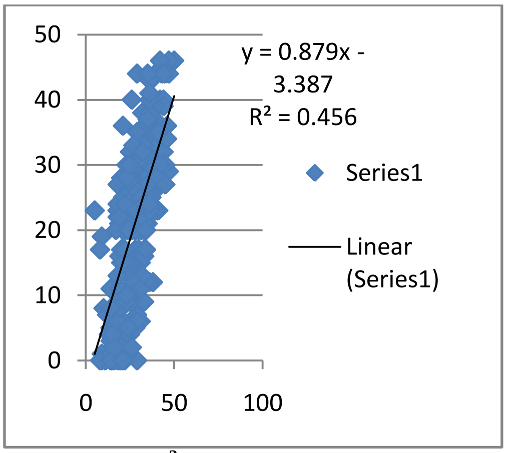


Fig I. R^2 value for OE and TE

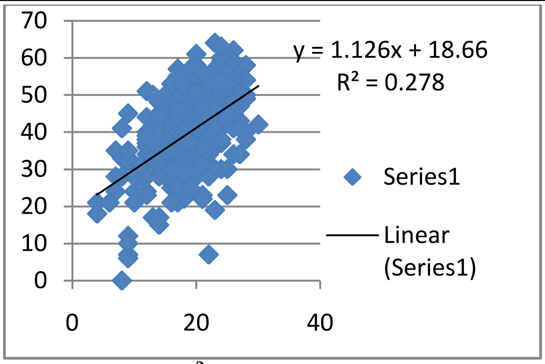


Fig 2. R^2 value for IE and TE

Regression analysis was done by collected data of OE and TE results of first year students and IE and TE results of third year students.

From the figure 1, it is observed that R^2 value for OE and TE is 0.456(45.6%) and for IE and TE R^2 value is 0.278(27.8%). As the R^2 value is low, it is harder to predict TE result from IE result but in OE we can estimate approximate result of TE.

χ^2 test can be used to find out whether one or more attributes are associated or not. We take hypothesis that attributes are independent. If the calculated value of χ^2 is less than the table value at a certain level of significance, the hypothesis is correct and vice versa.

$\chi^2 = \sum \frac{(O_i - E_i)^2}{E}$, O_i=Observed frequencies, E_i= Expected frequencies

From table 11,

In statement 1st (χ^2=**0.897<3.841**, $\alpha = 0.05$), 3rd (χ^2 =**0.005<3.841**, $\alpha = 0.05$) and 12th (χ^2=**0.030<3.841**, $\alpha = 0.05$), hence opinion is independent of category. In statement 1, it was clear from percentage that 53 % students and 65 % faculty agreed that IE create competition among students. In statement 3, 51% students and 50 % faculty agreed that IE gives the accurate result. In statement 12th, 53% students and 55 % faculty admitted IE helps to improve SGPA (Semester Grade Point Average).

In statement 9th (χ^2=**1.459<3.841**, $\alpha = 0.05$), 14th (χ^2 =**1.125<3.841**, $\alpha = 0.05$),15th (χ^2=**1.459<3.841**, $\alpha = 0.05$), 8th (χ^2=**2.703<3.841**, $\alpha = 0.05$), hence opinion is independent of category. In statement 9, it was clear from percentage that 65% students and 80 % faculty agreed that IE system gives equal credit to topics and their marks. In statement 8th, only 35% students and 15 % faculty confessed OE system is beneficial in all subjects.

In statement 2nd, (χ^2=**4.657>3.841**, $\alpha = 0.05$), 4th (χ^2 =**4.657>3.841**, $\alpha = 0.05$),5th (χ^2=**6.594>3.841**, $\alpha = 0.05$), 6th (χ^2=**10.227>3.841**, $\alpha = 0.05$), 7th (χ^2 =**4.550>3.841**, $\alpha = 0.05$), 10th (χ^2=**7.593>3.841**, $\alpha = 0.05$), 11th (χ^2=**4.545>3.841**, $\alpha = 0.05$), 13th (χ^2=**5.220>3.841**, $\alpha = 0.05$), hence opinion is dependent on category. In statement 2, it was clear from percentage that 42% students andonly 15 % faculty agreed that OE system is more reliable than IE. In statement 4th, 42% students and only 15 % faculty agreed that students could lose confidence in OE. In 5th statement, 84 % students and only 55% faculty agreed OE is more relaxing for students. In statement 6th, 71 % students agreed that OE develops creativity and thinking skill, while 70 % faculty disagreed to this. In statement 7th, 53 % students confessed that OE helps to solve reasonable examples, while 75 % faculty disagreed to this. In statement 10th, 82 % students strongly agreed that in OE questions are upgraded while 50 % faculty disagreed to this. In 11th statement, 67 % students and only 40% faculty agreed OE system reduces cheating. In statement 13th, 44% students confessed that OE system motivates students to learn, while 85 % faculty feels IE system motivates students to learn.

CONCLUSION:

Students scored good marks in OE than TE, as in OE questions were asked for 1 to 2 marks, so the difficulty level is less, while in TE question were asked for 4 to 6 marks with higher difficulty level. There is no significant difference in IE and TE average marks, as both are paper based exam.

By regression analysis it is difficult to predict result of TE from IE or OE, but predicted result of TE from OE is more reliable compare to prediction of TE from IE.

From Table 3 it is found that students strongly agreed that OE is more relaxing, with upgraded questions in examinations. Overwhelming majority of faculty expressed that students lose confidence in OE, while IE is more reliable, beneficial in all subjects, gives equal credit to topics and marks, motivate the students to learn and helpful for overall development of students. Student showed OE develop creativity andthinking skill, is more reliable, and reduces cheating while faculty showed preference to IE for all this. But both students and faculty agreed that IE system affects education system positively and is beneficial in all subjects.

ACKNOWLEDGMENT

We would like to thank Professor S. K. Wanjale for his expert advice and encouragement throughout this study.

REFERENCES

[1] Mubashrahjamil, R. H. Tariq and P. A. Shami .computer based vs paper based examinations : perceptions of university teachers ,TOJET : The Turkish online journal of Education Technology– october 2012,volume 11 Issue 4

[2] Majdi al-qdah and Islam Ababneh. Comparing online and paper exams : Performance and perceptions of

Saudi students, International journal of information and education technology, vol.7, No.2, February 2017

[3] Dorien Hopster-den otter, saskiawools, Theo J. H. M. Eggen, Bernard P. Veldkamp. Formative use of test results : A users perspective, studies in eduacational evaluation 52 (2017) 12-23

[4] Joeran Beel, Stefan Langer, Bela Gipp. A comparative analysis of offline and online evaluations and discussion of research paper recommender system evaluation .In proceedings of the international conference on theory and practice of digital libraries, edited by Sarantos Kapidakis, Cezary Mazurek, and Marcin Werla,9316:153-168

Appendices

Table 3:Responce of students and faculty for all statements and calculated values of χ^2

Sr. No.	Student Response				Faculty Response				χ^2 *with* $df\ 1, \alpha = 0.05$
	E OE	OE Response in %	IE	IE Response in %	E OE	OE Response in %	IE	IE Response in %	
1	26	47	29	53	7	35	13	65	**0.897**
2	23	42	32	58	3	15	17	85	**4.657**
3	27	49	28	51	10	50	10	50	**0.005**
4	32	58	23	42	17	85	3	15	**4.657**
5	46	84	9	16	11	55	9	45	**6.594**
6	39	71	16	29	6	30	14	70	**10.227**
7	29	53	26	47	5	25	15	75	**4.550**
8	19	35	36	65	3	15	17	85	**2.703**
9	19	35	36	65	4	20	16	80	**1.459**
10	45	82	10	18	10	50	10	50	**7.593**
11	37	67	18	33	8	40	12	60	**4.545**
12	26	47	29	53	9	45	11	55	**0.030**
13	24	44	31	56	3	15	17	85	**5.220**
14	21	38	34	62	5	25	15	75	**1.125**
15	19	35	36	65	4	20	16	80	**1.459**

Table 4: List of statements included in the Questionnaire

Sr. No.	Questions	Online Exam	Insem Exam
1	Which system could be more effective to create competition among students?		
2	Which system of examination more reliable?		
3	Which system of examination produce more accurate results?		
4	Students could loose confidence in..		
5	Which system of examination is more relaxing for students		
6	Which system of examination develop creativity and thinking skill?		
7	Which system of examination is help to solve reasonable /analytical examples?		
8	Which system of examination is beneficial in all subject ?		
9	Which system of examination gives equal credit to topics and their marks?		
10	In which system of examination questions are upgraded?		
11	Which system of examination reduce cheating?		
12	Which system of examination help to improve SGPA of students?		
13	Which system of examination motivates the students to learn?		
14	Which system of examination affects the entire educational system more positively?		
15	Which system of examination could be more supportive to achieve educational objective positively?		

Quality Education with Reference to Academic Audit and Best Practices in Evolution System

Appaji Korikana,

Research Scholar,
Dept. of Education and Education Technology, University of Hyderabad, (Telangana)
Mail : appajikorikana@gmail.com
Track No: 03
Track Name: Quality in Education

Abstract
Development of a country depends on development of education. In India there is an emerge to maintain quality education as education department influenced by many factors. The number of institutions imparting higher and professional education has grown up by leaps and bounds in resent past. But there is no quality in education in most of the institutions. In this scenario well qualified teachers and innovation in teaching practices are must. Good administration with indigenous strategies of teaching will enhance the quality of teachers and education. Academic audit, best practices in evolution system, utilizing the library facilities will improves the quality in education. Motivate the learners to spend their time in libraries instead of wasting their valuable time with electronic gadgets like smart phone and Bluetooth devices. Quality management and quality teaching staff with proper utilization of updated technology will give quality education.

Key words: Indigenous, Evolution, learners

INTRODUCTION:

The two words "quality" and "education" are commonly and carelessly used in every day discussion. Quality as contained in Oxford Advanced Learner's Dictionary (2010), means the standard of something when it is compared to the things like it. How good or bad something is. Quality is used on every commodity e.g quality shoes, shirts, cars, etc. When a women selling mango in the market sees a potential customer approaching her shed, she will not waste time to make use of quality to draw the man nearer for the purchase of her mango. Thus she will say "buy high quality mango". This means that any commodity can either be of a high quality or low quality. Equally we have low quality and high quality education.

In the present scenario there is no quality in education at all the levels such as primary, secondary and higher education. Primary level children are purely dependents on teachers. So the teacher is the entire responsibility of quality education at primary level. Where as in secondary level children will have maturity and some awareness about education. So secondary level stage is an important stage to achieve quality education at higher level. The students at higher education level are able to follow the rules and regulations of the teaching staff. But there are many factors influencing at this stage. The main factor for no quality education at higher level is lack of quality education at primary and secondary level, especially secondary level. Because the secondary level is the main stage to receive the knowledge as much as possible. After this stage a child can appy his/her knowledge what he learned during primary and secondary stage in higher education.

Generally education can be regarded as an activity which goes on in a society and its aims and methods depends on the nature of the society in which it operates; so education is sensitive to time place and circumstances. This is because it is constantly changing, adapting itself to new demands. Education management is also failing in this aspect by improper monitoring of staff, syllabus and activities among children. The class room teachers also engaged with multiple works so they are also facing problem in providing quality education to the students.

Mostly teachers are brought from above average students only. Because almost the toppers of the class are going to different fields such as civil services examinations, joining in IITs and getting placement at top most MNCs etc. If we observe the past 10 years of education system education is purely commercialized. Private institutions are working result oriented and publicity oriented but not quality education. Even most of the government institutions are working to satisfy and reach the government targets but not quality education. Then where is the quality education ? very less institutions are working for quality education. If we have quality student in such type of institutions they are almost choosing different sectors, some are interesting in software technology and some are interested settle in foreign countries. Then there is no possibility to expect quality teachers. If quality teachers are not available then there is no scope to maintain quality education.

What is the Need of monitoring quality of education?

This question may seem trivial but it has its historical background. In Europe and many other areas, the problem of illiteracy retreated for more than two centuries, the area education for all is provided as a standard. But the possibilities of using education more and more. We have moved from quality to quality. Transformation is caused by responsibilities for education and its quality. Gradually it is moved from community to state, from state to school and parent. So education has to be monitored in every stage such as administrative stage, teaching stage, parent communication and student attitude in studies. Later stages it is necessary be followed by the educational institutions to achieve quality of education.

Steps to be followed to achieve quality education:

To achieve quality education there must be followed some of important techniques at each level of education. There should be systematic plan and implementation is must in improving the quality of education.

1. **Good administration with indigenous strategies of teaching:**
   There is proverb "If tree is good then fruits are automatically good". Similarly if administration is good then any institution has good teachers, if good teachers are there then good students with good academic record will come. Not only this but also to apply indigenous strategies of teaching in teaching then automatically education quality will improve finally we achieve the quality of education.
2. **Academic audit:**
   Academic audit is an important thing to maintain or improve quality education. Academic audit should be focussed on teacher recruitment and teaching in the respective institution. Implemented lesson plans, assignments conducted and activities conducted. Curriculum should be checked and notice the modifications if any. As per trends there is a necessity to verify and modify the curriculum which is relevant to the present society needs and demands.
3. **Best practices in evolution:**
   Evolution is the measurement criteria to assess the student. If students released with improper or wrong evolution, they only be the future teachers it leads to building a failed education system because their academic scores or grades are not genuine. Accordingly they cannot survive their life properly with unemployment and the scarcity of quality teachers. Each and every stage of evolution through out the academic year must be sincere. Since it is series of stages to get quality education. Evolution is an important stage to maintain quality in education.

4. **Analysis on conducted exams:**
   Analysis is one of the best method to proceed further stage and to achieve real results. Either teacher or administration can conclude that the result in examinations. After evolution process every individual progress of the class has to be analyzed then guide and trained according to the individual capacity. What ever the status of an individual performance of a student it gives genuine results by analysis technique only. Automatically quality of education will improve through individual performance. Every subject teacher duty is to encourage each and every student by revealing their presentation in their examination. With this encourage every student feel happy mode and they will try to improve their progress by knowing their strengths. Every one has individual talent by birth it may be educational or non vocational but the teacher can identify it and motivate them to utilize their talents to education purpose. This will happened through analysis only.

5. **Awareness program to utilize the latest technology:**
   Now way days technology improved very fastly, but the students are failing in utilizing the latest technology. For example to improve their qualification they need not wait for offline distance courses. They can improve their individual interests and talents through online distance courses. But they are unaware of the programs like SWAYAM , SWAYAM PRABHA etc which are implemented by central government. So awareness programs should conduct to utilize the latest technology initiations in the field of education.

6. **Counselling on usage of electronic gadgets and social media:**
   Most of students are spending their most valuable time in every day life with smartphone by following the social media activities like whatsapp, twitter, tiktak, instagram and facebook. They are spending much time with electronic gadgets on the name of information search. But they are deviating from actual search by edicting the social media. Education management should observe this and motivate the students to utilize the libraries in searching information and to avoid the smart phones during library hours. This will give impact on quality of education.

Conclusion:

Education quality is linked with quality management, quality teachers, quality teaching, quality syllabus which related to contemporary education, quality examination system and quality evolution. If any one fails the quality in above all aspects we cannot achieve the quality of education. Quality management can monitor properly, quality teacher can motivate the students in improving their individual talents, quality teaching will make the quality student products, quality evolution will give the real results. In every stage there is no compromise in providing quality education. In this scenario well qualified teachers and innovation in teaching practices are must. Good administration with indigenous strategies of teaching will enhance the quality of teachers and education. Academic audit, best practices in evolution system, utilizing the library facilities will improves the quality in education. Motivate the learners to spend their time in libraries instead of wasting their valuable time with electronic gadgets like smart phone and Bluetooth devices. Quality management and quality teaching staff with proper utilization of updated technology will give quality education.

References:

1. Richard Rose. (2018), Your child's Needs or The Needs of all our children? Seeking a more collaborative model for the provision of inclusive and equitable schooling, University of Northampton, UK.
2. Rohidas Nitonde and Jadav B.U, (2015), Academic and Administrative Audit: A parameter for quality education,
3. Haseena V.A and Ajims P. Mohammad, (2015), Journal of Education and Piece: Aspects of quality in Education for the improvement of Educational scenario, Vemballur.
4. Zuzana Juscakova, (2015), Quality indicators in Education, National institute for Education:
5. Martand T. Telsang and Sushma S. Kulkarni, (2011), Academic audit- A tool for enhancing teaching learning effectiveness, The journal Engineering Education.
6. S. G. N. Eze, (2009), Features of quality education, Enugu state university of science and technology.

Innovative Learning Approach to Teach Machine Learning Course

Gautami G. Shingan[1], Snehal S. Patil[2]

[1,2]Department of Computer Science and Engineering Rajarambapu Institute of Technology, Rajaramnagar.
[1]gautami.shingan@ritindia.edu
[2]archana.jakhale@ritindia.edu
Track No: 04
Track Name: R & D and Innovations

Abstract:
In the 21st century, technology changes very quickly, to cope up with the new technology and algorithms to solve real-time problems, Innovative Teaching Learning Approaches plays a vital role. Machine Leaning one of the recent trend in engineering to solve real-time problems in the field of marketing, banking, image processing, forecasting and many more. As Machine Learning has a practical oriented approach, teaching the course with the traditional approach is not appropriate to learn by students effectively. An innovative approach like project-based learning, collaborative learning, google classroom, flipped classroom are most suitable for this course to understand the problem, datasets, pre-processing methods, applying an algorithm to the problem and finding the most accurate solution. The main objective of the activity is to develop logical thinking, critical thinking, finding solutions to the run time errors and collaborative work among the students. Detailed execution of the activity has been discussed in the paper in detail. Finally, the CO attainment and students' feedback has been taken and analysed to find the learning approach towards the concept using innovative teaching-learning Methodology.

Keywords: Innovative Teaching-Learning Approach, Project-Based Learning, Google Classroom, collaborative learning etc.

1. Introduction

Machine Learning is one of practical based course in the field of computer Science and Engineering that can applied to resolve the real time problems in different areas like Banking, Marketing, Forecasting, Image Processing, Computer vision, Classification, Object Detection and so on. The nature of problem changed at different scenarios hence, student should able to apply different algorithms to the problem and find out the most accurate solution. Traditional teaching-learning methodologies are not suitable to solve problems practically, as it believes in teacher plays a role of teaching and students plays the role of listening i.e. one way

communication which results into lack in clear perview of concepts, knowledge retention. Sometimes student have the knowledge of theory but they could not apply algorithms to the problem. To bridge the gap between theory and practical we proposed project based learning approach to learn the concepts in machine learning course. This paper introduces four innovative classroom teaching approaches to learn the concept are shown in figure 1.

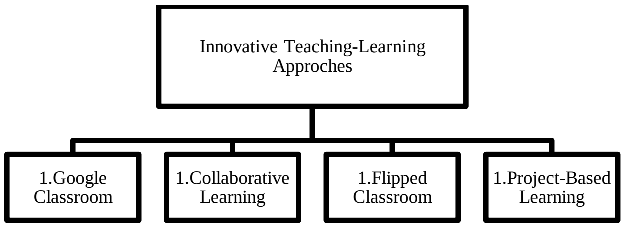


Fig 1. Innovative Teaching-Learning Approaches

Google Classroom, Collaborative Learning and Flipped Classroom activities are used for classroom learning activities and Project-Based Learning activity is used for classroom learning as well asIn-Semester-Examination (ISE) assessment.[3]
The organization of paper, section 2 present action plan and implementation of all methodologies. Section 3 shows the result of these activities by analysing student responses and impact of these activities on CO attainment of the course and grade change. Finally, conclude impact of activity based learning in teaching engineering courses and its outcomes.

2. Methodology

The main objective of the paper is to:

1. Understand basic concepts in the course
2. Apply knowledge to solve real time problems
3. Develop all skills within students
4. Work in collaboration
5. Develop knowledge retention

The activities and its implementation are as follows:

A. Google Classroom

Now days, the trend is of E-learning as there are lots of resources materials are available online [6]. Google provides plenty number of resources like blogs, articles, research papers for leaners to get knowledge through it which helps to create google environment in the classroom.

Topic: Machine Learning Applications

Action Plan:
1. Prepare a group of 3-4 students.
2. In general discussion on Machine Learning Applications.
3. Ask the students to identify area where machine leaning is used.
4. Study the field in depth.
5. Present the applications in selected field in front of class.

Outcomes:
1. To understand importance of Machine Learning in Computer Science.
2. To know different fields where machine leaning applicable to solve complex problems.

B. Collaborative Learning

Collaborative learning is an educational teaching and learning approach to that involves groups of learners working together towards a common goal like problem solving, or complete a task.[4,5]

Topic: Classification Algorithms

Action Plan:
1. Prepare a group of 3-4 students.
2. In general discussion on classification technique in classroom (In-class Activity)
3. Discussion on classification algorithms and real time problems where classification required (In-class Activity)
4. Ask the students to select any one classification algorithm and apply them to any classification problem i.e. problem based learning (out-of-class Activity)
5. Present the problem in front of class.

Outcomes:
1. Able to learn different classification problem.
2. Able to learn how to apply theory to the real scenario and find solution.

C. Flipped Classroom

In optimization algorithms, there are huge number of algorithms available to get local and global optimal solution. However, it is not possible to cover all algorithms in the classroom. In such situation we use flipped classroom activity [1,2]. The activity plan is:

Topic: Optimization Techniques

Action Plan:
1. Prepare a group of 3-4 students.
2. In general discussion on NP-Hard Np-Complete Problems and optimization algorithms (Random search, Hill climbing, Simulated Annealing, GA, PSO, ACO, TLBO etc).
3. Ask the students to identify area any one optimization problem.
4. See the videos on YouTube and understand the basic concepts related to selected algorithm.
5. Solve the problem using any suitable optimization technique.
6. Present the work in front of class.

Outcomes:
1. To able to write mathematical model and objective (cost) function to optimize (maximize or minimize) problem.
2. To learn types of optimization and stopping criteria's of algorithms
3. To know different optimization technique to solve NP class problems.

A. Project-Based Learning

Project-based learning (PBL) is one of the student-centric pedagogy that comprises a dynamic classroom approach in which students get an in-depth knowledge through discovering solution to the real-world challenges. Students learn about a subject by working for an extended period of time to investigate and respond to a complex question, challenge, or problem [7]. The main objective implementing this technique is to build logical, critical and technical skills within the students and develop their online profiles by writing own blogs and upload code on GitHub.

Classroom Implementation:

Topics : Algorithms

Action Plan:

While teaching any new algorithm in the classroom the following
1. Explain algorithm and mathematical background of the algorithm
2. Solve an example manually to understand the how to apply algorithm to problem
3. Demonstration of algorithm using any real time application

ISE Assessment using Project Based Learning Technique:

The activity starts at the beginning of the semester. Instructions given to students are as follows:

ISE—I Instructions:
- Construct a group of 3 to 4 students. (Jan First week)
- Select any one real time problem and suitable algorithm to solve it. (Jan second week)
- Fix the objective, platform and system requirement to implement (Jan third week)
- Present and upload PPT on Moodle. (Jan fifth week)

ISE—II Instructions:
- Implement the solution. (February and March month)
- Presentation should contain problem statement, objective, mathematical background, execution of code and its expected output with result analysis. (April first week)
- Student should upload video on YouTube, code on Github and post one blog (April first week)
- Upload code, Blog and video links on Moodle. (April first week)

Table 1. Students online submission

Topic	YouTube link	Blog Link	Github link
Analysis of Regression & Classification Techniques	https://youtu.be/06dO6TLNWr4	https://www.linkedin.com/pulse/linear-regression-rupesh-sharma/	https://github.com/Gambitier/SVC-KNN-LR-CNN
Image Compression based on K-Means color clustering	https://youtu.be/Z8olrRk0E1k	https://medium.com/@madhurapardeshi1311/image-compression-using-k-means-clustering-algorithm-fc641aa461cd	https://github.com/BHAVANAITI/ImageCompression/tree/master
Analysis of Banknote using supervised learning algorithm BPN and SVM	https://youtu.be/1Zs-cm6TBv4	https://medium.com/@rachanajadhav9999/authentication-of-banknote-using-machine-learning-algorithm-adfa6f20e298	https://github.com/rachanajadhav9999/Banknote_authentication-using-machine-learning
Object Detection	https://youtu.be/X0PrpaIbJb8	https://objectdetection.wordpress.com/2019/04/14/object-detection-using-tensorflow/	https://github.com/shindesonam/ObjectDetection
Stock market Prediction using Machine Learning	https://youtu.be/mIhBlg5vhUg	https://thekeyideas.com/stock-market-prediction-using-ml-algorithms/	https://github.com/hrishikeshrn/Stock-Market-Prediction-using-Machine-Learning
Facial Recognition System using Open Face	https://youtu.be/eynQbGFnFlk	https://medium.com/@vrushabhkangale/face-recognition-system-using-open-face-480d581986b	https://github.com/VK1503017/Face-Recognition
Prediction of Automotive Accident using Machine Learning Algorithm	https://youtu.be/bc5kTXA9EcQ	https://predictionofautomotiveaccident.blogspot.com/2019/04/prediction-of-automotive-accident.html	https://github.com/amruta10/ml
Visualization Tool for Analysing large data.	https://www.youtube.com/watch?v=dr3po7_lo74&t=155s	https://www.linkedin.com/pulse/data-visualization-omkar-lonkar/	https://github.com/aries97/omkar-/blob/master/Visualization.rar
Maze Path Prediction	https://youtu.be/J2KDhuSC5aM	https://www.linkedin.com/pulse/maze-path-detection-swapnil-mane/	https://github.com/Deepalikudale/Maze-Path-Prediction

3. Result and Discussion

Above activities are applied to elective course named machine learning course of B. Tech. final year students. The total strength of class is 25.Table 1 shows all students submission where they have uploaded blogs, youtube video and code on github. Results are classified into three categories: CO attainment, Change in Grade of Students and Student Responses.

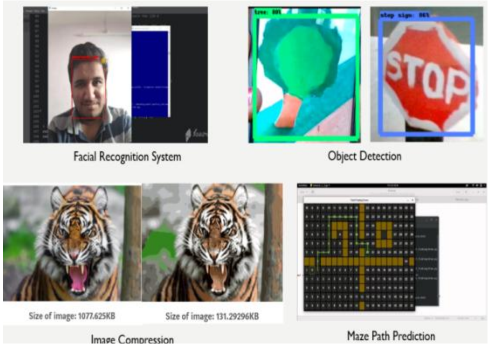


Fig.2(a)Screenshots of projects implemented by students

Fig. 2(a) shows some outputs of projects that students has implemented for ISE assessment. Fig 2(b) and (c) shows sample screenshot of blog created by students and comment given by viewers of the blog. The rubrics used for ISE—I and ISE—II are shown in table 2 and 3 respectively.

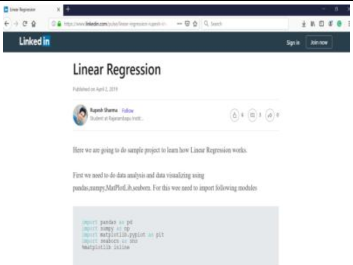


Fig. 2(b) Sample Screenshot of blog posted by students

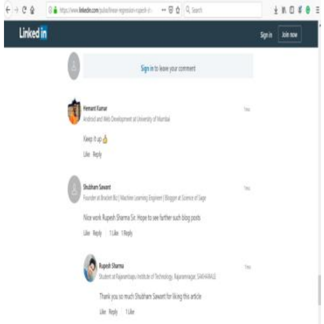


Fig. 2(c) Screenshot of comments posted by blog visitors

Table 2. rubrics used for ISE—I

Dimensions	Scales			
	0-1 Poor	**2-3 Fair**	**4 Good**	**5 Excellent**
Identification of problem	Moderate explanation of the purpose of	Average explanation of the purpose of and need of problem.	Good explanation of the purpose of and need of problem.	Detailed and extensive explanation of the purpose of and need of
Objective and Methodology of problem identified	Only some objectives of the proposed work are well defined; steps to be followed to solve the defined	Incomplete justification to the objective proposed; steps are mentioned unclear; without justification to objectives	good justification to the objective proposed; methodology to be followed to be specified but detailing is not done.	All objectives proposed are well defined; steps to be followed to solve the defined problem are clearly specified.
Presentation and Demonstration	Lack of confidence and familiarity in some parts of presentation	Basic organization and preparation; confident in only some part of the presentation	Good organization and preparation; confident in most parts of the presentation	Excellent organization and preparation; confident and relaxed in whole presentation
Deadline	Never Follow deadline	Rarely follows deadline	Regularly follows deadline as per schedule	Always follow deadline early than schedule
Active Participation	Student was absent from lab or did not participate. There was no attempt to make prior arrangements to make up the lab.	Student tardiness or unpreparedness makes it impossible to fully participate. If able to participate, student has difficulty explaining key lab concepts.	Student arrives on time to lab, but may be unprepared. Answers to questions are basic and superficial suggesting that concepts are not fully grasped.	Student demonstrates an accurate understanding of the lab objectives and concepts. The student can correctly answer questions and if appropriate, can explain concepts to fellow classmates. Student is eager to participate and assists when needed

Table 3. rubrics used for ISE—II

Dimensions	Scales			
	0-1 Poor	2-3 Fair	4 Good	5 Excellent
Program Demonstration	Unable to explain program design	Able to explain some program design	Able to explain entire program design	Able to explain program design
Program Execution and Output validation	Unable to run Program; The program produces incorrect results	Able to run Program correctly Without any logic error; The program produces correct results but does not display correctly. does little check for errors and out of-range data	Able to run program correctly without any logic error and display inappropriate output; The program works and meets all specifications. Does some Checking for errors and out of range data	Able to run program Correctly without any logic error and display appropriate output; The program works and meets all specifications. Does exception-All checking for errors and out of range data and added some extra concepts in it
Video creation/ writing blogs/code on github	Video/blog consists of only introductory information, flow is missing; covered few concepts; achieve some objectives	Video/blog consists of in satisfactory information, flow is missing; covered few concepts; achieve some objectives	Video/blog consists of in satisfactory information, in flow; covered few concepts; achieve all objectives	Video/blog consists of in depth information, in flow; covered all concepts; achieve all objectives
Deadline	Never Follow deadline	Rarely follows deadline	Regularly follows deadline as per schedule	Always follow deadline early than schedule
Active Participation	Student was absent from lab or did not participate. There was no attempt to make prior arrangements to make up the lab.	Student tardiness or unpreparedness makes it impossible to fully participate. If able to participate, student has difficulty explaining key lab concepts.	Student arrives on time to lab, but may be unprepared. Answers to questions are basic and superficial suggesting that concepts are not fully grasped.	Student demonstrates an accurate understanding of the lab objectives and concepts. The student can correctly answer questions and if appropriate, can explain concepts to fellow classmates. Student is eager to participate and assists when needed

A. CO Attainment:

In this section we are comparing Co attainment of machine learning course for academic year 2017-18 and 2018-19. In our Institute, Rajarambapu Institute of Technology adapted Outcome Based Education (OBE) system. CO Attainment calculated from OBE based Ion CUDOS system. From the figures we analyse that, innovative teaching learning approaches outperforms traditional methodologies. Form the table 4 we say that these activities helps learners to understand basic concepts in machine learning as CO1 is improved by 15.21%. below figures also shows that CO2 improved by 6.28% and CO3 by 9.37%. The overall improvement is 7.89%.

Table 4. Co Attainment Comparison

Sr. No.	Cos	COs to activity Mapping	Academ ic year 2017-18	Academ ic year 2018-19
CO 1	Demonstrate concept of machine learning and collaborative filtering.	Google Classroom and Project based learning	68	83.21
CO 2	Apply clustering and classification techniques for group	Collaborati ve Learning and Project based	72	78.58

	identification and clustering.	learning		
CO 3	Design solutions for the problem optimization and demonstrates Bayesian filtering.	Flipped Classroom	65	74.37
CO 4	Demonstrates and builds models for recommendations.	Project Based Learning	73	73.41

B. Change in Grade of students:

Here we have compared grades in In-semester examination (ISE) of students of current academic year 2018-19 with respect to last academic year 2017-18 shown in table 5. It has been observed that there is improvement in count of students having AA and AB grades

Year	**AA** (91-100)	**AB** (81-90)	**BB** (71-80)	**BC** (61-70)	**CC** (51-60)	**CD** (41-50)	**DD** (31-40)	**XX** (detained students)	**FF** (Fail)
2018-19	02	06	08	03	04	01	01	-	-
2017-18	-	03	11	5	04	03	-	-	-

C. Student Responses:

We have taken responses from the students at the end of course in term of rating as well as in written form. Following graph shows rating given by students. The average rating of activities are 8.78.

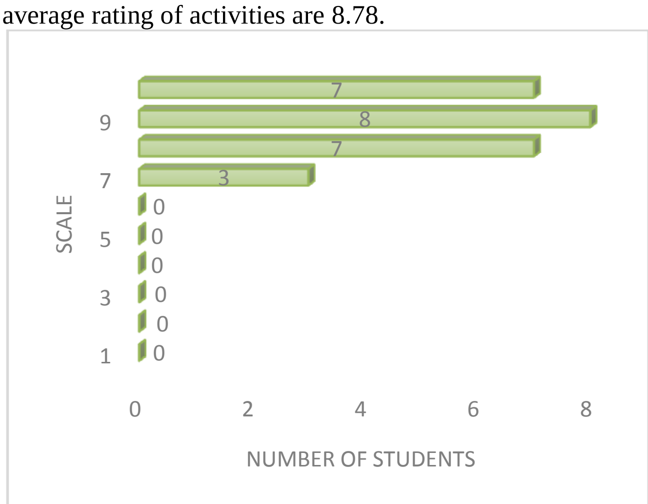


Fig. 3 Rating of students to the activities conducted for machine learning course

The written comments given by students are:

1. Algorithm applied to real life problems task was good.
2. Nice learning experience.
3. Develop the confidence of self-study and present.
4. Algorithm teaching method was good but syllabus must not be more application oriented.

4. Conclusions

The new learning methodologies like google classroom, collaborative learning and flipped classroom are useful to create healthy environment in the classroom and student enjoy learning. It also develop students individual as well as collaborative involvement in problem solving.It also helps students to retain the knowledge whenever it required. Due to these activities there is exponential growth in attainment of CO's and improvement in the grades.

References

[1] Prakash M. Jadhav and Varsha T. Lokare, "A Holistic Approach for Teaching Data Structure Course in the department of Information Technology", Journal of Engineering Education Transformations, 2017.

[2] Gautami G Shingan, Bharati K Ugale,"A Holistic Approach for Teaching Design and Analysis of Algorithms Course in the Department of Computer Engineering", Journal of Engineering Education Transformations, 2018.

[3] Varsha T Lokare, Prakash M Jadhav, Snehal S Patil," An Integrated Approach for Teaching Object Oriented Programming (C++) Course", Journal of Engineering Education Transformations, 2018.

[4] Bharati K Ugale, Gautami G Shingan,"A Novel Approach to Improve Logical and Critical Thinking through Collaborative Learning and Using Visualization Tools", Journal of Engineering Education Transformations, 2018.

[5] Marjan Laal, "Benefits of collaborative learning", Published by Elsevier Ltd, Procedia - Social and Behavioral Sciences 31,486 – 490,2012.

[6] SathyendraBha, "Leveraging E-Learning through Google Classroom: A Usability Study", Journal of Engineering Education Transformations ,Volume 31 , No. 3, January 2018.

[7] S. M. Hirikude, "An Interdisciplinary Project Based Learning, a case study", Journal of Engineering Education Transformations ,Volume 31 , No. 1, July 2017.

Innovative Techniques in Teaching Learning for Quality Education

Sumant A. Sarmokadam

Department of Electrical Engineering,
St. Vincent Pallotti College of Engineering & Technology,
Gavashi Manaput Wardha Road Nagpur-441108
sumant_sarmokadam@rediffmail.com
Track No: 04
Track Name: R & D and Innovations

Abstract: The teaching which connect the students with the subject is known as the effective teaching. The delivery of subject knowledge to the student should be such that it clears the basic concepts of the subject and explains how to apply those basic concepts to solve the practical problems. The used of ICT helps to bridge the gap. The preparation of teaching plan should be such that it encourages students to take greater responsibility for their own learning. This paper proposes different techniques in Teaching – Learning for providing quality Education to the students.

Keywords: Teaching Plan, ICT, teaching – Learning Process

I. INTRODUCTION

In today competitive world it is necessary to adopt such techniques which gives more practical knowledge to the students. Teaching – Learning process should be such that it encourages students to take greater responsibility for their own learning. It is possible by motivating students for self-learning. The self-learning helps to identify, review and analyze complex engineering problems. The effective utilization of modern tool like ICT, encourages the students for self-learning. The general observation about the students is that, students take interest in any subject only if they understand the basic concepts and practical application of those concepts to solve live problems in the industry. All basic concepts in the subject should be explained by discussing industry-based case study which further explains how those concepts are implemented practically.

The effective Teaching - Learning process should be such that it encourages or motivates the students to learn each topic of the subject in depth. Such processes definitely help the students for developing out of box thinking and for applying their innovative ideas in practical implementation. The quality education is the education which penetrates the subject knowledge in the student in such manner that it increases confidence level of the students and improve the decision-making power which can help the them solve practical problems. This paper proposes different techniques for quality education

II ENCOURAGE STUDENTS TO TAKE GREATER RESPONSIBILITY FOR THEIR OWN LEARNING

In general, we observed following behavior of the students in class-

a) Most of the students hesitate to share subject difficulties with the staff and without understanding the basic concepts of the topic, they mug up the answer – which helps them to clear the theory examination but not useful for lifelong learning.

b) Students do not know how to take responsibility of their own learning

c) While studying, students are least bother about their Interpersonal skills which will be more helpful for the students while working in job

d) Students are not getting any platform to develop their convincing power

To address all these issues participative learning is required and following below mentioned technique of Teaching –Learning is more helpful to provide quality Education to the students.

In every theory subject after completing syllabus of each unit, prepare list of important questions based on that unit. Now form group of students and ask them to prepare the answer of these question. Motivate these students for preparation by giving inputs on self-study, help them to prepare subject notes using different tools like ICT, e-books, animated PPT, NPTEL Videos etc. Now introduce this group of students to the class and ask other students to contact them to get the answer of their query related to first unit of the subject. This group of students take the ownership and act as the mentor for first unit of subject. Similarly do the same process for remaining units of the subject. The formation of student group should be such that each and every student have to participate in the process. So that every student prepares at list one question. Motivate students to participate in more than one group and use innovative technique to explain answer for the question. At the end of session take the feedback of each student from class on the basic questions which will help to develop their personality.Such technique of Teaching-Learning will bridge the gap within students and between students and faculty.

II.TECHNIQUES TO IMPROVE TEACHING - LEARNING PROCESS

The Preparation of Teaching plan of subject should incorporate following techniques to improve Teaching – Learning Process for Quality Education. Different techniques for Theory and Practical Subjects are discussed below:

Theory Subject:

1. **Deliver subject input in Descriptive and objective Pattern:**
   The subject delivery should be such that it provides subject input or knowledge in descriptive and objective pattern. The descriptive inputs help the students to clear theory examination and objective inputs helps to prepare competitive examination. After completing syllabus of every unit, cover objective questions based on the units which are normally asked in GATE, IES Examinations, other competitive exam. etc. Such teaching encourages the students to take interest in subject because students gets parallel inputs at same time.
2. **Use of ICT:**
   Most of the students prepare their subject with conventional pattern. If faculty use ICT tools in class along with Chalk and duster like NPTEL Video Lecturers animated PPT, Swayam ON LINE Courses, Flip class then students get alternate ways to learn the same topic. Also explain how to use these tools in effective manner. It creates self-learning habit and helps to increase their problem analysis skills.
3. **Topics beyond syllabus:**
   Cover some topics which are beyond the syllabus and ask students to do literature survey for the same. Such practice connects the students with outside world & also it will help the students to update their subject knowledgea bout innovations in their field.
4. **Experimental Learning**:
   It is one most important and effective learning technique which gives clear idea about the concepts to the students. It is achieved by covering some topics of the subject by preparing small demo models, conducting experiments and by arranging field visits which clear the concepts more effectively
4. **Use of Industry Case study:**
   Cover some topics using industrial case study. First explain the concepts to the students and then discuss how that concepts are helpful to solve industry-based problem. It helps to develop the ability of investigation of complex problems.
5. **Use of software:**
   Software tools helps to simulate and analyse basic concepts of the subject, which creates interest about subject. On the basic of simulation, students can study the behaviour of the system with change in system parameters. This will allow students to think out of box and help them in their innovations and research.
6. **Use of Charts:**
   Prepare innovative charts to explain basic concepts of the subject. The chart should be self-explanatory and easy to recollect the highlights of the concepts. Also ask the students to prepare such chart for effective communication.

For Practical Subject:

1. The practicals should be based on industry problems. It should give clear idea about how it helps solving the industry-based problems.
2. In practicals, students should maintain a separate copy to solve the assignments based on industry-based problems other than regular practical journal.
3. Use of Virtual labs for conducting the practical.
4. Application of software for conducting the practical.
5. At least one practical should be based on Mini Project

All above teaching techniques helps the students in one and other way to develop their personality in terms of knowledge, communication, innovations etc.

IV. Conclusions

The use of innovative techniques and ICT in preparation of teaching plan encourages students to take greater responsibility for their own learning. It also motivates the students for self-learning. Theeffective utilization of these techniques helps the students to get quality education and their overall development.

All these Innovative techniques should have student centric approach so that they support to enhance the quality of education.

V. References

1) A demand of value based higher education system in India: A comparative study, Kareena Bhatia and Manoj Kumar Dash Journal of public Administration and policy Research Vol. 3(5), pp. 156-171, May 2011
2) Education system in Modern India, Mohan Gautam, Sunny singh, International Journal of Scientific Research And Education Volume-4, Issue-01, Pages-4876-4879, January 2016 ISSN € : 2321-7545
3) Indian Education system, Swati Rai, International Journal of Social Sciences, Volume 4, Issue 3, pp. 17-26, 14th July 2018
4) Indian Higher Education System: Challenges and Suggestions, Sahil Sharma, Electronics Journal for Inclusive Education, Vol. 3, No. 4 [2015], Art. 6
5) Impact of ICT on the Teaching and Learning Process Stella Nwigbo, IOSR Journal of Mobile Computing & Application (IOSR-JMCA) e-ISSR: 2394-0050, P-ISSN: 2394-0042. Volume3, Issue 2 (Mar. –Apr. 2016), PP-01-07

Skill Development and Employability

V. M. Natraj[1], S. D. Kalpande[2], D. O. Bhavar[3]

[1,3]Department of Civil Engineering, Guru Gobind College of Engineering &Research, Nashik
[2]Department of Mechanical Engineering, Guru Gobind College of Engineering & Research, Nashik
[1]vnatram@gmail.com
Track No:5
Track Name: Skill and Entrepreneurship

ABSTRACT:
Professional courses are the most sought by aspiring graduates. The primary, higher secondary education systems across the country put more emphasis on classroom teaching to prepare students to pursue professional courses. Every year lakhs of ambitious graduates appear in entrance examinations. A small percentage of these students get admission in IIT's, NIT's (Tier 1 & Tier 2) & other reputed institutes. Remaining of them are admitted into private, self-financed institutions (Tier 3). A marked difference exists in the quality of the students graduating from Tier 1 & Tier 2, Tier 3, institutes. Tier 2 and especially Tier 3 form major chunk of technical institutes across the country and are mainly responsible for the growing unemployment of engineering graduates. Although prescribed syllabus and teaching pattern exist across various universities, the sub-standard education delivered especially under Tier 3institutes can be attributed to be the main reason for growing number of unskilled engineers and unemployment. The accumulation of unemployed graduates has resulted in more supply than demand, leading to lowering in admission to many of the engineering colleges. It is thus necessary to bring in reforms into the technical education system to produce skilled graduates who can be accepted by the industry with a minimal training. The paper reviews the root cause for the deterioration of quality education especially in Tier 3 institutes and the need for imparting, mandatorily specific skill sets required for engineering graduate to be employable.

KEY WORDS: Professional, education system, Tier 3 institutes, sub-standard education, unskilled engineers, employable.

1. INTRODUCTION

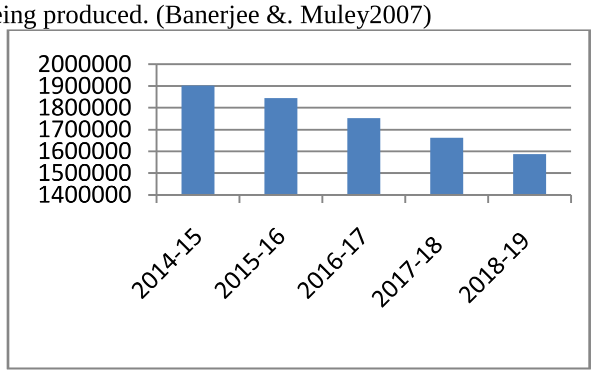
Engineering education in India originally began to produce technical graduates to support the human resources requirement of growing industrial need. Curriculum & teaching methodology was designed to impart necessary specific technical skill to operate & run the industrial needs (Banerjee &. Muley 2007)

The country witnessed a mediocre growth and aspiration towards technical education post independence. During 1947 the country had 44 Engineering & 43 Polytechnic colleges, which included Pharmacy & Architecture institutions with an total intake of 3200 and 3400 respectively. (AICTE Handbook 2019-20).

Globalization, and the pace of technological, economical growth demanded rapid industrialization, leading to growth of production, construction, IT & Software, hospitality and other industries. This called for Research and development to support the technological & industrial growth. To meet the need for Research and development, technical institutes started offering Post graduate, doctoral and post doctoral studies. The post independence economical growth of the country was associated with the growth of the technically skilled human resource. Country witnessed an unprecedented growth of technical institutes and technical graduate especially between 1980-2000. This led to development of substandard technical institutes in due course of time and is understood to be the main cause for the large scale unemployment of engineering graduates. The aim of the paper is to review the growth and declining trends of engineering education in India. It also attempts to review the root cause for the falling trend in student's fancy to Engineering education.

2. RISE AND FALL OF ENGINEERING COLLEGE

The need to meet the growing demand of technically enabled graduates witnessed, a swift growth in Engineering and Polytechnic colleges especially from 1995 onwards was observed. There was a slow growth of technical institutes from 50 colleges in 1950 to 1511 engineering college in 2006.Each of these institutes had an average intake of 74 in 1950 and 1511 in 2006. Studies showed that major growth in the number of Engineering college sanctioned occurred from 1995 onwards. This spurted the average intake by 17.6% per year between 1995-2006 as the average intake increased from 242-346 per institute. Such growth had an effect on the quality of the graduates being produced. (Banerjee &. Muley2007)



(*Source: AICTE Handbook 2019-20*)
Fig 1.Trend of Student intake

AICTE reports revealed considerable increase in students preference to engineering education during 1980-2000, which saw continued growth in the number of Engineering colleges. This trend was mainly due to the availability of good employment opportunity in some faculty of Engineering, while others suffered. IT & Software, Electronics & Tele communication, core sectors like production, automobile, construction provided good employment opportunity. Hence a spurt in engineering intake was observed as the total intake of admission in the country peaked to 19,01501 during 2014-15.(2)

The fall in the Engineering admission began from 2014-15. Largest slide was observed during 2016 as admission fell by 75,000 every year thereafter. During 2016-17 the total intake capacity was 15,71,220, actual students admitted was 7,87,127, thus the deficit admission was about 50.1%.Similarly the total intake capacity during 2015-16 was 16,47,155, actual students admitted was 8,60,357, thus the deficit admission was about 52.2%.The downfall trend is depicted in figure1. (1)

The falling trend in students enrolling to engineering colleges was not a general phenomenon. IIT's, NIT's and premier technical institutes saw a rise in the intake during the same period. This is evident from the fact that IIT's had an increase in intake by 900 seats during 2017-18 and by another 700 seats during 2018-19. Similarly NIT's seats increased by 1000 seats. The institutes which suffered majorly were the major chunk of private self financed engineering colleges from Tier 3 institutes.(2)

An analysis of the admission trend showed that unemployment prevailed mostly in the teirIII privately managed colleges. Many researchers attributed substandard education disseminated in these colleges as the main reason for unacceptable output from such institutes. Although in some cases, high grades/mark was obtained by students, however these students were unable to clear even the simple pre interview tests. The feedback by the interviewers reflected that, in general majority of the students were unacceptable by industry as they lagged requisite skills (both soft and hard) expected in a technical graduate. This scenario led to accumulation of unskilled and unacceptable engineering graduates over the past few year she nceescalated unemployment. Survey on human resources requirement indicate that although good demand exist across various sectors of industries, unavailability of suitable skilled graduates is leading to unemployment in the country.(2)

3. EMPLOYABILITY ISSUES IN ENGINEERING GRADUATES

Employability refers to possessing skills which are necessary to obtain and sustain employment. Employability necessitates that a candidate possess multiple skills and competencies to be a potential and productive worker to the organization An engineer graduating from an university is supposed to have acquired skills required to operate, run, design and develop products with minimal specific training and in short period and become productive.

The figure of unemployable engineering graduates in India pose an ambiguous number. Aspiring Minds employability survey 2019 on employability in IT, ITeS, sectors across India claim 80% of Engineering graduate are not employable. On a whole it is claimed that around 80% to 90% engineering graduates are not employable under various engineering streams. The quality of the engineering graduate also effects the pay package they are offered and most of the graduates are employed below their qualification. (3)

Aspiring Minds (2019) found that a meagre of 2.5% engineering graduates have the skills to work on artificial intelligence required by industry, merely 1.5% - 4.5% of graduates possess required skills in data engineering, and 2.8% - 5.3% are proficient to work on wireless technologies

Employability survey across India, conducted by National Association of Software and Services Companies (NASSCOM) and McKinsey in 2005, revealed that around 25% of Engineering graduates were employable in multinational company.

India has huge young population and about 36.6 million boys and girls had registered for higher education during 2017, of this 79.2% had enrolled for various under graduate stream. Of this 17.1% of the students had enrolled for Engineering & Technology education during this year. (AISHE, 2018) The main reason for the choice of Engineering & Technology education by the students is the availability of good job opportunity to the graduates.

Currently good job opportunity in multinational and major national companies and industries exist for students of all Tier –I & few Tier II institutes and dwindled during past few years for majority of the Tier III institutes. Under Digital India about 60 million to 65 million jobs are expected to be created by 2025. However engineering graduates are required to be trained to take up the challenges of changing technology

A vital objective of every employed graduate is to sustain the employment so obtained, which needs certain job specific skills. Tier –I & few Tier II prepare the graduate to be Industry-ready and job-ready making them highly acceptable by employers. (NASSCOM, 2005, 2016)

The skill set required are grouped as soft skill and hard or domain specific skill. The basic skill sets necessary may be generalised as communication skills, interpersonal skills, integrity, right attitude, problem solving, decision making and team building skills. Other traits expected by employers is loyalty, high morale, head team taking responsibility and leading it to designed target successfully. Hence unavailability of such skill and competencies makes a candidate unemployable. Domian or professional skills require analytical logical reasoning, problem solving and interpretive skill. (Chavez et al., 2007)

Some common skill gap as recognized by employers in new engineering graduates are reliability, self-motivation and willingness to learn (under core employability), and problem solving, creativity and the use of modern tools (under professional skills) (Blom and Saeki (2011)

4. REASONS FOR UNEMPLOYABILITY:

4.1 *Quality and Quantity of teachers*: The success of an education institute totally depends on the quality of the teacher. **Teacher is an indispensable component in preparing successful engineers.** The main drawback of the teaching profession is that the candidate is directly inducted into teaching after possessing requisite qualification and should start teaching process immediately. **No mechanism of training exist to judge his competency as a teacher and to teach particular subject.** He starts giving lecture to students with the bookish knowledge he was taught and he is expected to produce good results. Insufficient **experience** and **exposure** results in poor knowledge transfer. (**Jainab Zareena & Yasmeen Haider, 2013),**)

It is observed that although the medium of instruction is English the curriculum is taught in the mother language of the particular region. This encourages the students to use local language as a means of communication within and outside the classroom. Hence the students are deprived of the advantage of learning to speak in English automatically which is serious set back to his communication skill. This will be a great disadvantage in the communication skill when they are required face the interview.

The fast growing industries and global competition has put great responsibility on the hiring process and the employers wish to hire graduate who have attitude towards work culture and will be productive. This necessitates an outcome based education to prepare students to cater to the industrial requirement. In this context NBA, has defined 11 outcome of the curriculum to be taught at universities. The engineering teacher is to be moulded into out based system of education through training and frequent interactions (Srinivas Pai. et.al, 2019)

Another serious drawback of the teaching profession, especially in the privately managed institutes is the scope for the teacher to indulge in Research and development activity. R&D activity are crucial in the career development of the teacher and also the students. Negligible or poor R&D reflects the inability or rigidity of the teacher to gain knowledge of the latest development in his field. Thus students are deprived of the knowledge and skill regarding the latest technological developments in the area.

In some cases due to over burdening of workload, insufficient and erroneous practical instrument/equipment, loaf ck good Training and Placement officer etc are other factors leading to production of unskilled engineers

4.2 *University Curriculum*: The industry constantly trains its worker to update their working skills to suit the changing technology. Hence constant upgardation of working knowledge and skills are necessary to survive in the industry.

A serious lacuna in the engineering education especially in the university affiliated colleges is the rigidity of the syllabus and the curriculum. The pattern of examination is prepared to suit the curriculum so designed. In majority case the syllabus is not industry oriented. The syllabus is kept unchanged for a certain period of time and no addition or deletion from the existing syllabus can be made during this period. About 60% of the syllabus is theoretical and do not include any industrial applications, nor industry applications are taught in class. Thus huge gap exist in the professional skills learnt and that required by industry.

4.3 *Uncontrolled growth of Engineering college:*

In view of meeting the human resource demand of growing industry sector, sanction was accorded large number of Engineering &Polytechnics. During 1980-2000, the intake capacity also grew drastically. However the quality of education disseminated in few Tier II & majority of TierIII was so dismal that students graduating from these colleges were unable to get any sort of employment. Many of the graduates were satisfied with employment which fetched them less salary.

Gradually admission to such institutions dwindled and many of them went into financial crisis. Such situations necessitated the authorities to run the college with minimum faculty which destroyed the academic capabilities of the college. With recurrence of this cycle the admissions to these colleges becomes so less that the authorities approach AICTE for closure. Reports by AICTE reveal that around 200 Engineering colleges have opted for closure. The employability of students in such colleges is low and they are the major contributors to growing unemployment of the country.(3)

4.4 *Students have little industry exposure:* University engineering education pays more emphasis on theoretical aspects of Engineering. However an engineering graduate learns more by seeing and doing. In this context practical and industrial exposure makes learning more easy and enjoyable. Aspiring Mind reports that around 60% of faculty do not discuss the industrial application of theory they teach. Another disturbing factor is the lack of interest in students regarding co curricular activities.

53% students are reported to often skip the industrial expert/ guest lecture, and also do not attend any seminar/ conference during their student tenure nor participate in co curricular activities like project and other competitions, employability development programme. Majority such students are thus out of the employability development mechanism and face unemployment for quite long time.

5. SKILL NEEDS FOR EMPLOYABILITY

The choice of engineering education was primarily based on the premise that mere graduating would fetch an employment. This was true until the supply was very less compared to the demand and specialized skills were not a prerequisite. Technological development, rising supply of graduates and industrial demand for technically skilled workforce led to stringent selection norms. This included introduction of pre interview tests which included logical reasoning and quantity aptitude test, group discussion, & personal interviews.

The employers prefer mutli skills in an employee to meet their requirement. This gave rise to the concept of skilled technical workforce who is “Job ready” & “Industry ready”. The graduating student was thus required to possess sufficient skill to become productive to the employer within a minimum period of time and minimum job specific training. (Andreas Blom and Hiroshi Saeiki , 2011)

The skill requirement vary by profession. Educators, Training & Placement officer, and students should be aware of the specific skill requirement which the particular profession needs. It thus becomes the role of educators to provide necessary counselling regarding the skill set required by the student. The educators, training and placement officer should thus work on the following aspects,

1. Assess student employability status and his preparedness for placement activity
2. Identify programme specific skill requirement which employer consider most important ()
3. Analysis of Satisfaction level of employer during subsequent years
4. Skill gap of individual or important skills that the student is falling short, so as to impart customized training.
5. Suitable counselling on the appropriate employment avenue and skill training required

The skill set essential under different stream of engineering have been surveyed by various agencies and researchers. Some of the agencies like Aspiring Minds, NASSCOM, AISHE, etc have done elaborate work in providing necessary inputs for developing course specific skill set.

The employer satisfaction survey conducted by FICCI and World Bank provided the required in putto the educators across India. Sample survey of 157 employer across India was conducted during September to November, 2009. The respondent were required to reply to a questionnaire regarding expected learning outcomes as designed by NBA, employers overall satisfaction level of the employed graduates, significance and satisfaction of 26 different skills, Ten out of the 11 NBA Program outcomes were included in the questionnaire.

Based on the survey the required skill set was grouped as,

5.1. ***Core Employability Skills***: These skill represent the generic attitudinal and affective skill, such as reliability and team-work**, i**ntegrity, self-discipline, reliability, self-motivation, Entrepreneurship skills, teamwork, understanding and taking directions for work & assignments, eagerness to learn, flexibility, empathy.

5.2. ***Professional Skills:*** These skills are representative of cognitive skills associated to the

Engineering professions. These are key skill associated with higher order thinking skills and is key is obtaining and sustaining employment. This include identifying, formulating, and solving technical/engineering problems, Designing a system component or process to meet desired needs, appropriate use of modern tools, equipment, & technologies, applying knowledge of mathematics, science, engineering, customer service skills, knowledge of contemporary issues, creativity.

5.3. ***Communication Skills:***

These are considered as lower order skills and include written communication, design & conduct experiments, analyze and interpret data, reading, communication in English, technical skills, verbal communication.(Andreas Blom and Hiroshi Saeiki (2011)

The result of this survey highlighted the existing skill gap and provided the important new insight into which of the specific skills are important for employers and where the graduates currently fall short. Several other significant outcomes of the study are;

1. Role of Individual& Educator:

a. Soft skill basically depends on the individual family & educational background, individual interest in personality & self development.

b. Ignorance& lack of interest in soft skill during Matriculation and Higher Secondary Education

c, Lack of support by the school and college authority to develop soft skill in students.

2. ***Dissatisfaction with the quality of graduates:***

Around 64% of employers were barely satisfied about the quality of the engineering graduates. This supports the employability status study reports of the country as published by various agencies and the need to upgrade the skill set to improve the quality of engineering graduates

3*.* ***Role of University:***

Stringent measures to inculcate domain specific skill set acquisition through industry friendly curriculum. Teaching -Learning to be upgraded by giving more impetus to problem based learning, project based learning, opportunities to enhance communication & other soft skill

4. ***Poor higher-order thinking skills (analyzing, evaluating and creating):***

Majority of the university syllabus put emphasis on theoretical aspect of a subject and hence develop their theoretical understanding of the subject. However when faced with real life situation involving problem solving, analysis and interpretation they fail to produce results. Such skill known as the higher-order thinking skills are the requisite of the industry.

Student entering the engineering college are educated from elementary to higher secondary which promotes lower order of thinking (memorizing and understanding) system. Hence such students are likely to under perform when exposed to higher-order thinking situation. The satisfaction level of employers concerning such students was found to be *Some what satisfied*.

6. ***Student employability Development programme:***

In the current context majority of engineering graduates needs to be provided with skill development trainings. The type and extent of training depends on the skill gap existing with the student. Student development plans may be designed suitably as below

1. Engineering students to be eligible for placement activity should have a good academic background. In

this context the role of teacher becomes important. The teachers are thus required to upgrade their quality through R&D works, industry inter action, seminar /conference. The teacher should be able prepare the student to be Job –ready.

2. Institution should develop strong industry institution relation to have frequent interaction on trends in technology development.

3. Internship to be made a part of curriculum at all universities and develop tools for employability assessment of students by third party. Encourage more industry based projects.

4. Employability assessment and training programme to begun from first year of the entry of the students into engineering course.

6. Conclusion

India has huge technical talent pool, who are recognized across the globe. Majority of the engineering students from Tier II colleges & most of the Tier III are unemployable, which can be attributed to their low of employability skill. Although some of these students have reasonably good academic record, and possess low order thinking skills they are found to lag seriously in soft and hard skills required to obtain and sustain employment. All such students are observed to fail utterly when exposed to higher order thinking situation, making them unsuitable for higher package employment. Many of the students work at pay package below par toil throughout their career to get reasonably good salary. Such situations have led to fall in student's enrolment to technical institutes and closure of some technical institutes.

Employability skill surveys revealed skill gap is not restricted to particular region of the country, and particular industrial sector but existed across the country and industrial sectors.

Technical Education should be directed towards imparting higher order thinking capabilities through and simultaneously taking care of lower order thinking skills. Industry friendly syllabus, mandatory internship, frequent industrial interaction, problem and project based learning should form major part of curriculum. It can be concluded that if these measures are not taken on priority basis engineering education will lose its sheen and students preferences will be limited to Tier I &Tier II colleges & most of the Tier III colleges may face closure.

References

1. All India Survey on Higher Education 2017-18, Government of India ministry of Human Resource Development Department of Higher Education.

2. All India Council for Technical Education Approval Process Handbook (2018–19)

3. All India Survey on Higher Education 2017-18 Government of India, Ministry of Human Resource Development Department of Higher Education

4. Analysis of Talent Demand and Supply –IT BPM Industry, 2016, NASSCOM, New Delhi

5. Andreas Blom and Hiroshi Saeiki (2011), "Employability and Skills of Newly Graduated Engineers in India", Policy Research Working Paper 5640,, pp 1-33

6. Bhattacharjea, S., Wadhwa, W. and Banerji, R. (2011) Inside primary schools: A study of teaching and learning in rural India. Mumbai: Pratham Mumbai Education Initiative

7. Blom and Saeki (2011) list the following skill gaps that employers identified in new engineering graduates: reliability, self-motivation and willingness to learn (under core employability), and problem solving, creativity and the use of modern tools (under professional skills).

8. Chavez et al., (2017) "Employability of Engineering Graduates from 2013 to 2015 as Basis for a Proposed Student Development Program" Asia Pacific Journal of Multidisciplinary Research, 5(1),pp:155-166

9. Jainab Zareena & Yasmeen Haider (2013), "Self Perceived Attributes for Employment: A Study on Engineering Graduates", IJHRMR, 3 (4), pp: 29-32

10. Mohd Fairus Awang et al (2012). "Analysis of Employability for Bachelor Graduates of Faculty Engineering and Built Environment for Year 2011, Procedia - Social and Behavioral Sciences 60, pp:150 – 156

11. NASSCOM and McKinsey, 2005. NASSCOM and McKinsey Report 2005: Extending
India's Leadership of the Global IT and BPO Industries, NASSCOM and McKinsey, New Delhi, India

12. Rangan Banerjee & Vinayak P. Muley (2007) "Engineering Education In India", Draft Final report, September 14, 2007, Observer Research Foundation,pp1-134

13. Ramanan et al (2015), "Approach Towards Reducing Soft Skill Gap of Engineering Graduates In India From Employers' Perspective To Employability" International Journal of Engineering Research, .3(6), pp:504-511

14. Renu Gupta (2018) Skilling India: The Role of Pedagogy in Developing Life Skills Working Paper No. : WP 115 Skilling India,pp:1-22

15. Sinha, S., Banerji, R. and Wadhwa, W. (2016). Teacher Performance in Bihar, India: Implications for Education. Directions in Development. Washington, DC: World Bank.

16. Srinivas Pai. P, Subrahmanya Bhat K, Shrinivasa Rao. B. R. Niranjan N. Chiplulkar (2019) "The Need for a Structured Approach to Teach Engineering – Some Preliminary Thoughts", 32(3),pp: 19-26

Use of Existing Primary School Infrastructure of for the Skill Development of India

Leonardo Souza[1], Purnanand Savoikar [2]

[1]Research Scholar, Department of Civil Engineering, Goa Engineering College, Farmagudi Goa – 403 401,
[2]Professor, Department of Civil Engineering, Goa Engineering College, Farmagudi Goa – 403 401
[1]lrdcs@rediffmail.com
[2]psavoikar@gmail.com
Track No: 5
Track Name: Skill and Enterprenuership

Abstract: Development of skills is closely linked to the existing and proposed infrastructure. The importance of infrastructure for sustained economic development is well recognized. High operational costs arising from unproductive and inadequate infrastructure can prevent the economy from realising its full growth potential regardless of the advancement on other fronts. Infrastructure development in India has a momentous positive involvement toward growth. In the past many years the government has stressed on skill development. Infrastructure of transportation, power and communication through its backward and forward linkages facilitates growth. This needs a vast skilled talent pool. From a policy perspective, there should be greater emphasis on utility of existing infrastructure for skill development to sustain the high economic growth of the Indian economy. There are a large number of primary schools that exist in India especially today. These can be effectively used for skill training centres in Skill India Mission.

Keywords: India, infrastructure for skill development, investment, output growth, Primary Schools for Skill Development

1. Introduction

Development of skills is closely linked to the existing and proposed infrastructure. The importance of infrastructure for sustained economic development is well recognized. High operational costs arising from unproductive and inadequate infrastructure can prevent the economy from realising its full growth potential regardless of the advancement on other fronts. More importantly, we find that infrastructure development in India has a momentous positive involvement toward growth than both private and public investments. Physical infrastructure covering transportation, power and communication through its backward and forward linkages facilitates growth. Social infrastructure including water supply, sanitation, sewage disposal, education and health, which are in the nature of primary services and has a direct impact on the quality of life. Educational infrastructure is the least talked about subject. However it is of primary importance in the skill development needed for the economic development of the nation. The performance of infrastructure is largely a reflection of the performance of the economy. Infrastructure industries are measured by six key infrastructure and core industries (i.e., electricity, crude oil, petroleum refinery products, coal, steel and cement) on the basis of the different parameters such as trends in growth of physical output in infrastructure sectors, telecommunications, power, ports, railways, civil aviation, and post. In the present paper we investigate the utility of existing infrastructure in India to provide the necessary skills for the economic growth. In this context, we study the possibility of the role of institute industry interaction and primary educational infrastructure facilities already existing to better the skills of people in India. There is unidirectional relationship from infrastructure development to output growth. From a policy perspective, there should be greater emphasis on infrastructure utility for skill development to sustain the high economic growth which the Indian economy has been experiencing for the last few years.

2. Development and Skill Training

Equipping the workforce with adequate skills required for the today's and tomorrow's jobs is a strategic concern in the levels of national growth and development that all nations desire. Today's trends in globalization are accelerating the diffusion of technology and the swiftness of innovation. Daily new occupations are emerging and replacing others. Within each profession, required skills and competencies are developing and surfacing rapidly. Simultaneously the knowledge content of production processes and services is rising.

To keep training relevant, institutional and financial arrangements must build solid bridges between the world of learning and the world of work. Bringing together business and labour, government and training providers, at the local, industry and national levels, is an effective means of securing the relevance of training to the changing needs of enterprises and labour markets. We need to build solid bridges between the world of work and training providers in order to match skills provision to the needs of enterprises. Sustained dialogue between employers and trainers, coordination across government institutions, is very necessary. This is often done best at the district level where the direct participation of employers and workers together with government and training providers can ensure the relevance of training. Continuous workplace training and lifelong learning enables workers and enterprises to adjust to an increasingly rapid pace of change thus anticipating and building competencies for future needs.

It is vitally important to ensure broad access to training opportunities, for women and men, and predominantly for those groups facing greater difficulties, in particular youth, lower skilled workers, workers with disabilities, rural communities. The training strategy for strong, sustainable and balanced growth must address strategic issues as well as practical arrangements. It should provide a platform for further exchange of ideas and experiences among a wide range of institutions, enterprises, experts from all over the country. Ultimately, each country's prosperity depends on how many of its people are gainfully employed and how productive they are, which in turn rests on the skills they have and how effectively those skills are used. Labour market information, employment services and performance reviews are steps to an early identification of skill needs. Skills are a foundation of decent work (ILO, 2010).

3. Skill India Initiatives

India's rise in recent years is a most prominent development in the world economy. India has re-emerged as one of the fastest growing economies in the world. India's growth, particularly in manufacturing and services, has boosted the sentiments, both within country and abroad. The provision of quality and efficient infrastructure services is essential to realize the full potential of the growth impulses surging through the economy. India, while stepping up public investment in infrastructure, has been actively engaged in involving private sector to meet the growing demand (De, 2008).

A. Skill India Mission

For the first time since India's independence, Ministry for Skill Development & Entrepreneurship (MSDE) has been formed to focus on enhancing employability of the youth of the nation, through skill development. Skill India is an initiative of the Government of India. It was launched by the Prime Minister on 15thJuly 2015 with an aim to train over 40 crore people in India in different skills by 2022. The initiatives include National Skill Development Mission, National Policy for Skill Development & Entrepreneurship 2015, Pradhan Mantri Kaushal Vikas Yojana (PMKVY) scheme and the Skill Loan scheme

B. Vision

This mission was created with a vision to create an ecosystem of empowerment by Skilling on a large Scale at Speed with high Standards and to promote a culture of innovation based entrepreneurship which can generate wealth and employment so as to ensure Sustainable livelihoods for all citizens in the country. The core objective of the entrepreneurship framework is to coordinate and strengthen factors essential for growth of entrepreneurship across the country (GoI, 2015).

C. Key thrusts of Skill India Mission

Common Norms for skill development schemes across India notified to ensure standardisation across all existing programs for skill development. The key areas of the mission are given below (GoI, 2017).

- Curriculum for 251 job roles and Content for 100 courses finalized
- Industry Validation of standards
- 40 Sector Skill Councils formed
- 4500 + National Occupation Standards and 1661 Qualification Packs
- Aimed at promoting excellence in Vocational Training
- Provide a benchmark for comparison amongst various institutes and trades
- Differentiating factor, increased market competition and quality improvement in institutions
- ISO 29990 certification of ITIs for International quality standards, recognition of trainees and certification at international level
- Revamp of Curriculum to include:
- Workplace skill
- Industry internship
- Empanelment of industries for conducting 3 weeks in-plant training for trainee instructors
- National Body to certify skills across India being set up as part of skills eco-system
- Will standardise and improve assessments across the country
- AICTE has permitted to run ITI courses in 500 polytechnics across the country
- Long Term skill development courses (ITIs) being provided with academic equivalence with
- formal education, through bridge courses
- Efforts on for using sparable infrastructure of engineering colleges
- Incentives being provided under Common Norms for training in Special Areas
- Women participation more than 40%

D. Impact Assessment

For the purpose of undertaking impact assessment, annual as well as five year targets will be set for each stakeholder by the (policy implementation Units) PIU. Impact assessment will be undertaken to ensure that the targets are met well within the time frame. The stakeholders will also be subject to a quarterly review. With the help of the PIU, it will be easier to monitor the implementation of the policy initiatives and take corrective measures in case of non-compliance. A mid-term review of the policy will be undertaken based on impact assessment by a third party. The policy can be considered for review after five years, based on learning's from implementation of the policy (GoI, 2015).

4. The Talent pool of India

To maintain the current development India needs to have a skilled workforce of 500 million by 2022. About 12 million persons join the workforce every year. This talent pool needs to be adequately skilled. The following sectors drive the growth of the economy as well as play a significant role in employment (ICRE, 2010):

1. Auto and Auto Components
2. Building and Construction Materials
3. Building and Construction
4. Real Estate Services
5. Electronics and IT Hardware
6. Education and Skill Development Services
7. Food Processing
8. Gems and Jewellery
9. Healthcare
10. Textiles
11. Leather and Leather Goods
12. Organised Retail
13. Tourism and Hospitality
14. Transportation and Logistics
15. Media and Entertainment
16. BFSI
17. Chemicals and Pharmaceuticals
18. Furniture and Furnishings
19. IT
20. ITES.

While the enrolment in school education sector is about 227 million, about 15.3 million combined enrol in higher education and vocational training. The technically and vocationally qualified and skilled workforce, primarily comprising of ITI/ITC (1 million), BE (1.7 million), Polytechnics (0.7 million) give us a current workpool of skilled talent is around 3.4 million. It can be thus estimated that the required capacity for training the new workforce would be about 15 million annually (ICRA, 2010).

5. Institute-Institute-Industry-Interrelationship

There needs to be an Institute-Institute-Industry-Interrelationship for the full impact of skill development to take place. Higher institutes can share knowledge phase-wise to lower institutes and/or participants directly. Industry can send workmen for compulsory/voluntary training to lower /higher level institutes as per requirements.

A. Interrelationship not Interaction

Interrelationship signifies a permanent bond while interaction is a more transient one. The relationships between institutes of higher and lower learning and industry vis-à-vis skill education must be well defined yet amenable to minor modifications, without elaborate red-tape. Flexibility is the main pivot of the mechanism of skill education.

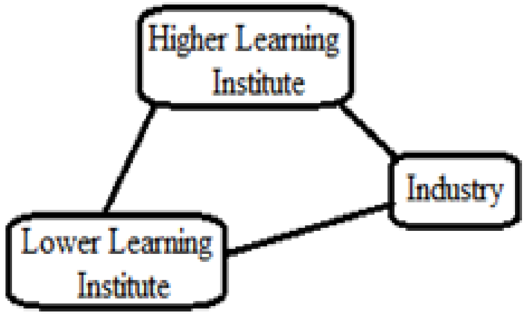


Fig 1. Institute-Institute-Industry-Interrelationship

All this needs Government intervention for the simple reason that in India nothing is achieved unless there is a stimulus from the government that then translates into a concrete movement towards development. For this the government has to think out of the box. Today training is restricted by the funding from government and governmental agencies directly and indirectly. There is an absurd interference from the finance and revenue departments that want to rationalize everything in terms of cash for services variables that play marginal role in training. There is no gain without pain in this scenario. The insistence of a minimum number of participants to justify employing a trainer does not work in this case. The Government must be ready to train even as less as two participants per batch to get the movement going. Only then will the skill training initiative succeed

B. Industrial infrastructure in India

The most distinctive part of India's physical infrastructure development in recent years is the development of road network across the region. All parts of India are linked by good roads. The road network consists of Expressways, National Highways, State Highways, Major District Roads, Other District Roads and Village Roads. Ports have always played a crucial role in India's development. The annual aggregate cargo handling capacity of major ports has increased and there was an impressive growth per annum in container traffic during the past years. Indian airports provide international standard aeronautical services to domestic and foreign travellers in addition to handling Cargo. Policy initiatives have had a marked positive impact upon airline traffic. Air traffic has grown up substantially. Indian Railways which has world's second largest rail network in the world. It has been a major contributor to the development of the India's industrial and economic landscape since independence. Of the two main segments of the Indian Railways, freight and passenger, the freight segment accounts for roughly two-thirds of traffic. Urban infrastructure consisting of drinking water, sanitation, sewage systems, electricity, and gas distribution, urban transport, primary health services and environmental regulation has contributed to the development profile of India. To promote small and medium scale industries there are Industrial Estates, Industrial Parks and Special Industrial Zones strewn across the length and breadth of India

Table 1 List of Infrastructure found in India

No	Infrastructure
1	Electricity
2	Roads and bridges
3	Railways
4	Ports
5	Airports
6	Telecom
7	Irrigation
8	Water and sanitation
9	Storage
10	Gas
11	Industrial Estates, Corridors and Parks
12	Special Economic Zones

C. Training Infrastructure in India

There are already exiting a number of engineering Colleges, Government technical schools, Industrial Training Institutes (skill development centres), and polytechnics in India. Besides this there are many other institutes that can be used for other non-technical skill development

Table 2 Current Education and Skill Development Capacity in India (ICRA 2010)

Category	Sub-Category	No.
School Education	Pre-Primary Schools	67,157
	Primary Schools	7,72,568
	Middle Schools	2,88,493
	High and Higher Secondary	1,59,708
Vocational Training	Government ITI	2,076
	Private ITI	5,529
College Education	Central University	20
	State University	216
	Deemed University	101
	Institutions of National Importance	13
	Research Institutions	140
	Arts, Science & Commerce Colleges	11,698
Technical and Professional Education	Engg., Tech., & Arch., Colleges	1,562
	Medical Colleges (Allo/ Ayur/ Homeo/ Unani/ Nurs./ Pharm., etc.)	2,053
	Teacher Training Colleges	1,669
	Polytechnics	1,274
	Others (Includes Law, Management, MCA/IT, Agriculture etc.)	2,513

D. Modalities for Skill Training Interface

There are a number of professional courses available for imparting professional education but they all fall short of industry expectations for various reasons. As there is an acute need for pretrained and pre skilled workers by the industry in India there is a need to work out the proper modalities for providing skill training. A proper interface with proper infrastructure and proper expertise is required.

6. Primary schools as Skill development hubs

As India aims to be the largest economy in the world there is a need to upgrade the rural as well as urban skill pool. There is need to have a good infrastructure with minimum costs and maximum outreach. Primary school infrastructure is the answer to this.

A. Primary School Infrastructure in India

The primary schools are the most widespread infrastructure available to the Government it is an ideal place to conduct the process of skill training. They are usually idle for the latter half of the day and especially in the evening. This can be adventitiously be used by industry and even village panchayats to train workmen and unemployed youth with necessary skills. They are already well known in the locality accessible and have minimum basic facilities. They can be easily upgraded with minimum costs for skill training.

B. Training for Rural development

There is urgent need for trained medical health (Basic nursing and para-medic), Ayurvedic, beautician/stylist, tailors, repair and service (mechanics, repairmen), and various such employment and self employment oriented skills in the vast rural outreach in India. This will help uplift the rural skill pool and provide automatic upgradation of rural infrastructure and increase Gross Domestic Product substantially. A group of villages in a zilla canshare schools each providing an individual skill training to the others (e.g. one village can train motor mechanics, one village can train beauticians, one can train health assistants etc for others in the group). This will greatly help to advance the pace of rural development. Training can be area specific to suit the industry of the region. Retired industry professionals who reside in the villages can be invited as skill trainers.

C. Training for Civil and Construction Industry

In the Construction industry for example, the skilled and semi-skilled but untrained labourers (Masons. Painters, tile-fitters, carpenters, plumbers, house-electricians...) can be sent for basic training to these schools so they know the technical background and knowhow and proper tools to use. This will make them more efficient and reduce errors and wastages that can be recovered as savings by the companies employing them.

7. Conclusion

The issue of skill development in India is significant both at the supply and demand level. This is because the country presently faces the twin challenges of non-employability of large sections of the presently educated workforce that possess little or no job skills as well as severe paucity of highly-trained, quality labour,. The skill development ecosystem in India is distorted and skewed. It is based on an outdated formal education system which has little or no vocational training. The vocational training is both qualitatively and quantitatively in a rather dismal state. The higher education system is desperately trying to cope up with issues related to quantity versus quality.

Given the current state of affairs in the educational system and the future requirements caused by rapidly emerging technologies, the challenges related to skill development in India are enormous.

The government of India has listed skill development as one of its priorities and started the Skill India initiative. It aims to enhance participation of youth, seek greater inclusion of women, disabled and other disadvantaged sections into the workforce, and improve the capability of the present system, making it flexible to adapt to technological changes and demands emanating from the labour market.

By making use of present infrastructure and proper institute-institute-industry-interrelationship we can speed up and widen the outreach of the Skill India Mission to maximize its applicability.

References

De P. (2008),International Infrastructure Development in East Asia – Towards Balanced Regional Development and Integration, ERIA Research Project Report 007-2, Chiba: IDE-JETRO, pp.105-130..

Government of India, (2015) National Policy for Skill Development and Entrepreneurship Ministry of Skill Development and Entrepreneurship,

Government of India, (2016) Skilling India Transforming India, National Skill Development-Brochure/Size, Ministry of Skill Development and Entrepreneurship, 30.05.16

Government of India, (2017), Economic Survey of India, 30-09-2013, Directorate of Planning, Statistics and Evaluation,

ICRA Management Consulting Services Limited (2010) The Skill Development Landscape In India And Implementing Quality Skills Training, FICCI

International Labor Office (2010), G20 Training Strategy A Skilled Workforce, for Strong, Sustainable, and Balanced Growth International Labour Office, Geneva, November 2010, ISBN 978-92-2-124277-2

Promoting Entrepreneurial Traits through the Development of Skills

Sara T. Patel[1,] Manoj R. Sonawane[2]

[1,2]Applied Science and Engineering Department, SVKM's Institute of Technology,
Near Mumbai-Agra Highway, Dhule, Maharashtra, India 424001
sarapatel2000@gmail.com
manoj.sonawane@svkm.ac.in
Track No: 5
Track Name: Skill and Enterprenuership

Abstract: The technology startup sector is widening. The Global Entrepreneurship Monitor (GEM) has estimated that more than a million startups are created worldwide each year and that these contribute to the dynamic ~ $450 trillion ecosystem. In the developed countries, the digital sector has been growing more than three times the rate of the economy. There are two magnitudes of this. The first is an equalizing of the entrepreneurship field so that what comes out as smaller businesses can now compete unruly with larger rivals. The another magnitude, which in part develops from the first, is the arrival, within the past decade, of tech titans such as Facebook, Amazon, Apple, Netflix and Google referred universally as the FAANG's, whose economic and social power and influence is pervasive across the technologically advanced world. Moreover, research has shown that Science, Technology, Engineering and Mathematics (STEM) entrepreneurs in particular build some really pioneering fundamentals to create viable businesses.[1]This study orients to deliberate the ramification of entrepreneurship education and financial literacy on entrepreneurship skills. Study also applies the survey method with the workaday approach.

Keywords: Entrepreneurship, Skill development, Business, Knowledge, Employment, Female entrepreneurship.

Introduction: Entrepreneurship is a messy and complex process that is not linear. About 2% of populations should be entrepreneurs for a country to be prosperous. It means that out of~1.33 billion Indian population, 26.6 million should be entrepreneurs. But, currently there have been nearly 48 million businesses ranging from small cap to large cap (almost 3.6%) which is pretty good sensing the percentage increase but still can be considered as a negligible development because only a handful of entrepreneurs and their businesses can withstand the humongous market value. So, building a good entrepreneur is an issue in the developing India.[2]Artificial intelligence, cybernetics and high-tech infringements are transmuting the global economy. Inventiveness and independency are very imperative to an entrepreneur. There are two individualities of entrepreneur: as creator and as idealist. As a creator, entrepreneur creates an actually new business. As an innovator, entrepreneur initiates rectification in the terms of production, marketing, and management for the current business.[3]Through imagination, fearlessness, independency and adequate skills, the disaster in business can be curtailed. Regardless of failure, it will be able to analyse the factors triggering it, obstinate and get up immediately. The increased number of educated unemployed populations over years have ensued social problems such as poverty, thuggery, drug abuse, intolerance, trafficking, and many more.

The primary strategic business challenge that the businesses confront is the impact that unsettling change in economy is having on their businesses.[4] Second-most significant trial for these same companies is how they fascinate and absorb the most highly accomplished employees to meet these tasks. The effects of this global change are being felt across the country, predominantly by the youth, who are inflowing the work force at the precise time when enormous traditional jobs are becoming outdated, others are undergoing noteworthy change and new ones are being designed. How do we best prepare the youth for a future occupied with swift variation, experiments and breaks is the most valid question today. We assume the future opulence of our country and our youth is reliant on how we alter our performance today. Much has been written about the key skills needed to ensure we have the most fruitful work force possible. But one of the most important keystones of progression and wealth creation is creating a more tough culture of risk-taking. The youth, while often well educated, are missing the vibrant lessons of entrepreneurship and daring. Required methods of how to furnish the youth with entrepreneurial expertise and knowledge they so desperately need are studied and discussed.

Methodology:

The study helps to review the concept of entrepreneurial development and its several backgrounds. Most of research articles on entrepreneurship were accessed from Journal of Innovation and Entrepreneurship (JIaE), HBR, Forbes Reviews, and Google. Some research articles, books were accessed from different digital libraries. The audiences of research were people fascinated by a business venture, people already into some startup and people learning to be entrepreneurs. This study engaged a qualitative method with case study approach. The informers of the study were servicemen and women, corporate job people, retired people, startup CEO's, business analysts, consultants, parents, students and also the commoners. The data was collected straight from its source using observation, in-depth interview and digital documentation procedures. To validate the data, methodological triangulation was used. The data analysis was conducted using a communicating model with three components: data reduction, data display, conclusion drawing. Analysis was also directed along with the informants involved in data collection.

A. Development and expansion of skillsets:

'A person who sets up a business or businesses, taking on financial risks in the hope of profit'(the Merriam Webster Dictionary).An '*entrepreneur'* is an individual who creates and runs a business, bearing most of the risks and enjoying most of the rewards (Investopedia). The Organization for Economic Cooperation and Development (OECD) has identified three main groups of skills required by entrepreneurs:[5]

1. Technical-communication, environment monitoring, problem-solving, interpersonal organizational skills, technology implementation and use.
2. Business management planning and goal setting, decision making, human resources management, marketing, finance, accounting, customer relations, quality control, negotiation, business launch, growth management, compliance with regulations skills.
3. Personal entrepreneurial self-control and discipline, risk management, innovation, persistence, leadership, change management, network building, and strategic thinking.[6]

Entrepreneurship skills have several dimensions that can be studied comprehensively including financial skills, management skills, startup business skills, operational skills, marketing skills, communication and management information skills. Based on the opinions of experts we can conclude that the skills of entrepreneurship in educational institutions are fundamental because it will increase, competitiveness, the courage to take risks, and improve business profits are built in a creative and innovative.

Entrepreneurship education:

Entrepreneurship education has been defined as "a collection of formalized techniques that informs, trains and educates anyone interested in participating in socio-economic development through a project to promote entrepreneurship awareness, business creation or small business development." Enterprise education also called entrepreneurial education on the other hand, is usually conceived more broadly, seeking to foster self-esteem and confidence by drawing the individual's talents and creativity, while building the relevant skills and values that will assist students in expanding their perspectives on schooling and opportunities beyond.[7] Methodologies are based on the use of personal, behavioural, motivational, attitudinal and career planning activities.[8] The indicators of entrepreneurship education can be seen from entrepreneurship education programs cultivate the desire of students to entrepreneurship, entrepreneurship education makes students aware of the existence of business opportunities Also, entrepreneurship education enhances a sense of discipline in the learner in the long run of entrepreneurship.[9]

To measure the variables of entrepreneurship education based on indicators:

1. Entrepreneurship education program to cultivate entrepreneurship desire is when the entrepreneurial course has been perceived began to grow the desire to entrepreneurship.
2. Entrepreneurship education programs add knowledge and insight in the field of entrepreneurship is after entrepreneurship educations feel more knowledge in the field of entrepreneurship.[10]
3. Entrepreneurship education program awareness raises the existence of business opportunities is after entrepreneurship education makes aware of existing business opportunities.

Entrepreneurship education should include:

Increasing entrepreneurial potential through entrepreneurship programs in schools, implementing entrepreneurship education through entrepreneurial values, encourage successful entrepreneurs to share their knowledge and experience in entrepreneurship processes with entrepreneurship education students.[11]

Entrepreneurship education variables include dimensions: grow entrepreneurial desire, adding knowledge and insight in the field of entrepreneurship, grow awareness of business opportunities and can improve entrepreneurship skills. Being an entrepreneur and being a successful company carries such a high risk that entrepreneurs have the special skills to be successful.

B. Basic Skills:

Being an effective leader:

1. **Developing skills to be an effective leader- Suggestions:**
   Having a strategic vision, improved communication with fellows, spotting and retaining the best talent, leading by an example, asking for advice, preparing people to lead, knowing weaknesses and strengths before delegating, implement coaching, maintain transparency, rewarding people, strengthening network.
2. **Managing time more effectively:**
   Organizing your days to make sure you do the right things at the right time requires discipline, but the reward will be less stressful and better managed and more successful.
3. **Delegating more effectively- Suggestions:**
   Taking an objective at the workload, contribute where help needed, identify the talents in the organization, train, coach, empower, trust, sharing business strategies with employees, developing repeatable processes, focusing on results, follow up without micromanaging, encouraging direct reports to delegate.

Becoming a better communicator:

Improving communication skills, creating a communication plan, engaged listening, effective non-verbal communication, managing stress in the moment, asserting in a respectful way, improving internal communication in the organization.[2]

Improve networking:
Growing the network, improving networking skills, exchange stories, respond to other’s challenges, and use social media as an effective tool.

Appropriate management:
Identification of opportunities, vision and influence, efficient decision making, management of operations, finance and financial management, sales, backup plan, problem solving.[12]

C. Financial literacy:
Financial literacy helps individuals make more emphatic and competent decisions in the economic context of their lives. A combination of awareness, knowledge, skill, attitude, and behaviour required to make financial decisions and ultimately achieve individual financial well-being. Financial literacy is the ability to use knowledge and skills acquired to better management, to understand financial information and make effective decisions by using this information, the choice of numerous alternatives for establishing financial goals, making informed financial decisions, self-confidence in making financial decisions. It goes beyond the primary idea of financial education, where the influence of financial knowledge on behaviour is mediated by financial attitudes.[13]

Breaking down financial literacy:
Financial literacy is to be taught from the school days itself to ensure the complete learning of the students till they mature to take bold steps about personal finance such as investing, tax planning, insurance, paying for college, budgeting, real estate and retirement. Some financial aspects are crucial to be learnt and analysed for an expansive approach to financial literature: Learn the steps to financial planning and compounding interest,[14]managing debt, profitable savings techniques, understand the cash flow, ability to track spending, learning to analyse investments, understand and plan to achieve financial goals, learn to risk, hold and liquidate, analysing debt and ways to avoid it, understand the financial statements, credits, debits, taxations, mastering the art to procure financial records, recognize and analyse profit and loss statements, understanding assets and liabilities and multiplying assets, analysing the impact of taxations and inflation on investments, recognizing the power of corporation.
Studies have proven that the entrepreneurship education is directly proportional to the financial literacy. For students, financial education is important because the current formula of learning is only two elements: memories and money. Teachers guide the student's needs through evaluation guidelines, but the sites are not ready for successful training, often a new economic responsibility and reality. The study also showed that students were ‘weak pressured’ as compared to poorer degrees. The success of the student has no further education but limited to educational success. The future success of the students depends on their education, development, and strengthening their lives.

D. Digitalization for entrepreneurship:
An investment in a project that assembles and deploys specialized individuals and heterogeneous assets that are intricately related to advances in scientific and technological knowledge for the purpose of creating and capturing value for a firm.[15]As a significant social, economic and technological phenomenon, it can be reflected as the amalgamation of traditional entrepreneurship with the importance of influencing new digital technologies in new forms, such as social, mobile, analytical, cloud and cybernetic solutions. All for the advancing, changing the traditional way of creating and exploiting business things in the technological era.
The link between high-tech revolution and the formation of companies is one of the primogenital associations in the study of entrepreneurial organization. Technological opportunities with wider protection of intellectual property are more likely to be marketed through the creation of companies. Technological innovation funds in to higher levels of economic production and can offer innovative merchandises and amenities that transform human life and proficiencies.[16]The digital business, in relation to corporate technology, offers companies and individual’s new ways to link, cooperate, conduct trade and form associations between people. It influences the company functionalities and determines how the company is managed today. The market perception combined with modern technology offers only the traditional way of understanding the market or business that includes a digital dimension. The combination of knowledge and technology from the start serves to guide multi-functional teams of business leaders and technology engineers to meet consumer needs. Once these bases are established, as in any business, these consumer needs must be monitored and addressed throughout the life of the company. From a technological point of view, digital companies include one or more software platforms, which exploit the best technology available to meet the individual needs of the company.
The ultimate mast, which is a most important constituent of the digital business and its accomplishment is the platform that is provided or grabbed. These technologies allow companies to struggle to achieve their goals, establish their vision and achieve their goals. The use of technology in terms of innovation only serves companies to continuously improve their performance by accelerating activities, processes, skills and business models. This is the way of the future. The digital business is still in its infancy and has immense space for growth and progress.

How does this work?

1. **Technological consistency and efficiency:**
   As an entrepreneur, it is vital to realize that technology is a highly unpredictable concept. It is focused to change and therefore changes the way the market works. Its incompetence in keeping up with the latest technological advances can influence the future of the startup.

2. **Replacement of labour by technology:**
A labour-intensive workforce now belongs to the past and labour is expensive due to long hours of operation and high production costs. Unless you feel you are living in the era of the pre-industrial revolution, you opt for technologically innovative business ideas.[17]
3. **The inevitable digital creativity:**
As an entrepreneur, if unsuccessful to adapt to the latest digital revolution, the counterpart having higher techno-potential will take the startup out of the frame.
4. **Developing a social media as a consumer platform:**
Contrasting the pre-digital era in which consumers had discovered products through traditional old-school media, the modern consumer is an expert in technology and the internet. To guarantee and reach the reference base, it is imperious that it appears on digital displays on numerous social media boards.
5. Quick solutions to the digital mourns:
In the post-digital age, budding buyers are very cognizant of their buying options. They know precisely what they want and do not avoid dropping their allegiance to their brand for a product or service that is superior, more convenient and effortlessly available.[18]
6. Quick digital service:
The accelerated consumer of the new era is a little impatient and does not like to wait to his turn. If aimed to exploit the maximum potential of the reference market, digital innovation is an inevitable tool.
7. **The digital marketing strategy:**
Can be chalked out into: i) Attract more prospects: Focuses on gaining website traffic through virtual product marketing, email marketing, SEO, pay-per-click marketing (PPC) and social networks.

ii) Convert multiple leads: A website that will show you more traffic in an identifiable customer identifier. The making of irresistible offers of downloadable content, the development of opportunities treats e-mail, A / B tests and interesting videos.

iii) Close more sales: Consumer customers aren't good if they don't close.

8. Search Engine Optimization (SEO) as a long-term investment:
SEO is not a onetime task. Don't get involved once the website is launched and then ignore it. Google regularly announces updates and the website must be compatible based on these updates. Consumers use the internet to get information on almost everything. Making sure your business draws attention when it's needed is crucial. Therefore look at SEO with a long-term goal.[19]
The exceptional digital uprising has altered the significance and customs of entrepreneurship around the world. The evolving field of trade technology examination has not been able to speed up with the swift fluctuations in the digitization of the socio-economy.

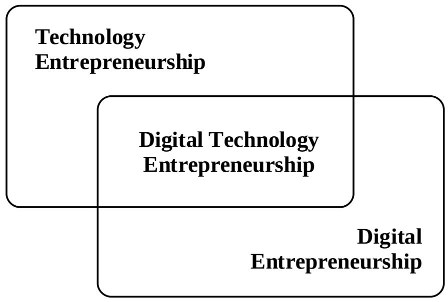


Fig 1. The result of combination entrepreneurship

E. Youth entrepreneurship:

Youth unemployment is acknowledged as one of the glitches that could grow in global magnitudes in the near-term years, which will cause socio-economic complications for humanities. Youth entrepreneurship is considered an alternative in addition to other methods to create job opportunities. However, worldwide recognition and long-term youth entrepreneurship is needed for this sector, which certainly has a promising future.

Manipulating factors for youth unemployment:

Socio cultural factors as inhibitors to entrepreneurship, economic and political factors, policy framework, industry support and patronage, education system and orientation, finance and business support.

The profit of encouraging youth for Entrepreneurship:

Many young people engage in entrepreneurship, young people often appear to go into business due to lack of a better job, few youth entrepreneurs possess basic business skills, youth entrepreneurship is less financially rewarding than wage employment.

The alleyways and hurdles to performance:

Education significantly boosts the youth entrepreneurial performance, age-old cultural dimensions obstruct the path to successful businesses, financial barriers as in personal savings and borrowings from family, friends, bank and going into debt, administrative and regulation requirements, the bankruptcy laws and their vulnerability to lead to a business pitfall, copyright, patent and trademark regulations consume the productivity time of a business, informality weakens youth business performance, constructive physical functioning environments elevate performance and a good infrastructural support, admission to finance and market incorporation presents chief challenges, profitable venture capitals and angel investors, an experienced mentoring.

Approach to empower youth entrepreneurship:

1. Creating an ambience of entrepreneurship awareness amongst the youth.
2. Providing finance counselling to budding youth entrepreneurs.
3. Link the design of youth entrepreneurship programs with impact evaluation results.

4. Equipping the youth with personal empowerment skills. 5. Reallocate resources away from ineffective programs.
6. Update the school curriculum with entrepreneurship education.
7. Modifying and enhancing the administrative system of the lacunas to ensure healthy formality completions.[20]
8. Policy formulation so as to ensure a smooth corporate expansion.
9. Develop an all-inclusive attitude and extensive vision in order to adopt local and worldwide significant series expansion.
10. Boost the youth spirit through the philanthropies and success endeavours of the renowned entrepreneurs.
11. Organize regional and international youth entrepreneurship summits to boost the collaboration and effective communication among youngsters.

Future research on young people and mentoring could focus on competitive motivations for starting a business and on the relationship between mentoring and 'temporarily fluid motivations'.

F. Nurturing entrepreneurship in schools:

Since traditional commercial education does not meet the changing needs of the environment, entrepreneurial education that improves attitudes and entrepreneurial skills has increased in university and post-university colleges. While traditional entrepreneurial education emphasizes the establishment and functioning of large companies, entrepreneurship programs emphasize creativity, imagination, proactivity and risk-taking that can respond to an uncertain environment.[21]Therefore, overall, although there is much rhetoric about the development of entrepreneurial attitudes and mentalities, there is no evidence of how they should be improved with precision. The published report has argued elsewhere that if the general goal of politics is to help young people deal with uncertainty and complexity and, indeed, enjoy it, the series of key components is not addressed in a transparent way, such as: feel the world of the entrepreneur's life, create a true empathy with the values of the entrepreneur, being able to see problems as opportunities, see the quest to 'make things happen' as a process of identifying related networks of people who need to be influenced, express intuitive judgments based on limited information, the constant practice of a series of business behaviours, have models of clear mind maps and reference frames on how to develop a company or organization through phases from the original idea to survival as mentioned by Gibbs in 1987 , interpret different environments of activity and the contingent need for business behaviour, have a clear frame of reference on how to evaluate an opportunity.[22]

From the body of learning research it is clear that the coherent structures of knowledge and meaning vary according to the individuals and are influenced by social and cultural factors. The ways in which things are done in a community, the values that influence the search for understanding and the nature of the activities involved, influence the learning potential. In the context of the world of corporate life, it can be argued that there is a need to base educational approaches on understanding the entrepreneurial ways of thinking, learning, doing and communicating.

How to exercise the effective Corporate Teaching:[23]

1. **Long cases: used for the practice:**
   Making personal decisions, solving innovative problems, understanding ways of doing things, making business decisions, practicing analysis and using reference frames and concepts.
2. **Short cases:**
   For previous preparation or for group work in the classroom: Used to support the key points of a class, to practice in reference structures, as a basis for the use of judgment in the decision-making process.
3. **Critical incidents:**
   It is used to stimulate free thinking and brainstorming collects an incident in an organization for discussion.
4. **Class questions:**
   They are used to explore existing ways of seeing things and testing experiential knowledge with a question.
5. **Anecdotes:**
   Used to link theory to practice: the art of good entrepreneurial education. Students challenged to develop anecdotes from the experience.
6. **Class notes:**
   Used to support the main points of the class.
7. **Games:**
   Used to develop teamwork, experience the pressure to make decisions with limited time or knowledge, introduce elements of competence, put into practice what has been learned, develop entrepreneurial skills.
8. **Drama:**
   Used to create empathy, create creativity, support personal trust and presentation skills, develop the role of managers or entrepreneurs as actors and encourage team development.
9. **Drawings:**
   Are used to stimulate the creative expression of a phenomenon, to generate trust when they project how the person sees things, generates feelings and emotions.
10. **Brainstorming:**
    Used to draw ideas, stimulate creativity, demonstrate the value of thinking 'off the wall' and create enthusiasm.
11. **Questions:**
    Used to test the participants' existing knowledge base and provide a basis for discussion.

12. **Personality and other evidence:**
    Used to stimulate personal interest in company concepts by allowing participants to define themselves, perhaps against customer groups.

13. **Consulting:**
It is used to practice frameworks of knowledge, support the internalization of learning, develop interpersonal communication, presentation and communication skills and create empathy with groups of real clients.
14. **Projects:**
Use similar to consulting but often for the purposes of academic evaluation. Used to develop planning, analysis, relationships and skills.
15. **Debates:**
Used to develop interpersonal skills, develop the security of public speaking and demonstrate the value of humour and anecdote to express a point, create fun in the classroom and group harmony and develop the ability to think in your feet.
16. **Newspaper cuttings:**
Used to show the relevance of the teaching to current issues or to create a "critical incident" for the debate.
17. **Presentations/Teaching:**
It is used to develop understanding in the use of knowledge, to develop personal skills, confidence, imagination, use of metaphor and the use of technologies in presentation.
18. **Simulations and role-playing games:**
It is used to create empathy and internalization of knowledge, the acquisition of knowledge of relationships, the development of the ability to act in different situations.
19. **Icebreaker:**
Used to warm up a group to encourage mobility, social interaction and presentations.
20. **Shading:**
It is used to get a real view of how others behave. It can be used as an exercise to classify behaviours.
21. **Networking exercises:**
Used to allow students to see how all planned events and results can be seen as the result of knowing who'.
22. **Practice instinctive decision-making:**
Used to encourage students to build simple reference structures for decision-making, simulating an entrepreneur's experiential approach.

Findings:

Basic financial literacy:[24] The basic financial literacy index consists of questions aimed to measure the practical knowledge of the financial aspects of entrepreneurship. Total 60 of the participants of varied age groups were included in the survey. The questions related to numerical evaluation were answered correctly by 40.6% of the participants. The answers to inflation were correctly given by 43.8% people.**The time value of money was recognized correctly by 39.63% of the** people**. The questions relating to compounding and** interest calculations were guessed correctly by 34.92% people and the questions about money-illusion were answered accurately by 22.5% of participants (Table 1).

Table 1: Financial literacy index.

Basic financial literacy	Numerical evaluation (%)	Inflation (%)	Time value of money (%)	Interest compounding (%)	Money illusion (%)
True	40.6	43.8	93.6	34.9	22.5
False	21.2	30.8	18	20.1	47.1
Don't Know	38.2	25.4	42.4	45	30.4
Total	100	100	100	100	100

Basic entrepreneurship outlook:[25]

Questions in the basic entrepreneurship outlook index have a completely different structure than the basic financial literacy index. The aim of the questions in this index is to measure the basic corporate literacy levels of individuals in relation to starting a business venture. The questions explore the extent of the homework of the business, its assets, the assurance of its success and also the prediction of the risks and solutions to them by the individuals.

The pattern of the replies to the basic entrepreneurship outlook index was highly diverse from that of the basic financial literacy level index. Only about 38.9% of the participants were clear about their vision to begin a startup. 37% just focused on earning profits from the business rather than making money by initiating a change. 35.2% of them planned to modify an idea and then launch it in a market. There was less enthusiasm for innovative launches. The risk taking ability was surprisingly found to be adequate for a successful launch (42.6%). The participants preferred mentorship over self-learning before and after the launch of their services (90.8%). The majority startup or to be startup owners did not chalk out the proper financial management strategies (37%) and only 31% did so. Almost 35.2% of the participants did not conduct a market survey before strategizing the policies for a largely selling product. 80% of the people were aware of the funding for their venture. 53.7% of the answerers knew how to maintain the cash-profit balance (Table 2).

Table 2: Entrepreneurship sampling questionary with obtained results.

Basic entrepreneurship outlook	Yes (%)	No (%)	Don't Know (%)
Do you have your motives to become an entrepreneur?	**38.9**	**46.3**	**14.8**
Are you comfortable with failures?	**79.6**	**16.7**	**3.7**
Will any of your responsibilities be disturbed by starting your dream business?	**31.5**	**29.6**	**38.9**
Are you looking for a problem to solve through your business?	**27.8**	**37**	**35.2**
Are you personally facing any problem currently about the	**48.1**	**50**	**19**

service that you plan to provide?			
Is the service you plan to provide or the product already in the market?	**35.2**	**29.6**	**35.2**
Is there an enough opportunity for you to take risks?	**42.6**	**7.4**	**50**
Is the risk of try and error method for your product good for you?	**44.4**	**14.8**	**40.7**
Have you given a reason why should they buy your product?	**40**	**20**	**20**
Have you decided about who is going to buy your product or service?	**100**	**0**	**0**
Are you offering a completely new product or a modification of an existing service?	**35.2**	**61.1**	**3.7**
Have you decided the source of cash for your startup?	**80**	**18.1**	**1.9**
Are there any financial gatekeepers to your startup?	**35.2**	**29.6**	**35.2**
Did you plan a strategy to maintain the balance between cash needs and profit from the sales?	**53.7**	**25.9**	**20.4**
Did you go for a mentorship or advice?	**90.3**	**92**	**0**
Are you a technical expert as well as the marketing expert?	**37**	**35.2**	**27.8**
Do you know how are you going to handle accounting, taxation, finance, and operations?	**31.5**	**31.5**	**37**
Can your product be easily described and understood?	**77.8**	**3.7**	**18.5**
Average Corporate Knowledge	**51.6**	**25.6**	**21.4**

G. Mentoring to build women entrepreneurs:

In 2018, a Women Entrepreneurs Summit was piloted by Word Press (blogging site).[26] All the women who expanded their startups through Word Press had united in the Summit. This is one of the very few platforms delivered for businesswomen to showcase their abilities. It attracted participants from more than 15 countries. Initiatives like these stimulate and upkeep women's entrepreneurship and we need more of them to address the inequity that presently exists but they don't reach women quick enough. According to Sixth Economic Census out by the Ministry of Statics and Programme. Implementation, women constitute around 14% of the total entrepreneurship which is 8.05 million out of the total 58.5 million entrepreneurs.[27]Such findings are setback to the journey of India towards developed economy as a developed economy should at least comprise of 30-40% of woman entrepreneurs. This is because women wishing to pursue and maintain a successful entrepreneurial path are still faced with a gender gap dominant in entrepreneurial exercise and principles. It's a vicious circle, and the only way to break it is to get more women, including women of colour and different fortunes, to join the business flow. In recent years, there has been a greater emphasis on entrepreneurship programs for women on college campuses.[28] These efforts are important in working to bridge the gender gap, the programs may not reach young women entering the university without a vested interest in entrepreneurship. This is important, since the skills and characteristics that make a good entrepreneur (strength, financial education and ability to establish and achieve goals, and even take some calculated risks) are useful for women, regardless of the chosen field. Furthermore, university programs will never reach girls who are not encouraged to pursue higher education.

Women entrepreneurs still constitute a peripheral part of the corporate ecosphere, largely due to the innumerable barriers that derive from their female gender, such as the obsolete social and cultural sensitivities, the planning of a stable family when they are in the middle of a company, they have many roles in their businesses and at home, the inability to impress investors and raise capital, feelings of uncertainty and fear of fiasco in a difficult business world. To avoid these problems, there have been coherent proposals, initiatives, additions, policies and methodologies that help women survive successfully through the problems of the business evolution cycle, making the restrictions they find strange. The participation of female entrepreneurs is of the utmost importance as women incorporate the traits of commercial entrepreneurship such as social awareness, multitasking, team spirit, cooperation, knowledge, favourable for both business growth and humanity.

Mentoring is considered the most operational for the individual and professional progress of female entrepreneurs. It is genuine and adaptable to your objective needs, your prospects and your business structure. In a parity relationship and trust mentoring, the mentor offers a just-in-time understanding and experience that supports the entrepreneur in decision-making. The woman learns from the skills of the mentor and is more inclined to transmit new learning about her activity because it is more meaningful and indispensable. Mentoring based on strength can be a more operational and lively development process for women entrepreneurs. Improves the social interface in which the mentor simplifies the woman to determine their strengths and use them to achieve their goals. Being aware of her strengths, the woman is dedicated to meditating and evaluating, and develops both personally and professionally. The mentor is essential to allow you to discover your strengths, use them in your business and unleash your potential. The predominant mentoring allows the mentee to discover, identify, freely emerge, practice, unionize and calculate their strengths and access them effectively in their companies.

An encouraging and energetic tactic for any business woman or woman who wants to be an entrepreneur counts on her efforts to recognize, appreciate and make proper use of her predominant internal resources in her business activities. During this process that really releases the strengths within it, a mentor is a catalyst to level it to distinguish its strengths, paying attention to those that authorize the growth of your business and, at the same time, emerge and highlight its unused potential. Note that this approach is suitable for both men and women and is adopted by both; however, women are inclined to be friendlier with these random methods. Adequate mentoring to be a female entrepreneur will improve the discovery, recognition, emergence, freedom, use, combination and assessment of strengths that will strengthen the personality, outstanding research and development of their talents innate that allow the recognition of their potential and goal realization. These are, in fact, the main stages of the goal for the success of women's businesses.

To barge into the entrepreneurship hustle and succeed in the same, there is a vibrant need to include female entrepreneurship education from the very beginning of a girl's curriculum. When in schools, short programs can be conducted through which entrepreneurship concepts can be imbibed into the child's mind. A small example of such program conducted in a school in Mexico: A cookie program has expanded to include an emphasis on teaching five essential entrepreneurial skills: goal setting, decision making, money management, people skills, and business ethics. In 2014, they launched a platform that allows girls to create their own personalized cookie site.[29]It offers games and quizzes focusing on entrepreneurial skills, as well as a place for girls to set their cookie goals, track their progress, manage orders and inventory, learn Internet safety skills, and, of course, sell cookies. Additionally, cookie sellers can now earn badges in creating business plans, customer service, and marketing. They can also earn financial literacy badges in areas such as budgeting, philanthropy, making smart buying decisions, and financial planning. The cookie program and financial literacy badges are part of a larger financial empowerment program, which has age-appropriate lessons and activities revolving around financial literacy for girls. The research tells us that girls behave better in 'girls environments', so it is essential to support smaller organizations and help them develop more entrepreneurial opportunities for girls. Business leaders can do their part as volunteers in existing girls programs or start tutoring programs for girls in their companies. Parents can include their daughters in the family's money-making process, and we can all talk to the girls in our lives about the importance of financial education and financial accountability. Young people today are preparing for a career in sectors that have not yet been invented. We need them to have the courage and confidence, along with business acumen and technological skills, to create the solutions that are rebuilding our world. But this is only part of the equation. They also need to know how to sell that solution to be adopted.

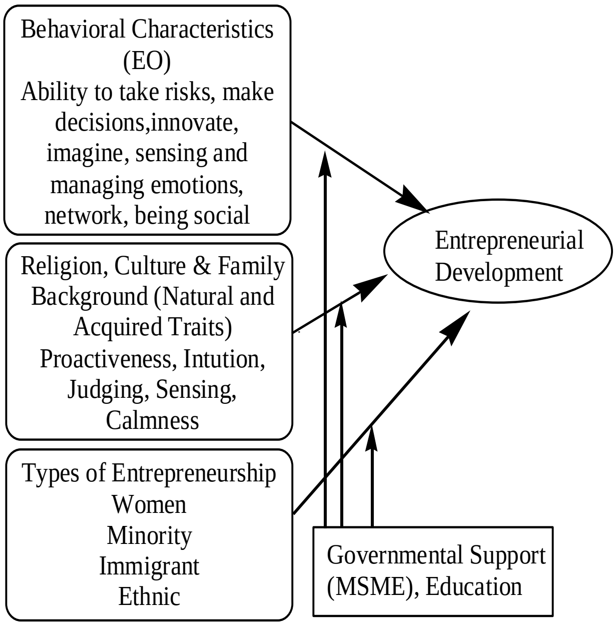


Fig 2. Outline of entrepreneurial development

Conclusion:

The present study takes a perspective of life in business activity. Although the data do not allow the identification of random relationships, the results advocate the perceptions of prospects and expertise for entrepreneurship that are linked to business activity and can help to better understand the role of age and age-related changes in entrepreneurship. Ultimately, the economic models of economic activity should include the age and potential mediators of their relationship with the business.[30]In practice, institutions can use the results to get the knowledge they need to successfully promote entrepreneurship as a means of financial security and employment for individuals of diverse age groups. An imperative fragment of the solution is to provide today's young people with a business mentality and related entrepreneurial skills to succeed in creating new businesses.[31] Government support policies and initiatives can help generate an atmosphere favourable to this transformation. Public investment in vocational and commercial training programs, fiscal policies that encourage business investment and capital formation are useful fundamentals. But the real responsibility for accomplishment in an unrestricted market economy to advance the skills of the next generation must lie in the business community. Starting and running a business requires you to take risks, feel comfortable with uncertainty and stay focused on your goals. It also teaches to be flexible, adapt quickly to new opportunities and challenges, hone persuasive skills and develop decisive decision-making and leadership skills. The most vital mechanism is that it builds resilience. In a future full of constantly changing new technologies, all organizations, large and small, new and old, will look for people with these skills.

Acknowledgement:
We profoundly thank the SVKM IOT's management and Hon. Principal of SVKM, Dr. N. P. Salunke for motivating us into engaging in constructive programs equipping us with the academic facilities and the study-serene infrastructure.

References:

1. Simon Hill, (2017), Entrepreneurial Characteristics in STEM: A Higher Education Institution Perspective, Coventry University, Coventry, England.

2. The BDC,(1944). About us: The Business Development Bank of Canada . bdc. [Online]. [Cited: May 15, 2019.] https://www.bdc.ca

3. Clarissa Bohlmann, Andreas Rauch & Hannes Zacher. (2017),A Lifespan Perspective onEntrepreneurship: Perceived Opportunities and Skills Explain the Negative Association between Age and Entrepreneurial Activity. s.l., National Center for Biotechnology Information.

4. Barrood, James C. (2010),Entrepreneurship and Innovation:Global Insights from 24 Leaders. s.l., Rothman Institute of Entrepreneurship.

5. Martin Lackéus. (2015),Entrepreneurship in Education. Paris, The Organization for Economic Cooperation and Development (OECD).

6. Bruce, Rotheny. (2018). To be successful, youth need entrepreneurial skills and experience, The Globe and Mail.

7. Team, Timothy Butler, (2016),Skills and Behaviours that Make Entrepreneurs Successful, Massachusetts , Harward Business School.

8. Donald O. Clifton, Edward Chip Anderson. (2002)StrenghtsQuest: discover and develop your strengths in academics, career and beyond, New York : Gallup, ISBN-13: 978-1595620118.

9. R, Sullivan, (2000)Entrepreneurial learning and mentoring, Scotland, International Journal of Entrepreneurial Behavior & Research, Vol. 6.(3).

10. Saptono, Ari. (2018), Entrepreneurship Education and Its Influence on Financial Literacy and Entrepreneurship Skills in College, Jakarta, Journal of Entrepreneurship Education, Vol. 21(4).

11. Jessica, Slusser. (2018), The Future of Work: Building Entrepreneurship Skills in K-12, Getting Smart. [Online] February 21, 2018. [Cited: May 15, 2019.] https://www.gettingsmart.com

12. Team, Stanford School of Business, (2011),Global Entrepreneurship and the Successful Growth Strategies. California, World Economic Forum USA Inc.

13. Murat Yıldırım, Faith Bayram, Ahmet Oguz and Gulay Gunay, (2017), Financial Literacy Level of Individuals and Its Relationships to Demographic Variables, Karabuk, Mediterranean Journal of Social Sciences, Vol. 8(3), 2039-2117.

14. Kiyosaki, Robert. (2007).Rich Dad Poor Dad. Scottsdale, Plata Publishing LLC, 978-1-61268-000-2.

15. Lane, Gill and Dvid Clutterbuck. (2004),The situational mentor: an international review of competences and capabilities in mentoring, UK, Gower Publishing Ltd, ISBN-13: 978-0566085437.

16. Whittington, Dick. (2019)Digital innovation and entrepreneurship: bridging the skills gap, Cambridge : fifteeneightyfour, Cambridge University Press.

17. OECD, (2017),Unlocking the Potential of Youth Entrepreneurship in Developing Countries: From Subsistence to Performance, Paris, OECD, 9789264277830.

18. Szajda, Emily Dawn. (2017), The importance of digital business nowadays, GBSB Global.

19. Reliance Money, The importance of Digital Innovation for Entrepreneurs.

20. Juneja, Prachi. (2008), Youth Entrepreneurship Building Skills, Management Study Guide. [Online] 2008. [Cited: May 15, 2019.] https://www.managementstudyguide.com

21. Jones, C. and English, J. (2004),A contemporary approach to entrepreneurship education, Educ. Train., 46, 416–423.

22. Gibb, A.A. (2002),Creating Conducive Environments for Learning and Entrepreneurship; living with, dealing with, creating and enjoying uncertainty and complexity, Industry and Higher Education, Vol. 16(3).

23. Chung-Gyu Byun, Chang Soo Sung et al. (2018), A Study on the Effectiveness of Entrepreneurship,Jinju, Journal of Open Innovation.

24. Huston, S J. (2010), Measuring Financial Literacy, The Journal of Consumer Affairs, Vol. 44(2). 296-316.

25. Knoli, MAZ and Houts. (2012), The Financial Knowledge Scale: An application of item response theory to the assessment of financial literacy, The Journal of Consumer Affairs, 2012, Vol. 46(3). 381410.

26. Manla, G. (2018, 4 16), WordPress. (WordPress, Ed.) Retrieved 05 23, 2019, from Theano: https://generic.wordpress.soton.ac.uk/theano/2018/04/16/ieee-women-in-engineering-international-leadership-summit/

27. Market, Capital,(2018),Women Constitute Around 14% of Total Entrepreneurship In Country. s.l. , Business Standard.

28. Winn, Joan. (2005), Women entrepreneurs: can we remove the barriers? s.l., International Entrepreneurship and Management Journal , 1554-7191.

29. Acevedo, Sylvia. (2018), Why We Need to Nurture Entrepreneurship in Young Girls,Massachusetts, Stanford Social Innovation Review.

30. Vishnu Patankar and Dr. Nikhil Mehta, A Literature Review on Entrepreneurial Development and its antecedents, NITIE, Powai.

31. Zacharakis, William Bygrave & Andrew, (2011),Entrepreneurship, Massachusetts, John Wiley & Sons, Inc, ISBN 978-0-470-45037-6.

Paradigm Shift in Engineering Education: From Learning-Based-Projects to Projects-Based-Learning

Vivek B. Kamat[1], Jayant K. Kittur[2], Pramod Shabadkar[3]

[1,2]Department of Mechanical Engineering, Gogte Institute of Technology, Belagavi, (Karnataka) India
[3]Training and Placement cell, K. K. Wagh Institute of Engineering Education and Research, Nashik, India
[1]vivkamat@rediffmail.com
[2]jkk@git.edu
[3]pramodshahabadkar@gmail.com

Track No: 5
Track Name: Skill and Entrepreneurship

Abstract: Project Work taken up by the students, is perhaps a definite way of ascertaining acquisition of technical knowledge and know-how attained by engineering students while in their UG program. Such project works facilitate augmentation in their team work, leadership qualities, creativity and timely accomplishments of set targets. However, non availability of technical expertise within the college, absence of facilities for experimentation & prototyping, lack of motivation to think out of box, besides need for financial resources to execute the project work are observed to be the constraints which students have to face many a times. In order to ensure the much desired impetus to project work, providing a common platform to the prospective students and interested industry, to jointly alleviate the hardships, was envisaged to be a worthwhile practice. This would facilitate marketing of innovative concepts by the prospective engineering students, thereby honing their relevant soft skills and consequent direct enhancement in quality of engineering education. Timely interventions ***caused*** at different stages of the process can definitely add value to the much desired educational ***effect***. The whole exercise thus entails total paradigm shift in engineering education, from learning-based-project to project-based-learning.

Keywords: Project-based-learning, Industry-Academia-Connect, Students projects

1. Introduction

The unprecedented changes in the environment in which engineering is *taught* and ecosystem in which it is *practised* by the graduates will be guiding factor in defining the goals which design of engineering curricula will strive to achieve. Adopting proactive policies and implementing suitable strategies, will certainly lead the engineering education system and processes, to think out of box. The practice of engineering also has undergone significant changes as a profession, in this century. There are vast opportunities offered by technology developments in almost all sectors. Sophisticated diagnostic and computational tools are now available along with wide choice of materials. Customization demanded by diverse customers and competitiveness are inherent implications of globalization. Environmental awareness and considerations have imposed another set of constraints. Thus, the real challenge currently is to prepare engineering graduates to facilitate sustainable development using appropriate technology amidst social and economic changes. Demand for quality of engineering education is increasing in the wake of globalization and in this context, the concept of graduate attributes and professional competencies have become very significant.

2. Literature Review

In the present era, no problems can be solved entirely by applications of technical solutions only, particularly when societal issues play overwhelming roles. This is predominantly the situation in the world where all systems are growing larger, crossing technological boundaries and even posing difficulties in identifying the boundaries. No doubt, engineers of the day do have to be proficient in skills and know-how in their particular technical field but it is equally important to develop ability to recognize non-technical aspects of the issue in hand and their interactions and possible impact on the solutions under consideration. It is therefore a real challenge to introduce and integrate such relevant aspects into engineering education system and certainly calls for innovative approaches. Various education systems, particularly engineering education systems, where such paradigm shifts are attempted are briefly reviewed.

Various factors of project design induce motivation and orient thought process and promote examination of difficulties encountered by students and teachers, with projects. In their article [1], the authors strongly advocate the potential of projects to help students learn. How technology support can be availed by students and teachers while they are working on projects and sustain motivation and thought process, is appropriately described by the authors. Thus it is established that project-based learning is a comprehensive approach that engages students in investigation of authentic problems.

Self-learning through inquiry, reflecting their knowledge and coupled with collaborative efforts to research and identify projects, are salient features of the approach. Attainment of new viable technology skills, becoming proficient communicators and emerging as an advanced problem solvers are other benefits which are included in the approach. All these aspects have been well articulated by the authors in their article [2].

In their article [3], the authors, while discussing the general capabilities of engineering education graduates, have also accounted for sustainable development and integration of non-technical issues into various environmental engineering curricula. The focus is on the so-called Aalborg Model, a problem-oriented and project-based learning paradigm utilised at Aalborg University (Denmark), and the mutual benefits that this particular learning strategy provides for students, faculty and communities. Also, the discussion underlines the importance of a problem-oriented approach over a subject-oriented approach, for ensuring a balance between problem identification and innovative problem solving. Here, it is concluded that a problem-oriented, project-based learning approach, which involves interplay, mix and diversity aspects of education would enable engineers to effectively handle sustainability- related problems.

Team-based open-ended project works also has a set of competencies to be attained by the students. In the paper [4], the procedures that can be used to assess the extent of attainment of set competencies by the team of students as well as individual students, is described. As assessment and evaluation is an integral part of any education system, the practices followed in the University of Twente (the Netherlands) are mainly discussed.

The authors have explored students' and teachers' perceptions of a project-led engineering course at a Portuguese university, by way of a case-study [5]. Bringing about the transition from a traditional, teacher-centered perspective towards project and learner-centered education process, and the extent to which strengths and weaknesses are acknowledged by both, the students and the teachers in doing so, are appropriately analyzed. Despite any negative experiences, the benefits of a project-based approach, identifying interdisciplinary nature, high student motivation and the acquisition of soft skills as key features of project-led education, are clearly recognized as findings.

Inquiry based learning is entailed in any student centered approach, that can strengthen the links between teaching and research. The article [6] examines and analyzes three alternate options with varying level of independence and strength of the teaching–research nexus. A discovery oriented open inquiry based learning approach, is found to be more effective, for ensuring strong links between teaching and research.

Problem-based learning (PBL) and its characteristics is a successful strategy for higher education. By way of another article [7], authors have described the suitability of project work and analyzed guided small group work as an innovative alternative for conventional engineering education at Maastricht University and Technische Universiteit Eindhoven. While group work tutorials offer good prospects in initial years of a programme, the project works offer a strong alternative in later phases. It is concluded that as an overall strategy PBL has certain limitations, rendering it less suitable for engineering education. However, PBL approach ensures that students are exposed to a multitude of strategies which are critical for twenty-first century successes.

3. Current Status

Presently globalization has influenced change in the attitude towards quality aspects of engineering education. However, Institutions are found to be complacent about its quality of *admissions* and *placement of students.* In engineering education, *placement and career* is the area of operations which is defining the very purpose of the process. This activity primarily focuses on the creation of enabling environment to promote placement and appropriate career progression. Much desirable soft skills training which often is not a part of curricular activities, needs to be provided to the graduating students as they lay almost nil emphasis on these aspects which employers are very particular about. Entrepreneurship development is a widely misplaced aspect of career option which should have been the core ability of the engineers. Off course, further higher education is much sought after educational career option which provides a focal point for the aspirants to determine their professional career path. Institutions accordingly, are focusing their attention on the in-process activities of the engineering education system.

As the colleges are turning out graduates who are expected to be the human resource of the client industry, duly fulfilling their technical manpower requirements, an assessment of the graduating students as per industry standards also needs to be facilitated. An effective Industry-Institute Connect would certainly facilitate these aspects.

4. Interventions

Any graduate program in engineering provides for a project work to be undertaken by student-group, while in their final year. This facilitates orientation of students learning towards multi or interdisciplinary thinking and application of mind to create a solution for identified or perceived problem, having some bearing on human life operations. Compatible friends form the group of students from their class and initiate their project work concept without much motivation for a innovative or creative thinking. It is just taken up towards partial fulfillment of curricular requirements for completion of UG program in engineering. The thinking is restricted, most of the times, by the perceived handicaps of in-house expertise available with the college faculty to offer much essential guidance in the work, infrastructure available in the college in terms of knowledge resource for research work, facilities for experimentation and prototyping facilities. Their, out-of-box thinking, is inhibited in a way, by these issues along with the financial constraints, which are constantly at the back of their mind.

Make-in India, Start-up India, are the buzz words of present day governance. There is also an urge, to contribute, though in a small way, towards these missions.In order to inculcate the spirit of innovation, not inhibited by constraints of finances or otherwise, an idea was mooted to provide a platform to final year students, for showcasing and making a case for industry sponsors and facilitate patronizing of project work, on a competitive and efficient basis.

Every under-graduate student is required to take up a project work, individually or in a group, while they are in their Semester VII and carryover the same in their Semester VIII. This project work has to be completed satisfactorily, towards partial fulfillment of curricular requirements of the four years of the course curriculum. The project works normally undertaken by such students are library projects, basically involving research and case studies or some working projects involving making of a prototype to demonstrate the utility and capabilities of the designed product or solution.

While students are in their Semester VI of the programme, awareness and sensitization sessions should be organized in the college. The pool of resource persons for these sessions shall be drawn from amongst eminent innovation mentors, entrepreneurship mentors, VC associates, promoters of incubation and business acceleration centres, etc. A systematic effort has to be made to properly re-orient the students from conventional way of going about the selection and finalization of their project works, to an innovative approach of ideating, generating and conceptualization of the same. Research methodology involving discussions with technology experts, researchers and also peers, should be briefly explained. Success stories of innovations may be narrated for igniting and energizing thought process. Possible constraints that can inhibit generation of good ideas are also required to be discussed. Three major constraints envisaged include availability of

1. Technology Expert Guidance
2. Infrastructural facilities for Experimentation and Proto-typing
3. Financial Resources

Approaching Industry or Corporate Houses is concluded to be one probable feasible solution to tide over the hurdles. That being the case, the students are to be informed about the initiative taken, for facilitating the interface for the much desired connect between Industry and Academia.

As the students are expected to finalize their project works in the beginning of Semester VII which commences in July, it is essential that immediately after their Semester VI examinations they apply themselves to the task of researching and arriving at concept of their proposed project work. An initial discussion with peers and faculty guides is sufficiently held. The requirements in terms of expert guidance, facilities and finances are estimated and the project proposal is readied by end of July. The details of such project works decided by students of various engineering programs has to be obtained in prescribed formats. The same has to be collated and compiled in order to circulate the same to prospective Industries from neighboring places. Such industries are requested to indicate which projects from the compiled list are likely to be of interest to them. All these proposed project works will be scrutinized by an expert committee constituted for the purpose and innovative and impressive ones will be shortlisted limiting the number to around 30. Project works indicated to be of interest by the prospective sponsoring Industries will also be added to the ones shortlisted and allowed to be showcased during the interactive session to be held in the month of August. This proposed interactive session will have around 50 prospective Industry representatives and around 30 selected and shortlisted proposed project works that will be showcased by way of presentation, by respective student project groups along with their faculty guides.

Each project group will be allotted 5 minutes to present their case to the industry representatives. After 10 project works are presented, there will be a question-answer session for 20 minutes, during which the queries, if any, of prospective sponsoring industries will be responded to by the students. This session will go on for half-a-day and at the end of the session the industry representatives will indicate which project works are likely to be considered by them for necessary support. Subsequently, the student groups will approach the respective industry for availing the requisite support and facilitation, for successful execution of the project work.

It is possible that some of the project works are quite innovative ideas and concepts and there lies a tremendous scope for further converting the same into a commercial proposition. The constraint in terms of time, in respect of such project works can best be resolved mutually by the supporting industry and the concerned group of students and faculty guides, appropriately, at their end.

5. Conclusions

The creation of appropriate platform for showcasing the proposed project works to the prospective industry and facilitation of desired interaction and industry-academia connect which culminated into consequent symbiotic association, shall establish much essential confidence in the engineering students to think out-of-box and conceptualize innovative project works for their B.E. Programmes. The shackles will be broken and the perceived constraints will no more be considered to be hindrances and limiting factors in their creative thinking. The inherent endorsement by industry to the project work undertaken by students group, by itself will be a great differentiator. This initiative is expected to further augment the potential of expanding the scope of catchment prospects for technology based innovations.

References

[1] Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., &Palincsar, "A Motivating project-based learning: Sustaining the doing, supporting the learning", *Educational psychologist,* 26(3-4), 369-398, (1991).

[2] Bell, S. Project-based learning for the 21st century: Skills for the future. *The Clearing House*, *83*(2), 39-43, (2010).

[3] Lehmann, M., Christensen, P., Du, X., & Thrane, M, "Problem-oriented and project-based learning (POPBL) as an innovative learning strategy for sustainable development in engineering education", *European Journal of Engineering Education*, *33*(3), 283-295, (2008).

[4] Powell, P. C. "Assessment of team-based projects in project-led education", *European Journal of Engineering Education,* 29(2), 221-230,(2004).

[5] Lima, R. M., Carvalho, D., Assunção Flores, M., & Van Hattum-Janssen, N, "A case study on project led education in engineering: students and teachers perceptions." *European journal of engineering education*, *32*(3), 337-347, (2007).

[6] Spronken Smith, R., & Walker, R, "Can inquiry based learning strengthen the links between teaching and disciplinary research?" *Studies in Higher Education*, *35*(6), 723-740, (2010).

[7] Perrenet, J. C., Bouhuijs, P. A. J., & Smits, J. G. M. M, "The suitability of problem-based learning for engineering education: theory and practice", *Teaching in higher education*, *5*(3), 345-358, (2000).

Enhancement of Employability Skills through Master Student Programme: A Case Study

Pramod K. Shahabadkar, V. R. Lele, P. S. Vispute, Dr. Keshav N Nandurkar

K. K. Wagh Institute of Engineering Education & Research, Amrutdham, Panchavati, Nashik
Corresponding author: pramodshahabadkar@gmail.com
Track No:5
Track Name: Skill and Entrepreneurship

Abstract
It is observed that aptitude skills consisting of Quantitative, English, Logical Reasoning and soft skills like communication, leadership qualities, group learning, and attitude along with Technical Skills play a significant role for getting the job through the campus interview. Campus selection process is competency based and a student having good technical and soft skills will leave the campus with a placement offer along with a degree in hand. Although the student faces the campus interview in his/her final year engineering, however the preparation for the campus interview by the student must start from the First year itself. Institutes are doing their best in enhancing the employability skills of engineering students by conducting the various training programs.
This paper focuses on the unique training module titled as “Master Student Programme” conducted in an Engineering College located in the western part of Maharashtra. The objective of this “Master Student Programme” is to enhance the Soft skills and thereby increasing employment opportunities for students in the campus interview.
14 skills are identified and are assigned each skill to 14 student groups and asked them to prepare the course and power point presentation. These skills includes: Memory, Writing, Reading, Time Management, Diversity, Resources, Notes taking, Money Management etc
These 14 groups are trained and well groomed by the faculties and Sr Students as mentor for enhancing their confidence and presentation skills and also their course. These 14 skills are being shared by the 14 groups with the first and second year students through master student programme which is by the students and for the students. Feedbacks are taken before and after the event to know the enhancement of soft skills in students.
Master Student Programme was conducted to guide the first and second year students for becoming a master student and this experiment is being conducted since last Sixteen years in the institute with a different theme for enhancing the soft skills. Over a period of last Sixteen years, this experiment has resulted in to total 224 Teaching and Learning groups and produced well trained 896 student instructors. This Master Student Programme has led to enhancing group processing skills, self-learning and shared leadership among 896 students. Further, on an average of 200 student learners have participated in each experiment in the last sixteen years resulting in to total of 3200 students’ participation.
The major contribution of this paper is, sharing of the master student skills and Master Student Programme which is by the students, to the students and for the students. Master Student Programme can be implemented in the colleges and universities and the methodology for implementing is explained in this paper.

Key words: Employability Skills, Master Student, soft skills

1 Introduction

In this era of competitive world, teamwork, learning ability and soft skills along with academic excellence are prerequisites for the survival of an engineering student. In the changing scenario, students have to work in groups. Structuring the learning situations where students interact with each other and work together is a primary requirement for an educational institute. This paper is about structuring the appropriate Teaching - Learning environment for learning the soft skills. Herein, we describe the experiment conducted at K K Wagh Institute of Engineering Education & Research, Nashik- India for teaching the characteristics of master student and there by developing soft skills in the students through Master Student Programme. Herein, students work in the groups to maximize their own and each other’s learning. The approach focuses on studying the concepts together rather than alone.
The remaining part of this paper is arranged as follows: Next section discusses back ground of the study followed by Concept of master student, Implementation of the Master Student Programme and in the end results of the experiment and conclusion.

2 Background of study

This study was conducted at K K Wagh Institute of Engineering Education & Research, Nashik- India. This institute is situated in the western part of India and is a well known institute which is famous for imparting quality education in the engineering field. It was established in the year 1984 with current intake of 1008 students (including UG and PG courses). The institute strives hard in developing the soft skills of its students along with their academic excellence. Every year it conducts many programs for the benefit of students to develop their communication and self learning skills along with leadership qualities to help the students to get a maximum benefit from their regular classes.

3 Concept of master student

After joining the college students face numerous difficulties in managing their time and planning their career. Also they face problems in improving their: memory [3], communication skills and notes taking skill [4] in the class. Careful study reveals that many of these problems can be solved through mutual help among the students and learning the new skills. A fellow student might face serious stress problems during exams, while another might be good at stress management. A student may not fare well academically, but he might be a great communicator. His partner might be the other case. If we unite all strengths and good qualities of student and develop a mechanism to share them with the other students through proper Student-Student Interaction, it might well be possible to create a very elite force of students in the college and there by creating group learning environment. With this ultimate goal, we started the idea of making a student as 'MASTER STUDENT' [1]. With this objective in mind a brain storming session along with the staff was held to define and identify skills required for becoming a Master Student. Around 5 staff memebers incluing the principal of an institute and 20 students have participated in the brain storming session and ended with identifying the characteristics of a Master Student [2] and are listed are listed in Table 1. The list is not complete. It merely points in a direction.

Table 1. Qualities of Master Student

Natural Learner	Willing to change	Inquisitive
Competent	Relaxed about grades	Creative
Energetic	Good Reading habits	Responsible
Able to focus attention	Good Communicator	Time Manager
Note-taking skills	Hungry for knowledge	Good Memory

To teach the above qualities of Master Student a course is designed with 14 chapters as detailed in the Table 2. During the brain storming session, two teaching and learning methods one: Traditional Teaching Model in which an expert will be hired from outside to teach these skills to students and another is to train the students for above skills and course under the close mentoring of Sr staff and to share this with the other students: by the students for the students and to the students under a unique Program titled as "Master Student". Comparison of both the models [5] as detailed in the Table 3 is discussed in the brain storming session and finally it is decided to teach the Master Student Skills through the Master Student Programme.

Table 2. Master Student Learning Course

Relationship	Diversity	Time Management
Memory	Reading	Notes
Writing	Thinking	Resources
Money	Quiz writing skills	Health
Bookworms	Event management	Studying techniques

Table 3. Comparison of teaching and learning methods

Conventional Model of Teaching by Hiring a Faculty or an Instructor	Master Student Model by the students to the students and for the students
In this Model the mission is to teach or to give the instruction to students from an expert.	In this model mission is to teach the Master Student Skills by the students to the students and for the students.
Expert only improves his/her skills of self learning, presentation, communication and leadership qualities not the students.	It improves students skills of self learning, presentation, communication and leadership qualities
Faculty member constructs and shares the knowledge.	Students can retrieve the required information about the course through internet and also through library and shares with the students. Faculty effort is aimed at mentoring for developing student's competencies and talents.

The details of methdology followed for implementing the Master Student Programme for teaching the Master Student Skills are explianed in the following sessions.

4 Implementation of the Master Student Programme

In this section Procedure adopted is explained.

1. Fourteen Learning groups of students were formed. Each group consisted of four students. The groups were heterogeneous in respect of class, background, specialization, caste and religion.
2. The objectives of the course were explained to all the members. The topics as detailed in the Table 2 were assigned to each group as per the theme decided and their choices with the prior knowledge of the content in the course and asked them to prepare the course material by referring the soft Skills training books, Management books and Internet.
3. The students were given sufficient time for the preparation of course material and power point presentations. After two weeks each student asked to give the rehearsals without disturbing their class schedule. Each student speaker was given 45 Minutes for the presentation and 5 minutes for the Question-Answer session. In the rehearsal these student speakers were carefully trained by the faculty

members and well groomed to guide the students on their respective topics. Several rehearsals and feedback were taken before these groups' shares their gained knowledge to the larger group students of the institute.

4. The programme on Master Student was fixed and interested students were asked to register their names voluntarily for the participation in this teaching-learning experiment.
5. In this experiment cooperative groups of students are the teachers and learners are the larger group of First and Second Year students**.**
6. Each group delivered their presentations through PPT in front of the larger groups of First and Second Year Engineering Students.
7. This Master Student teaching and learning experiment is being conducted continuously since last 16 years with different themes in developing the master students in our institute. Feedback is an important aspect of any system. It gives an opportunity of fine-tuning and improving the process. In the present Teaching- Learning experiment also, the feedback from the participants were taken at the end of the experiment.

The experiment was well received by the students' community and has strongly recommended conducting such teaching and learning experiment more frequently. In their feedback speeches at the end of session, they appreciated this Master Student Programme and said the "programme was simply fantastic".

6. Conclusion

The Master Student Programme approach was adopted to guide the first and second year students for becoming a Master Student by Third and Final Year Students. So, there was an excellent rapport among the participants. It was observed that, this program has lead to development of soft skill and is resulted in to jobs through campus interview for the final year students who have participated in the experiment as speakers. Many of the speakers' have got the jobs in the reputed organisation with a very good salary.

One system is not a replacement of the other. Each system has evolved to meet new demands, to serve new target groups not included by the existing system. The teachers can play a vital role in bringing in a change by experimenting on using alternative methods of Teaching and Learning. This paper will add onto the contribution of authors who have ventured study in the area of employability enhancement programs in the Engineering institutes.

Acknowledgments

The authors gratefully acknowledge the Management of K K Wagh, Students, Administrative Staff and colleagues in general for their cooperation in the study.

REFERENCES

1. Dave Ellis, "Becoming a Master Student" (9th Ed.) Houghton Mifflin Company, NY
2. Pramod K Shahabadkar, Dr. K. N. Nandurkar and Prashant K. Shahabadkar "Cooperative Learning Experiment for Master Student Skills –A Case Study" Journal of Technical Education, July-September, 2006, Volume 29, Number:3
3. Pramod K. Shahabadkar "Memory" in ISTE News Letter of July-August, 2003.
4. Pramod K. Shahabadkar "Effective Notes taking" in ISTE News Letter of September-October, 2005.
5. Pramod K Shahabadkar**,** Ashwinin Kulkarni and Dr. K. N. Nandurkar, " Soft skills through cooperative learning- A case study", National Conference on Best Practices in Teaching and Learning(BPTL), Al-Musanna College of Technology, Sultanate of Oman, May-7-2012.
6. R. M. Felder and R. Brent, "Cooperative Learning." Chapter 4 of P.A. Mabrouk, ed., *Active Learning: Models from the Analytical Sciences*, ACS Symposium Series 970. Washington, DC: American Chemical Society, 2007.

A Reformative Approach for Improving Employability of Engineering Graduates

Dr. Pradeep B. Mane[1], Harshada B. Magar[2]

[1]Principal, AISSMS's IOIT, Pune-01
[2] E&TC, .AISSMS's IOIT, Pune-01
[1]pbmane6829@gmail.com
[2] hmagar15@gmail.com
Track No:5
Track Name: Skill and Entrepreneurship

Abstract: The disheartening statistics of Aspiring Minds' "National Employability Report of Engineers- 2019" regarding employability of engineering graduates in India states that "80% of engineering graduates are not fit for any job in the knowledge economy". This statement is self-sufficient to speak about the education and life-skills the graduates are getting during four years of tenure. The main problem is our system is accustomed to do some ad-hoc changes and this is the reason why the employability numbers remains glaringly obdurate.
The fundamental aspect of engineering should be applied engineering. Particularly talking about the engineering syllabus in Maharashtra it can be analysed that the focus is on theory rather than practical aspects and Internship. Little industry exposure creates a gap between industry needs and academia which is the main reason of low employability. Some technical minds grab these opportunities & come up with the expensive solution on this –"The job oriented courses" after engineering. Graduates from tier-3 cities and tier-2 prefer to enrol such courses and find safe job search. The students paying handsome amount of fees for engineering again paying for such courses. Students are willingly investing money and time over these courses. These courses are immerged out as a by-product of lacuna of system. In this paper the authors have focused on present scenario of engineering education and put forward a reformative structure to bridge the gap between pedagogic system and applied engineering.

Keywords: Employability, job oriented courses

1. Introduction

Every industrial sector is setting its benchmark for entry of the graduates in their domain. The specific job profile or role requires certain sets of skills which includes speculative perceptive, vigorous pragmatic validation of the knowledge they acquired in academics, cognitive skills based on experience and at least one domain expertise which differentiate the candidate from others. This is the key requirement of industry from the graduates or specifically engineering graduates. The classic theory of educational institutes for measuring and ratings is merely based on inputs such as-

1. The no. of teaching staff
2. Qualification of teaching staff
3. The infrastructure provided to stake holders

Etc, but this method is not proved to be fruitful in this competitive era, so the need of some more scientific methods immerged out. One of these is outcome based measuring and rating system. Outcomes are measured in terms of student learning, placements, research activities by faculties, patents filed, incubation centres, entrepreneurship activities by colleges etc. while dealing with outcome based system the loopholes of the total education ecosystem are highlighted. The main outcome "employability" is drastically hampered due to the traditional and monotonous education which is imparted to engineering aspirants. In India most of the university syllabi are based on theoretical knowledge, most of the faculty don't understand the applied engineering, the scanty well equipped lab, rarely available state of the art instruments for practice make the student only letter-scarecrows who shows only progress in terms of grades and number and left far behind of life skills, soft skills, basic domain skills.

2. Present scenario of engineering education.

As per the Aspiring Minds' National Employability Report-Engineers 2019 only 4.7% of Indians are able to write functional and logical correct codes. Comparing the figures and facts USA has 18.8 % [2]. This vast difference speaks about our Indian higher education system. There is a huge gap between the acquired skills of graduate engineers and the expected focused skills from them to suits the role in industry. The bleak employability statistics highlights this chasm. This chasm has to be overcome so as to save the abundant human resources we have.
To understand this first we discuss about the limitations of the present engineering education system.

1. Expansion of Education Institutes without standardization India has large numbers of institutions but they failed to maintain standardization.
2. Present Examination system

Our examination system is the main culprit of all chasms. The question mostly asked are repetitive questions so the students with least expertise can also qualify the exam or on our surprise scores good without absorbing course objectives.

This very predictive question extinguishes the dire incentive to study and apply the gained knowledge. The examination structure must get reform not only at local domain but on national level also. The policy makers should take these inputs and new guidelines should be formed. Student should get expertise at least in one domain and they should able to apply their knowledge so as to qualify the new benchmarks set for learning outcomes.[2] The passing criterion has to be absolute one rather than relative.

3. The need of reformation in engineering education.

As per 2019 survey of aspiring mind More than 46% of engineers seek core engineering jobs followed by software jobs (44%). [2] In this decade there was a boom of employment opportunities in sales and marketing jobs, content developers, technical creative writers but the survey says that major number of students from tier1 and 2 wanted to do the core engineering job in a first preference and software related jobs as a second choice. In fact according to survey tier 3 colleges students are aspired to do the above mentioned non-technical managerial job. This shows that these aspiring engineers still strive for the core field jobs but they are not able to get it without proper training of proper skill sets .Many of the companies denies the candidate those are having only degree certificate.[5]

The possible reason could be-The engineering degree certificate without any special developed skill set is not different than any other trade degree certificate.

The students themselves or parents of this graduate engineers now believes that after engineering it is mandatory to do the job oriented courses otherwise the engineering degree is same as that of BA or BCOM degree. Students are spending thousands of rupees for Computer language courses, Networking, Telecomm, CDAC, embedded system, CAD, CAM. Piping, Other system software and what not. They are not only investing the money but also the precious time period after degree which varies from 3 months to a year. Though this courses gives job guarantee they have many "* condition applied" for that. This practice is increasing day by day .In Tier 3 cities this trend is becoming popular. These students take admission in any college which is available in their district which is not having single accreditation, low faculty ratio, poor lab facilities. Students complete their degree over there. These colleges which are running out of student easily give admission to students in any nominal fees. After completing the degree these students come to metro cities and choose the job oriented courses and find a way for job, but many times these students are not good at communication skills, aptitude skills, interview techniques which may become hurdle for job hunting.

4. Where is the problem?

Substandard engineering education is the main problem in front of India. Except IITs and other prestigious technology institutes, most of the engineering colleges fail to provide a quality education to engineering student that will lead them to get suitable jobs. [1]

The Engineering education system needs reforms.

5. A Reformative approach for improving employability-

Some universities have already adopted internship to improve skill sets and industry-academic connection where students have to approach industry for internship which may be paid or unpaid. Considering this approach the ratio of engineering aspirants and industry giving internship is very low. [6]

In this paper we are suggesting one reformation which my help future engineer to get the job on the basis of skill sets.

1. It is observed that the need of industry is certain skill sets in the specific courses. For example- PLC programming, Java, C programming, embedded system, VLSI, Telecomm etc. Students learn these subjects more theoretically rather than practically. In this approach we have suggested reformation for last year's second semester syllabus. Instead of theory subjects in last semester there should 3 to 4 job oriented course offered by university. In these job oriented courses students should get full practical knowledge and hands-on practice. For these courses interested faculties should be given Industrial training for particular course or university should approach to some companies which can provide the training to faculties on particular skill sets.

2. There should be two ways for student-First way is traditional engineering for those who wish to go for higher studies or civil services other government exams and other way is above mentioned dedicated skill set engineering.

3. Students those who complete the engineering with certain skill set should get the certificate like-e.g. bachelor of ngineering with PLC certification. The skill sets may be embedded system, cad cam, java etc.

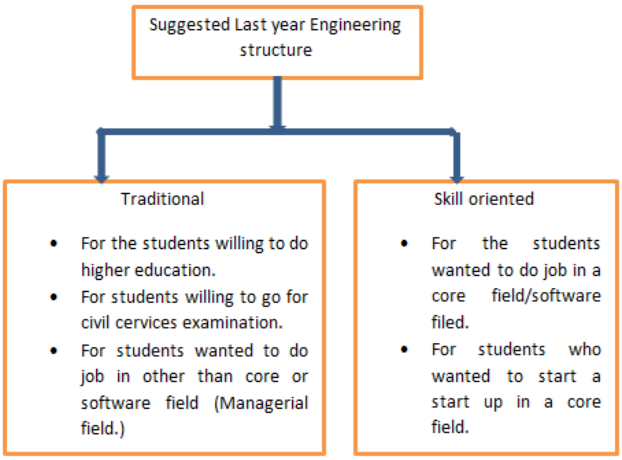


Fig. 1 Suggested Approach

6. Advantages

1. Because of these type of system students will acquire certain skill sets in their favourite core subject.

2. Students won't require investing money and time again in job oriented courses and engineering degree will be self-sufficient to get the job.
3. Employability will increase.

7. Challenges-

1. Separate examination pattern or evaluation criterion has to decide while awarding grades to these courses.
2. Establishing this system is a challenge itself. Colleges have to invest in lab setting and training of the staff.
3. Fee structure will change for last year and there will be no reservation benefits for this system.

To overcome the challenges and to adopt the proposed reformation to improve the employability the choice based credit system can be implemented. This gives freedom to students for selecting the courses from given pool of subjects to earn the credit required for the courses. [3]

8. Conclusion-

Students seek admission in engineering with great hopes of getting placed in good companies but the loopholes in the engineering education system turns out to be nightmare now a days. Reformation in engineering is happening but the syllabus only changes or examination pattern changes for that matter but there is no reformation in terms of acquiring skill sets which the main cause of employability, even to start the start-up or to become entrepreneur. A serious thought on structure reformation in much needed considering the awful employability status of Indian engineers. The stated idea of introducing dedicated skill set program in last year engineering syllabus can be helpful to improve the dreadful figures of employability now a days

References

[1] "India is in the middle of an engineering education crisis"- Downloaded from the website: https://economictimes.indiatimes.com/industry/services/education/india-is-in-the-middle-of-an-engineering-education-crisis/articleshow/63680625.cms

[2] Aspiring Mind, National Employability Report – Engineers- Annual Report 2019. Downloaded from the website of Aspiring Mind.

[3] Aithal, P. S., & Kumar, P. M. S. (2016). Analysis of Choice Based Credit System in Higher Education. International Journal of Engineering Research and Modern Education (IJERME), 1(1), 278- 284.

[4] Kaur, A. & Sharma, M. (2016). Academic curriculum reform of Indian higher education: Choice Based Credit System (CBCS). International Journal of Advanced Research in Education and Technology. P.g- 78-80.

[5] Zhou Yu, Qi Jingyao,(2013).Education Reform and Innovation in View of Globalization, Higher Engineering Education, 1-7

[6] Sharma, Sahil, Sharma, Purnendu, Indian Higher Education System: Challenges And Suggestions,(2015) Electronic Journal for Inclusive Education, Vol. 3, No. 4, pp.3-4.

Skill Based Evaluation Technique for Software Development Projects in Higher Education

Ravindra J. Mandale[1], Amol C. Adamuthe[2]

[1,2]Rajarambapu Institute of Technology, Rajaramnagar
[1]ravi123.mandale@gmail.com
[2]amol.admuthe@gmail.com

Track No:5
Track Name: Skill and Entrepreneurship

Abstract: The important requirement of IT industries from graduates are critical thinking, problem solving skills, programming skills, domain knowledge, soft and cognitive skills, communication and comprehension skills. Student academic project is one of the most important course that can easily address most of these issues. Industry practices for software development are not directly applicable to plan, execute, monitor and evaluate academic projects due to time constraints. This paper presents a skill based project evaluation technique for undergraduate software development academic project. Proposed evaluation technique focus on assessment of student's engineering skills, core skills, personal characteristics and communication skills at individual and group level. It evaluates student project from all employability dimensions by considering innovative practices used in IT industry. The skill based continuous evaluation technique for third year and final year B. Tech students showed improvement in timely completion of deliverables for in-house and sponsored projects with increase in placement and achievements in different project competitions.

Keywords: Project evaluation, Student employability ratio, Skill based evaluations, Outcome based education.

1. Introduction

According to National Employability Report presented by National Association of Software & Services Companies (NASSCOM) and many leaders in software industry, 80-94 percent of engineering graduates are not industry ready due to lack of graduate attributes. There is wide gap between IT industry and institutes because of mismatch in what industry demands and what institute provides. This gap is increasing significantly day by day due to lack of domain knowledge, inabilities of adopting recent technologies, old curriculum, poor assessment methodologies, etc. By considering all these challenges and problems, many of the engineering colleges add mini project and final year B. Tech/B.E. project in their curriculum to apply theory learned by students into practice. Projects plays avery important role in testing the knowledge of students in all aspects such as domain knowledge, soft skills, team management skills, communications skills, etc. The Student academic projects are often considered as genuine proof of the technical expertise the student gained over the course of study. Most IT interviewers consider the academic projects very seriously during interview, as in the case of most graduates, it is the only technical or practical work done by them. Student's project is the course that the interviewer asks and tests student's ability of solving problem. We can solve social, environmental, health problems using this project course. A project defined by Good [1] as 'a significant, practical unit of activity having educational value and aimed at one or more definite goals of understanding; involves investigation and solution of problems and, frequently, the use and manipulation of physical materials; planned and carried to completion by the pupils and teacher in a natural "real-life" manner'.

The existing evaluation technique for projects in IT department focusses more on technical requirements of project such as tool, technologies, coding done, report etc. It loses its focus on teamwork, communication, software engineering practices used, latest technologies used in IT industry for project activities.

The main objective of this paper is to present skill based evaluation technique to motivate students to take project rigorously to develop problem solving, self-learning abilities, and employability skills. Skill based evaluation technique for academic projects actively engages students in project activity, to be focussed to achieve project deliverables, working hard to get prizes, give equal opportunities to carry out the project work. The remaining paper is divided as follows. Section 2 presents related work. Section 3 contains proposed skill based evaluation technique. Section 4 presents results achieved and analysis is done. The conclusion and future work is given in section 5.

2. Related work

This section describes work done by different authors for assessing the student projects. Rafal and Aneta, 2017[2] discussed three dimensions for software engineering projects in academics such as project quality, project efficiency with social factors and client satisfaction. Based on these three parameters academic project are judged.

Sánchez et al., 2014 [3] presented evaluation and assessment criteria for testing student's professional skills such as Entrepreneurial attitude and innovation, Sustainability and social commitment, Foreign language, Effective oral and written communication, Teamwork, Proper use of information resources in project work. They presented a proposal for the evaluation of final year project based on the recommendations of "Guidelines to the evaluation of competences in the Bachelor and Master Degree thesis in engineering". The assessment is based on three evaluation milestones like Initial milestone, the Follow-up milestone, and the Final milestone.

Boettge, 2010 [4] proposed assessment tool with rubrics for technical communication of students. The author found the limitations of traditional evaluation such as bias, whims. Rubrics plays a vital role in indirect measurement of students. Rubrics helps evaluator for transparent evaluations and clearly distinguishes the students. They are strongly recommended for project work, as we cannot measure soft skills like work using direct measurement.

Derrick and Stevens, 2005 [5] proposed award competition for best student projects for improving student's engagement in project activity. This type of competition motivates students to self-learning abilities, confidence and modern tool usage qualities.

Raibulet and Fontana, 2018[6] presented experience in collaboration and teamwork parameters of students involved in project activity. This paper introduced the use of GitHub, Microsoft tool for evaluating collaboration and teamwork based on the use of these tools. Based on the operations performed on these tools for projects, collaboration and teamwork is judged.

To cater the needs, we proposed skill based evaluation technique for undergraduate student's project evaluation.

3. Proposed Skill Based Evaluation Technique

This section presents skill based evaluation technique used for third year mini projects and final year B.Tech projects in information technology department.

The course outcomes of project are as follows:

- Identify, formulate engineering problems by applying engineering principles
- Solve real life problem and provide software solution for them
- Demonstrate abilities of analysis, design and implementations

Strengths of proposed evaluation technique

This subsection covers proposed evaluation and assessment strategy for student projects. The evaluation technique adds transparency in evaluation, justice to each student, differentiation in student skill wise. It justifies clearly as project course has more credits as compare to other courses.

The skill based evaluation techniques is divided into three phases.

1. Continuous evaluation
2. Focus of individual and group evaluation
3. Evaluation based on employability skills

A) Continuous evaluation

Third year mini project course (Code: IT3561) has In Semester Evaluation (ISE) for 100 Marks. We divided these 100 marks into 4 evaluations: Synopsis Review, Design evaluation, Coding and final evaluation. As per the curriculum, mini project has to complete in sixth semester only.

Final year B.Tech course has In Semester Evaluation (ISE) for 50 marks and End semester examination (ESE) for 50 marks. In ISE, there are three evaluations: 15 Marks, 15 Marks and 20 Marks.

B) Individual and group evaluation

Table 1 indicates group and individual level contribution in mini projects and final year B. Tech projects respectively. We thought that student's group level performance is also important as it tests teamwork, task completion by team, task distribution among group members.

Table 1.Mini and mega project level contribution

Course	Class	Group level contribution	Individual level contribution
Mini Project-II	Third year Undergraduate Engineering Program	60%	40%
Final year Capstone Project	Final year Undergraduate Engineering Program	45%	55%

Our technique evaluates student projects at two levels: individual and group level.

Individual level skills are as follows:

- Communication
- Presentation skills
- Domain knowledge and Q/A
- Contribution in project work

Group level skills are as follows:

- Topic selection, definition, analysis
- Software requirement specification
- Designing skills
- Tools, Technologies, frameworks used
- SDLC follow-up
- Sprint planning
- Project deployment
- Report writing

C) Mapping to employability skills

Ali et al., 2019 [7] examined the different skills required while selecting graduates by IT industry. They categorized skills into four factors namely Specific skills, Core Skills, Personal Characteristics and Communication Skills, given in Table 2 and 3.

Table 2. Skills under four factors

Specific skills	Core Skills Personal	Personal Characteristics	Communication Skills
Word processing	Self confidence	Business ethics	Listening skills

knowledge			
Database knowledge	Critical thinking	Professionalism	Speaking skills
Spreadsheet knowledge	Creative thinking	--	Written skills
Ability to adapt to changing technology	Interpersonal skills	--	Communication
Technical skills	Leadership skills	--	--
Mathematical skills	Experience with real world problems	--	--

Table 3 Skills grouped into three factors

Core employability skills	Professional skills	Communication skills
Integrity	Identify, formulate and solve technical/engineering problem	Written communication
Self-discipline	Design a system to meet desired needs	Design and conduct experiments
Reliability	Customer service skills	Reading
Self-motivated	Knowledge of contemporary issues	Verbal communication
Team work	Use of appropriate/modern tools, technologies	Communication in English
Entrepreneurship skills	Creativity	Technical skills
Understands and takes directions for work	Apply knowledge of maths, science and engineering	Basic and advanced computer

.

Table 4 indicates mapping of parameters considered in evaluation to skills required from candidates while recruitment of IT industry

Table 4. Mapping of evaluation parameter to skills

Parameters	Core employability Skills	Professional skills	Communication skills
Identification/Selection of problem domain/sub-domain	√	√	√
Literature survey/information gathering	√	√	√
Identification of problem with broad objectives	√	√	--
Broad system design addressing gaps in existing system. Novelty of solution.	√	√	--
Identifying Functional & Non-Functional requirements	--	√	--
Adoption of latest Software Engineering practices used in industries (like Agile/Code and Fix /Prototyping etc.) for development	--	√	--
Design of system (Hardware/software)	--	√	--
Design of database system	--	√	--
Implementation of system as per requirements	--	√	--
Use of appropriate tools/technologies for coding the modules, Use of coding conventions	--	√	--
Project integration using GitHub	--	√	--
Testing of the project with appropriate use of tools/techniques	--	√	--
Project deployment using GitHub/Google Play/client side	--	√	--
Report writing – Requirement specification document, design document, coding manual, testing document, user manual	--	--	√
Organization and readability of report	--	--	√
Use of report writing (LaTex), English checking and Plagiarism	--	√	√

tools			
Use of visuals and presentation tools	--	√	√
English communication- Presentations for synopsis, design document, project completion	--	--	√
Body language and eye contact during presentations	--	--	√
Project plan as per agile methodology – Roles and responsibility of individuals, project planning and monitoring	√	--	--
Work completion as per activity chart. Use of sprint planning.	√	--	--
Teamwork/leadership	√	--	--
Participation in competitions	√	--	√
Use of recent Information Technologies to solve the problem	--	√	--

4. Results and Discussion

This section discusses about the result received by Skill based techniques presented.

We proposed skill based evaluation technique for third year and final year project by considering their scope, deadlines and technologies to be used for projects. The projects selected by students belongs to different categories such as mobile app development, Websites, Research based, IOT based products. For most of the third year project topics are taken from Smart India Hackathon Competition 2019 to maintain innovativeness and solve real world problem. For final year B.Tech project, student have flexibility to select the sponsored project topics from clients or industry, their own idea or future potential idea.

As part of result analysis and comparison, we compare the marks scored by third year students in mini project course with their performance in interviews conducted for industry internship program (IIP). Table 3 shows the correlation between evaluation and employability status . Analysis show that the student who got more marks in mini project, they are selected in interviews except some cases. We analyse that out of 66 students who shown interest in IIP track, only 30 students are selected from final interview. The selected students for IIP track received marks in the range of 11.36 to 14.39 out of 15.

Table 5. Correlation between evaluations and employability status

Roll No.	Core employ ability Skills (5 marks)	Professi onal Skills (5 marks)	Comm unicati on skills (5 marks)	Total (15 marks)	Emplo yabilit y status (Yes/N o)
S1	4.73	4.92	4.65	14.31	**Yes**
S2	4.39	4.75	4.30	13.44	**Yes**
S3	3.75	4.42	3.91	12.09	No
S4	4.56	4.71	4.60	13.88	**Yes**
S5	3.56	4.35	3.60	11.53	No
S6	3.21	3.5	3.17	9.89	No

Figure 1 shows number of students achieved grades (Excellent: 4 to 5, Good: 3 to 3.99, Average: 2 to 2.99 and Poor: 1 to 1.99) in core, professional and communication skills of mini projects.

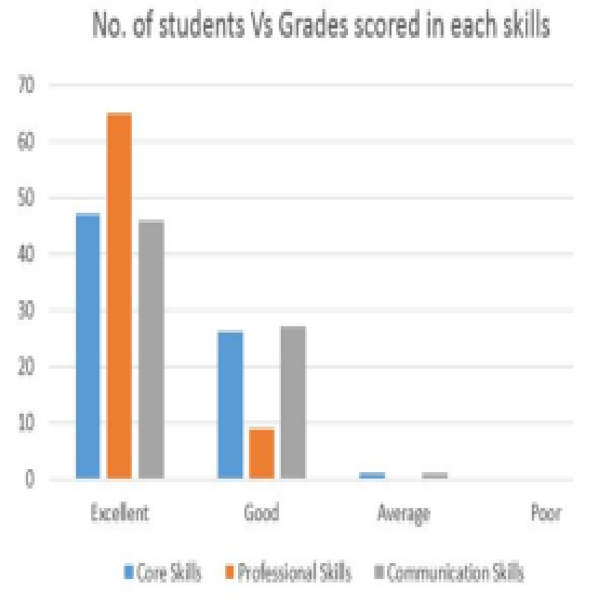


Fig.1 No. of students vs grades scored in each skills

- False acceptance= Student who got less marks but they are selected
- False rejection=Students who got good marks but they are not selected

There are some students who scored good marks but they are not selected in interview i.e. false rejection, it may be due to less mark in professional skills as there is more weightage to core and professional skills in interview evaluation. There is not any case of false selection. There are 14 cases of false rejection. This is lacuna of our system

Table 6 indicates the marks scored by final year students in their mega projects and result whether they are placed in company or not. Analysis shows that the students who got more marks; they fulfil the skill requirements of industry hence they are placed in industry.

Table 6. Correlation between evaluations and employability status

Roll No.	Core employ ability Skills (5 marks)	Professi onal skills (5 marks)	Communic ation skills (5 marks)	Total (15 mark s)	Sele cted (Yes /No)
S1	4.75	4.52	5	14.27	**Yes**
S2	5	4.42	4.42	13.85	**Yes**
S3	2.25	2.76	2.57	7.58	**Yes**
S4	4.25	4.52	4.28	13.05	No
S5	1.62	2.71	1.71	6.05	No
S6	4	4.33	3.28	11.61	**Yes**

Out of 45 students in final year B.Tech class, 18 students are selected and 27 are not selected in companies. The placed students received marks in the range of 9.62 to 14.27. As per the formula given above, there is only 1 false selection and 26 false rejection. Figure 2 shows the number of student
achieved grades in each skills for final year projects.

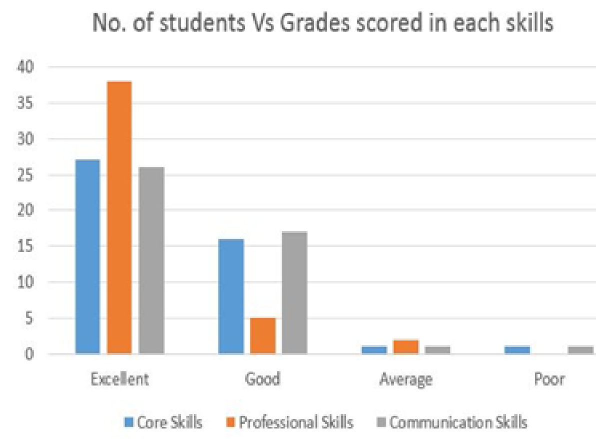


Fig.2 No. of students vs grades scored in each skills

5. Conclusions and future work

The skill based evaluation techniques for student projects showed improvement to project objectives. The proposed evaluation methodology improves student achievements in project competition, paper presentation. This technique is able to test students at two levels i.e. individual and group level. In addition to this, domain knowledge, soft skills, team management skills, communications skills etc. are judged using rubrics based evaluation. The evaluation technique motivates student to write reports using Latex tool. The results given by proposed technique are matching with success of students in Industry Internship selection and campus placement.

As the current mini project evaluation contributes more at group level, this leads to get some incorrect results. The current evaluation sheets will be modified to get the more accurate results. Future work includes implementation of proposed skill based evaluation for second, third and final year of all projects.

References

1. GOOD, C.V. (1973), 'Dictionary of education', McGraw-Hill
2. R. Włodarski and A. Poniszewska-Marańda, "Measuring dimensions of software engineering projects' success in academic context," *2017 Federated Conference on Computer Science and Information Systems (FedCSIS)*, Prague, 2017, pp. 1207-1210.
3. F. Sánchez *et al.*, "Evaluation and assessment of professional skills in the Final Year Project," *2014 IEEE Frontiers in Education Conference (FIE) Proceedings*, Madrid, 2014, pp. 1-8.
4. R. K. Boettger, "Rubric Use in Technical Communication: Exploring the Process of Creating Valid and Reliable Assessment Tools," in *IEEE Transactions on Professional Communication*, vol. 53, no. 1, pp. 4-17, March 2010.
5. E. J. Derrick and K. T. Stevens, "Work in progress - using emerging technologies to assess student software development projects," *Proceedings Frontiers in Education 35th Annual Conference*, Indianapolis, IN, 2005, pp. F4G-19.
6. Claudia Raibulet, Francesca Arcelli Fontana, "Collaborative and teamwork software development in an undergraduate software engineering course*",* *Journal of Systems and Software*, Volume 144, 2018, Pages 409-422
7. Ali, Fadzilah Akmal & Long, Yasmiza & Zainol, Fakhrul & Mansor, Maslina. "Student's Self-Perceived Importance of Employability Skills Needed: A Case Study In University of Sultan Zainal Abidin (Unisza)", Malaysia, 2019

Assessment of Knowledge Management Practices in Indian Universities

P. M. Pathak,

HOD and Sr. Lecturer in Chemical Engg,
K. K. Wagh Polytechnic, Nashik.
pmpathak@kkwagh.edu.in
Track No: 06
Track Name: Academic Governance

Abstract
There is need to identify, develop, record and utilize knowledge of experts in higher education domain. Universities are generating huge knowledge useful in academics, administration and research, but not having strong mechanism to capture, store, process and utilize knowledge. Universities in Maharashtra can also enjoy the benefits of Knowledge Management and can make their existing e-Governance practices more effective and efficient. Assessment of existing KM practices in Universities including Personal Knowledge Management Practices among University stakeholders conducted. A model for effective KM in Universities is proposed which will be guiding force for institutions of Higher Education.
Key words: KM, Personal Knowledge Management, University, e-Governance

1. Introduction

In new age economy, many entrepreneurial opportunities are created and knowledge management is one of the promising areas for entrepreneurs. As large number of organizations are joining knowledge management league, more such opportunities are crated. Not only profits making companies but also non-government organizations and public institutions like universities have also realized the importance of knowledge management in their organization and looking for fruitful results out of the knowledge management based processes. But as not all can appoint fulltime expert employees for knowledge management tasks, entrepreneurial opportunities exists in the areas including consultancy, knowledge capturing services, knowledge sharing services, knowledge storing services, knowledge analytics. In Maharashtra as private universities are coming up, they would like to follow best practices of private universities in the county and the world. As organizations have realized importance of knowledge sharing and knowledge management more and more entrepreneurial opportunities will be created and there is need of experts in knowledge management domain with entrepreneurial aptitudes to grab this opportunity.

Knowledge Management (KM) refers to practices used by organizations to find, create, and distribute knowledge for reuse, awareness, and learning across the organization. Knowledge Management programs are typically tied to organizational objectives and are intended to lead to the achievement of specific outcomes such as shared intelligence, improved performance, or higher levels of innovation.

Knowledge Transfer (an aspect of Knowledge Management) has always existed in one form or another through on-the-job discussions with peers, apprenticeship, and maintenance of agency libraries, professional training and mentoring programs. Since the late twentieth century, technology has played a vital role in Knowledge Transfer through the creation of knowledge bases, expert systems, and other knowledge repositories.

To understand knowledge management and knowledge transfer, it is helpful to examine the differences between data, information, and knowledge.

Data is discrete, objective facts. Data is the raw material for creating information. By itself, data carries no judgment, interpretation or meaning.

Information is data that is organized, patterned and/or categorized. It has been sorted, analyzed and displayed, and is communicated through various means. Information changes the way a person perceives something, thus, affecting judgment or behavior.

Knowledge is what is known. It is richer and more meaningful than information. Knowledge is gained through experience, reasoning, intuition, and learning. Because knowledge is intuitive, it is difficult to structure, can be hard to capture on machines, and is a challenge to transfer. We often speak of a "knowledgeable person," and by that we mean someone who is well informed, and thoroughly versed in a given area. We expand our knowledge when others share theirs with us. We create new knowledge when we pool our knowledge together.

Knowledge Management strategies and tools

There are many ways for an organization to identify, store, and transfer knowledge. Some strategies will work better in one organization than another. Some may not be appropriate for specific types of content. The challenge is to identify and develop complementary ways to further knowledge management and transfer in an organization.

After Action Reviews:

These debriefings are a way to identify, analyze, and capture experiences, what worked well and what needs improvement, so others can learn from those experiences. For maximum impact, after action reviews should be done either immediately following an event or on a regular basis, with results shared quickly among those who would benefit from the knowledge gained.

Best Practices:
The identification and use of processes and/or practices that result in excellent products or services. Best practices, sometimes called preferred practices, often generate ideas for improvements in other organizations or work units.

Co-op/Internships:
Formal arrangements are established for an experienced person to pass along knowledge and skills to a novice. In New Hampshire State government, the Co-op/Intern Educational Placement Program serves as a recruiting tool for agencies. The program helps agencies meet their short-term staffing needs in critical skill areas. It also serves as a mechanism for students to obtain practical on-the-job experience and academic credit as part of their educational experience.

Communities of Practice:
Groups of individuals who share knowledge about a common work practice over a period of time, though they are not part of a formally constituted work team. Communities of practice generally cut across traditional organizational boundaries. They enable individuals to acquire new knowledge faster. They may also be called Communities of Interest if the people share an interest in something but do not necessarily perform the work on a daily basis.

Documenting Processes:
Developing a written or electronic record of a specific work process that includes the business case for the process, steps in the process, key dates, relationship to other processes that come before and after, key players and contact information, any required references and legal citations, back-up procedures, and copies of forms, software, data sets, and file names associated with the process.

Document Repositories:
Collections of documents that can be viewed, retrieved, and interpreted by humans and automated software systems (e.g. statistical software packages). Document repositories add navigation and categorization services to stored information. Key word search capability is often provided to facilitate information retrieval.

Expert Interviews:
Sessions where one or more people who are considered experts in a particular subject, program, policy, or process, etc. meet with others to share knowledge. Expert interviews can be used in many ways, including capturing knowledge of those scheduled to leave an organization, conducting lessons learned debriefings, and identifying job competencies.

Job Aids: These are tools that help people perform tasks accurately. They include things such as checklists, flow diagrams, reference tables, decision tree diagrams, etc. that provide specific, concrete information to the user and serve as a quick reference guide to performing a task. Job aids are not the actual tools used to perform tasks, such as computers, measuring tools, or telephones.

Knowledge Audits:
Knowledge audits help an organization identify its knowledge assets, including what knowledge is needed and available. They provide information on how knowledge assets are produced and shared, and where there is a need for internal transfer of knowledge.

Knowledge Fairs:
These events showcase information about an organization or a topic. They can be used internally, to provide a forum for sharing information, or externally, to educate customers or other stakeholders about important information.

Knowledge Maps and Inventories:
These catalog information/knowledge available in an organization and where it is located. They point to information but do not contain it. An example is an Experts or Resource Directory that lists people with expert knowledge who can be contacted by others in need of that knowledge.

Learning Games:
These structured learning activities are used to make learning fun and more effective, provide a review of material that has already been presented in order to strengthen learning, and evaluate how much learning has occurred.

Mentoring:
In mentoring, an experienced, skilled person (mentor) is paired with a lesser skilled or experienced person (protégé), with the goal of developing or strengthening competencies of the protégé.

On-the-Job Training:
Most organizations use some form of on-the-job training where an experienced employee teaches a new person how to perform job tasks. If this happens at random or with no consistent written materials or processes, it is called unstructured OJT. A system of structured OJT differs in that specific training processes are written; training materials and guides exist and are used consistently by all those who train; training is scheduled; records are kept of training sessions; and "trainers" are given training on how to do OJT, how to give feedback, and several other factors.

In **India** NUEPA – National University of Educational Planning and Administration is active in research related to Knowledge Management in Higher Education. Many Indian universities are following Knowledge Management practices but there is need for more focused and structured.

2. Review of Literature

IBM in its publication 'Trust and knowledge sharing: A critical combination' concludes that, Fostering knowledge sharing is more than simply putting people together in a conference room or sending them on experiential learning programs. It is about creating an environment in which people are able to discern whether their colleagues are both knowledgeable and willing to extend their knowledge to the benefit of others. Without building a sense of competence- and benevolence-based trust between the knowledge seekers and sources, firms will find it difficult to take advantage of perhaps their most valuable resource, their employee know-how. Although trust is negotiated by people firsthand, managers can play a substantial role in creating the conditions through which trust is developed and fostered.

Stephen Gourlay in his article, 'The SECI model of knowledge creation: some empirical Shortcomings' states that, it is important to manage knowledge for a variety of reasons, then it is equally important that we have good models to assist this process. Nonaka and his colleagues' model, in particular the SECI matrix of knowledge conversion, is increasingly being cited by authors in a widening set of disciplines, and has evidently achieved something like a paradigmatic status.

Yogesh Malhotra of Syracuse University, USA in his paper, 'The Knowledge Application Gap in Information Systems Research and Education and their Quest for the Dependent Variable' states that, In the information resource management and information systems literatures, the quest for the dependent variable has emphasized the need to connect the information resource and technology inputs to specific performance outcomes. In other words, research studies and frameworks involving adoption and implementation of new technologies and business technology innovations need to include realistic implications for performance outcomes.

HalilZaim in his paper, 'Knowledge Management Implementation in IZGAZ' states that, Managing knowledge efficiently and effectively is considered a core competence for organizations to survive in the long run. The capability of organizations to leverage their knowledge resources seems to be one of the most important parameters from the strategic perspective. Nevertheless, the evolution and implementation of Knowledge Management is still in its infancy in Turkey, leading to the difficulty in composing a comprehensive and applicable KM framework for organizations in Turkey.

Karl M. Wiig of Knowledge Research Institute, Inc. Arlington, Texas, USA in his paper, Application of Knowledge Management in Public Administration states that, Knowledge Management (KM) plays important roles in Public Administration (PA). Each role serves specific constituencies and purposes and is implemented differently. Jointly, they build society's intellectual capital (IC) to improve the effectiveness of public and private decision making and situation handling. Four Public Administration KM areas are considered: Enhance decision making within public services; Aid the public to participate effectively in public decision making; Build competitive societal IC capabilities; and Develop knowledge competitive work force. Numerous KM approaches are adopted to serve these purposes.

Jeffrey Cummings in article 'Knowledge Sharing: A Review of the Literature' states that, Since 1996, when the Bank made a commitment to become a global knowledge bank, it has taken numerous steps to improve its information systems, strengthen internally and externally focused knowledge-sharing activities, and foster broader global knowledge-sharing initiatives, all in support of enhancing the Bank's and its partners' and clients' access to and sharing of ideas

In paper **Knowledge Management and Higher Education: A UK Case Study**, Desireé Joy Cranfield and John Taylor of University of Southampton, UK states that their Case Study utilizes Stankosky's Knowledge Management pillars to enterprise learning – leadership, organization, technology and learning - as a lens to investigate and understand Knowledge Management practices and perceptions within Higher Education Institutions, looking at challenges of implementation within this sector. Higher Education Institutions within the United Kingdom are very complex institutions, with diverse backgrounds, history, culture, resources and missions. The University presents itself in today's knowledge economy with a dichotomy of priorities, one which aims to provide quality teaching and research activity, and the other, to ensure effective and efficient management and administration within an increasingly competitive market.

The Case Study utilizes Stansky's Knowledge Management (KM) pillars to enterprise learning – leadership, organization, technology and learning - as a lens to investigate and understand Knowledge Management practices and perceptions within Higher Education Institutions, looking at challenges of implementation within this sector. Higher Education Institutions within the United Kingdom are very complex institutions, with diverse backgrounds, history, culture, resources and missions. The University presents itself in today's knowledge economy with a dichotomy of priorities, one which aims to provide quality teaching and research activity, and the other, to ensure effective and efficient management and administration within an increasingly competitive market.

The requirement by the Office of Public Sector Development Commission of Thailand, has listed KM as a key indicator in measuring a university's performance .It states that the successful level of KM practice in a university is a primary factor in measuring the university's performance.

Thai universities, including KhonKaen University (KKU), use KM as a tool for improving university performances by focusing on general management works

However most of the Thai universities have not been able to successfully implemented KM due to a lack of good KM strategic planning.

AdilLaoufi of **Morocco** in his paper Using Knowledge Management in higher education states that the work in the **Czech Republic** (Czechoslovakia), presented in (Mikulecká,2000). This work demonstrates the importance of the KM in universities and colleges by giving some examples of KM processes such as student registration, budget allocation, etc. Similar work was done by the ISKME U.S. research institute. This paper explores the extent of the KM approaches in education; it also presents a roadmap for the next coming years. The main objective of this work was to propose recommendations for practical solutions to improve knowledge sharing and reform decision-making within university institutions. Other more recent proposals address the application of KM in universities using the ERP (Enterprise Resource Planning) and e-learning.

3. Methodology

The study has adopted Popular Research Methodology normally adopted in conducting Management Research. The research adopted is 'Descriptive and Analytical method'. The Research Methodology considered popular methods for understanding collection of data, editing, classification and interpretation of data. The objectives of the study were kept in mind to develop a supportive research methodology.

Significance of the Study:

There is need to identify, develop, record and utilize knowledge of experts in Higher Education system.

Universities are generating huge knowledge useful in academics, administration and research. But not so strong mechanism exits to capture, store, process and utilize knowledge in the university system. Universities in Maharashtra can also enjoy the benefits of Knowledge Management and can make their existing e-Governance practices more effective and make the university system more efficient. Therefore it is needed to understand the existing corporate practices in Knowledge Management, its application to University system, assessing existing KM practices in Universities including Personal Knowledge Management Practices among University authorities and officers. The problems in KM in Universities also need to understand. A model for effective KM in Universities needs to be proposed which will be guiding force for institutions of Higher Education.

As per discussions conducted for the research purpose with experts including university officials Information Communication Technology experts, members of academic authorities, the study titled 'A Study of Knowledge Management Practices in Select Universities of Maharashtra' was initiated.

The present study is conducted with the following objectives:

1. To understand Corporate Knowledge Management Practices and its applicability in Universities.
2. To assess existing Knowledge Management practices in Select Universities in Maharashtra
3. To study personal knowledge management practices among authorities and officers of universities.
4. To understand significant benefits of Knowledge Management in Select Universities of Maharashtra.

Primary data is collected with the help of structured questionnaires/Interview. Four universities of Maharashtra namely North Maharashtra, Dr.BAMU, Pune and Tilak Maharashtra are considered for study.

Collection of data from University stakeholders including –

- University officers
- University Authorities
- University Associates - Administration
- University Associates – Academic

4. Conclusion and Discussion

Laptop is the most preferred computing device used for storing, processing and sharing information by university officers followed by desktop pc, smartphone and tablet or PDA.

As per as the Personal Information Management (PIM) practices of University officers are concerned, majority of university officers add information to their Personal Information Management tool once a week. Considerable one fourth adds information on daily basis. Monthly basis backup of data is preferred by university officers. Half of the university officers retrieve information from their Personal Information Management tool on daily basis.

Email is the highly used medium by university officers for sharing valuable information/knowledge to their University colleagues. While very few use social networking for sharing valuable information/knowledge. The use of professional information integration software like IBM Notes, blackberry tools etc. is limited to about one fifth university officers. There are some universities officers who only use pen drive to share valuable information/knowledge and avoid using email or social networking or blackberry like services.

University officers suggested to have written knowledge management/sharing policy or strategy as currently it does not exist as per opinion of most of the officers.

Even though universities do not have written knowledge management/sharing policy but currently Universities do have a value system or culture intended to promote knowledge Sharing.

Universities does not have has Policies or Programs intended to improve employee retention and officers recommend to have same.

Universities have partnerships or strategies alliances to acquire knowledge and officers found it very useful practice.

Universities do not have formal KM unit or post of Knowledge Officer. Also definite criteria assessing employee KM/Sharing performance does not exist. It is recommended by officers.

Half of the offers are of the opinion that KM is the primary responsibility of top management while half say that it is primary responsibility of middle management in the university.

Universities are using knowledge obtained from other Institutes of Higher Education. Knowledge from industry need to be used as currently it is not much used by universities.

Universities are extensively using the Internet to obtain external knowledge and have dedicated resources to obtain external knowledge. Also universities are encouraging staff to participate in project teams with external experts.

Currently universities are not providing formal training related to knowledge management practices to its officers and officers have suggested same to be implemented.

Universities are not much using formal mentoring practices and offers have suggested implementing same. Universities are encouraging experienced officers to transfer their knowledge to new or less experienced officers.

Universities encourage staff by sponsoring their projects from University Fund. Also Universities offers training to officers or sponsors for outside training in order to keep their skills updated.

The documentation of good work practices, lessons learned or listings of experts is rarely done at universities. Also training manuals, exit interview tips etc. are not much maintained by universities. These practices are recommended by university officers.

All Universities facilitates ICT to its officers for effective communication. Universities organize soft skill training for its officers which also helps in higher knowledge sharing practice.

Currently universities are not paying monetary incentives to officers for their contribution in KM practices and most of the university officers are not implementing the monetary incentive scheme for KM contribution. So also non-monetary incentive scheme for contribution to KM does not exist in any university and majority of officers are not of the opinion to have such incentive scheme.

Knowledge Management tool recommended by university officers according to importance given by them for implementation are as follows –

- Sharing Best Practices
- After Action Reviews (AAR)
- Implement Knowledge Plan [Based on knowledge strategy] and Establishing Knowledge Centers
- Communities of Practice (COP)
- Exit Interviews
- Peer Assists
- Knowledge Audit
- Knowledge Harvesting

5. Recommendations

From the present study we make following recommendations for improving Knowledge Management Practices in Universities of Maharashtra –

- ➢ Very importantly, mutual trust among university officers must be created and nourished for better and better knowledge sharing practice. Top management of the university should adopt formal and informal means for same.
- ➢ The universities should train its officers in efficiently and effectively using Personal Information Management (PIM) tools as this will prepare them for better contribution in Knowledge Management and Knowledge Sharing practices of the university.
- ➢ Universities must understand the importance of Knowledge Management and have written policies and strategies for its implementation. The full time Knowledge Management officer must be appointed for formal leadership to KM practices.
- ➢ The value system or culture for promoting knowledge sharing must be made stronger.
- ➢ Universities must have Policies for employee retention as many new opportunities exist for university officers particularly in private universities, employees which are asset for the organization must be retained.
- ➢ Universities should have partnerships or strategies alliances with more and more number of professional organizations and institutes of higher education, research to acquire knowledge which will help in keeping their officers updated.
- ➢ Universities should have definite criteria assessing employee KM/Sharing performance.
- ➢ The responsibility of knowledge management must be properly assigned to officers at all level.
- ➢ Universities should make more and more partnerships with industries so that updated knowledge from industry will help in updated curricula, teaching methods and research objectives.
- ➢ Universities should provide formal training related to knowledge management practices to its officers and officers.
- ➢ Universities should have formal mentoring practices. The knowledge flow of senior officer to new or less experienced officer need to be encouraged.
- ➢ Universities should have considerable budget for sponsoring projects of officers from University Fund and efforts should be made for more and more good projects from university fund. Also dedicated training center must be established for training university officers in order to keep their skills updated.
- ➢ The documentation officers must be appointed and documentation of good work practices, lessons learned or listings of experts should be done.
- ➢ Training manuals, exit interview tips etc. to be maintained by universities.
- ➢ Universities should adopt latest ICT devices and train their officers for same. Also regular soft skill training

for its officers is necessary which will also help in comfortable knowledge sharing practice.

- University staff must be recognized and awarded for their contribution to KM activities in the university. This will motivate others for higher contribution in KM.
- Taking university officers in confidence combination of tools mentioned below must be implemented in the university for improved Knowledge Management practices -

Sharing Best Practices –

- After Action Reviews (AAR)
- Implement Knowledge Plan [Based on knowledge strategy] and Establishing Knowledge Centers
- Communities of Practice (COP)
- Exit Interviews
- Peer Assists
- Knowledge Audit
- Knowledge Harvesting

6. **References**

1. Xing, K. S. (2006). Adaptive processes for knowledge creation in complex systems : The case of a global IT consulting firm. *Elsevier Information and Management*, 530 - 540.

2. Khalil, J. R. (2007). Application of knowledge management in management education:a conceptual framework. *Journal of Theoretical and Applied Information Technology*, 15 - 25.

3. Oye, N. e. (2011). Knowledge Sharing in Workplace: Motivators and Demotivators. *International Journal of Managing Information Technology*, 71-84.

4. Lavin, D. (2002). *Trust and knowledge sharing: A critical combination.* NY,USA: IBM.

5. Gourlay, S. (2013). The SECI model of knowledge creation: some empirical shortcomings. UK.

6. Malhotra, Y. (2003). The Knowledge Application Gap in Information Systems Research and Education And their Quest for the Dependent Variable. *Information Resources Management Journal*, i - vii.

7. Zaim, H. (2010). Knowledge Management Implementation in IZGAZ. *Journal of Economic and Social Research*, 1-25

8. Wiig, K. M. (2000). *Application of Knowledge Management in Public Administration.* Texas, USA: Public Administrators of the City of Taipei, Taiwan, ROC.

9. Cummings, J. (2003). *Knowledge Sharing:A Review of Literature.* Washington, D.C.: The World Bank Operations Evaluation Department.

10. Hakkarainen, S. P. (2010). *The Knowledge Creation Metaphor* – An Emergent Epistemological Approach to Learning. Helsinki, Finland.

11. Nonaka, D. I. (1997). Organizational Knowledge Creation. *Knowledge Advantage Conference.*

12. Kucza, T. (2001). *Knowledge Management Process Model.* Finland: VTT technical research centre of finland.

13. O'Leary, D. E. (2009). *Technologies for Knowledge Assimilation*. Marshall School of Business, University of Southern California, Los Angeles.

14. L. K. (2009). A Theoretical Framework for Knowledge Management Process:Towards Improving Knowledge Performance. *Communications of the IBIMA*, 67-79.

15. Metaxiotis K., Ergazakis K. and Psarras J. (2005) "Exploring the world of knowledge management: agreements and disagreements in the academic, practitioner community", *Journal of Knowledge Management*, Volume9 No. 2 2005, pp. 6-18

16. Hearn P., Bradier A., Jubert A. (2002), *"Building Communities: Organizational Knowledge Management within the European Commission's Information Society Technologies Program"*, ITcon - Volume 7, pp.63-68

17. Bhatt, Ganesh D. (2001), "Knowledge Management in Organizations: Examining the Interaction between Technologies, Techniques, and People", *Journal of Knowledge Management* Volume 5 Number 1,pp.68-75

18. Robinson H. S., Carrillo P. M., Anumba C. J. and Al-Ghassani A. M. (2004) "Developing a business case for knowledge management: the IMPaKT approach", *Construction Management and Economics*, 22, pp.733-743

19. Taylor, D. J. (Volume 6 Issue 2 2008). Knowledge Management and Higher Education: A UK Case Study. *The Electronic Journal of Knowledge Management*, 85 - 100.

20. Sarawanawong, J. (2009). Development of a Strategic Knowledge Management Model for Thai Universities. KhonKaen University, Thailand.

21. LAOUFI, A. (2011). Using Knowledge Management In Higher Education: Research Challenges And Opportunities. *Journal of Theoretical and Applied Information Technology*, 100-108.

Efficient Data Storage and Retrieval System Using Own Cloud for Higher Education Institutes

Ansari Zakir[1], Khan Tabrez[2], Syed Kaleem[3], Syed Shariq[4]

[1,2,3,4]Anjuman-I-Islam's Kalsekar Technical Campus, New Panvel, Navi Mumbai
[1]hod.me@aiktc.ac.in,hod.co@aiktc.ac.in[2],hod.ee@aiktc.ac.in[3],dean.sop@aiktc.ac.in

Track No: 06
Track Name: Academic Governance

Abstract: In institutes of higher education, record keeping and its retrieval has always been a problem. Often it is required that the same documents which originated from a common source are to be used by multiple users at different places for different purposes. This puts forward multiple challenges ranging from timely retrieval to data security. To overcome all such issues, a safe, secured, updated and efficient retrieval system is installed, configured and maintained at the institute level using open source cloud software called Own cloud. The user groups have been created program-wise. Then the user accounts are created for every faculty and added to specific program group. A directory structure has been created considering the common administrative and teaching-learning requirements of the programs. This structure has been shared with all the faculty members of the respective program. A write access or read access is provided to all the concerned users through which each user has required access on fly. Every faculty user has 1 GB quota and department clerk has 10 GB quota, which can be used to store individual's teaching-learning and administrative records. Such implementation has provided an immediate and efficient access to all the teaching-learning and administrative records at any point of time and any location.

Key words: Data Storage and Retrieval system, Cloud Storage,

1. Introduction:

In higher education institution, the data storage and retrieval is always been a problem. The same data such as students list, their exam results, academic credentials is required at multiple places by different users. This leads to pressure at the origin or source of the data which has to provide service to all the users. Also the changes (if any) made at one place are not visible at others places which leads to confusion. In view of all these problems it was required to have a system which would provide facilitation to all the users of the data at the same time. Also the changes made may be seen by all the users and they could update their data accordingly. The proposed system uses a public cloud called Own cloud to store the applicable data at a single place. The read or write access can be given to different users as per their requirements. This ensures that the data is available to all the users at all the times and they can also access it from any remote location. This can also be extended for keeping the e-learning content and resources on the cloud and giving access to the students by creating their accounts. It also happens that a faculty member was made incharge for some event conducted in a particular program. The various sub events of the program are subdivided among many faculty members who maintain the details of sub events. At the end all such details possessed by many faculty members have to be consolidated by a single person. To get all the details from different faculty members and to consolidate it becomes an issue due to unavailability of all the concerened at the same time. Using this cloud, every detail of that sub event can be uploaded by the respective faculty which can be consolidated by a single person by reffering the cloud. This uploaded information of the event is now holistic from invitation to contents, photographs, feedback etc. Now this holistic report becomes a useful document from NAAC and NBA accreditation perspective. Fig.1 gives the idea of using own cloud by different user groups.

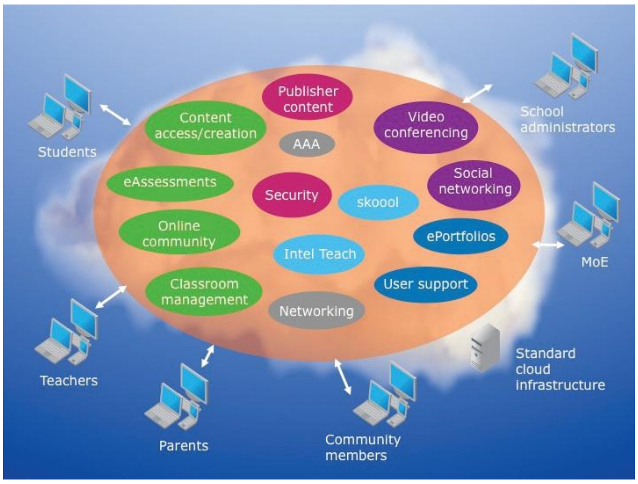


Fig. 1 General Idea of proposed method (Robert Fogel)

2. Related work

There is sufficient research work available in the filed of cloud computing as a tool for teaching learning practices, a few authors have done research in the filed of application of cloud computing for administration and governance. In one of the research works, the attitudes and behavior of the the students of this digital era towards use of Mobile Based Cloud Computing was evaluated as the students are more comfortable with information management practices

(Storing, Retrieving, Share and Apply). In this work a survey of 384 students was conducted to know the attitudes and behavior of the the students of this digital era towards use of Mobile Based Cloud Computing for learning in higher education. The results were later validated using machine learning algorithms. It was concluded that Mobile Cloud Computing should be supported and Encouraged in higher education (Ibrahim Arpaci, 2019). In another work it was demonstrated that the steps for transition from conventional IT infrastructure to cloud based system reduces cost of handling and maintenance of the hardware. This is an important aspect in the current scenario. The transformation can be done in five stages which includes Preparation, Analysis, Migration, Concluding the migration and Maintenance and Vendor Management phases. The details of action plans during each phase were also presented. (Vaishali Pardeshi, 2014). In yet another work the use of cloud instead of physical resources for handling huge data at university level was presented. A simulator has been proposed which can be used for keeping the data at cloud for its effective use by different users. The framework consists of a cloud developed for processing university's database which consists of staff and students information. The proposed system has the following features (i) support for cloud computing infrastructure, which includes data centers containing university database; (ii) a user friendly interface; (iii) flexibility to switch between the different types of users; and (iv) virtualized access to cloud data. (Kashish Ara Shakil et al). Md. Anwar Hossain Masud and Xiaodi Huang (2013) presented an architecture of mobile based cloud computing which would benefit the student learning. It was also evident that the proposed architecture would help students and staff in their respective tasks. In another work a cloud based smart education system was proposed wherein it was shown that the contents can be updated by the institution and it can be used by the users through the cloud. Six major elements/requirements for the cloud based smart education system were explained which includes cloud platform, compatible file format, authoring tool for content developers, content viewer, interface engine and a security system. It was concluded that the use of cloud computing in education would facilitate students learning. (Ji-Seong Jeong et al, 2013). The advantages, limitations, challenges and future scope for the use of cloud computing in higher education were presented (Anjali Jain and U.S. Pandey, 2013). The use of cloud computing for e-Governance by Government of India was presented. National e-Governance Plan (NeGP) model was presented applicable areas of cloud computing for e-Governance such as for issue of passport, birth and death certificate etc were presented. It was concluded that by adopting to cloud based e-Governance there would be ease in governance and the efficiency would be improved. (Deka Ganesh and Robin Singh Bhadoria, 2012). The impact of cost saving by implementing cloud based e-Governance was discussed. How some countries have used Government cloud to integrate various ministries and other applicable sectors was also presented. (Kishori lal Bansal et al, 2012). Combining e-Learning and cloud computing from the point of view of architecture, construction method and external interface with the model was presented. Cloud e-Learning is compared with the conventional e-Learning models. In the current cloud based e-Learning model, interactions among groups such as teachers students etc are possible also content development, content management, the layer by layer structure of the proposed system was explained. The improvement in connectivity between university, study centres and colleges was also elaborated. (Md. Anwar Hossain and Xiaodi Huang, 2012). Survey of cloud computing used by Governments across the globe was presented. Different types of clouds and layers of cloud computing were also explained. The rankings of Governments using cloud computing for Governance revealed that at the top Singapore uses 92.14 % e-governance for its operations while Netherlands uses 70.75% e-governance which stands at the bottom of the provided list (Kuldeep Vats et al, 2012). The possibilities of using cloud computing to provide quality education at less cost were presented. The paper also discusses the advantages that the teachers, faculties and administration staff would be getting by using cloud computing in education. A few case studies of implementation of cloud computing in education were also discussed. (Deka Ganesh and Malaya Datta Borah, 2012). A step by step four stage guide for implementation of cloud computing in educational institution was been presented. (Md. Anwar Hossain et al, 2012). Existing examination system at Indian universities was discussed, its drawbacks were presented. An alternative cloud based system of examination at Indian Universities was proposed. Challenges of integrating ICT in education were also shown. (Mohini Bhardawaj and Amarjeet singh, 2011). The idea of using cloud computing for educational organization specially university was presented. A frame work for using the computing techniques of cloud for administrative and learning scenarios were described. A survey revealed that the cloud based techniques are seldom used educational organizations (Tuncay Ercan, 2010). In one of the researches, the Cloud Cube Model (CCM) was modified and a new model called complete cloud computing formations (C3F) was presented. It was named as cloud computing for Education and Learning (ELaas) (Mohssen M. Alabbadi, 2011). The use of cloud computing for educational institute, its Architecture was discussed. Advantages and challenges associated with cloud have been discussed. (S. Sasikala and S. prema, 2010). A brief overview of cloud computing in educational institutions has been presented with guidelines for the deployment. The advntages, threats and deployment guidelines of cloud computing in education has been discussed. (Niall Scalter, 2010). The transformation in education due to affordable hardware and internet facilitates the use of ICT tools for learning. The paper tells about how the students of 21 century can acquire the essential skills required to remain competent through education cloud. The service providers and users perspective towards cloud based service was also explained diagrammatically. This paper forms the frame work of educational cloud wherein the use of cloud computing through the service provider for education and research has been shown.(Rober Fogel, 2010).

3. Methodology

Fig. 2 shows a mind map plot of interactions of different groups within an institute with the cloud. The entire cloud can be divided into 3 levels. Level 1 is at the administrator, who creates users for different departments and users. At level 2 the control would be given to the program owner/Section head who will give different rights to various faculties and staff of his respective program.

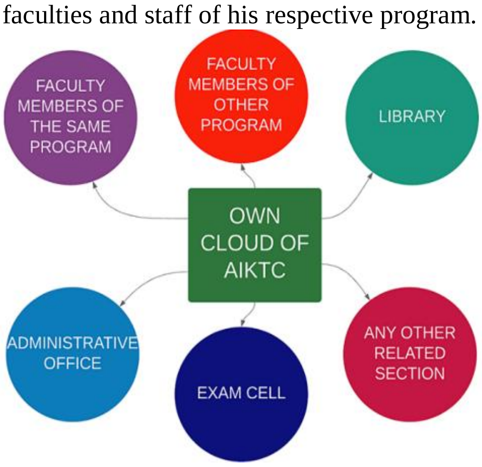


Fig.2 Interactions of different groups with the cloud

At level 3 the individual faculties and staff would be provided the access.Fig.3 shows various levels of functioning at the cloud.

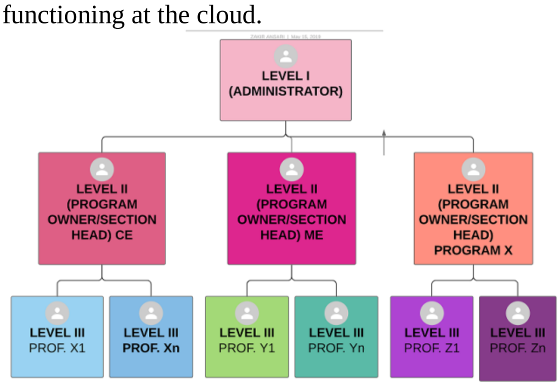


Fig.3 Hierarchy of the cloud

A. Level I (Administrator)

This level is for the administrator who will create the user groups as per the programs and sections. The Read or Write access to individual members for different data can be provided and controlled through this level.

B. Level II (Program Owner/Section Head)

This level is controlled by programs owners and section heads. Some of the common information such as different formats, students lists, student attendance, students' exam marks etc can be shared with all the faculty members while some other information pertaining to a specific faculty or group of faculties can be shared with that group only such as departmental exam coordinators or training and Placement coordinators etc.

C. Level III (Faculties and Staff):

At level III the faculties and staff would have access to different data as provided at level II. They also can keep their credentials such as their publication details, any achievements, learning materials developed for the students and can share it with appropriate faculties and staff. As an example the assessment results of the course taught by a faulty can be shared with the department exam coordinators and with the program owner as it is more related to them.

4. Case Study

From the perspective of NAAC preparations it was decided at the institute to update the academic files of the course owners for the last five years. There are some common contents of the academic file such as academic calendar, Time tables, teaching load office order etc which were to be used by all the course owners for updating their files. In the ordinary situation, all the data was to be provided to all the course owners of a particular program from the departmental clerk which would have made the clerk busy in this task.The cloud was used for this purpose. Fig. 4 shows the window asking the user to login with his password.

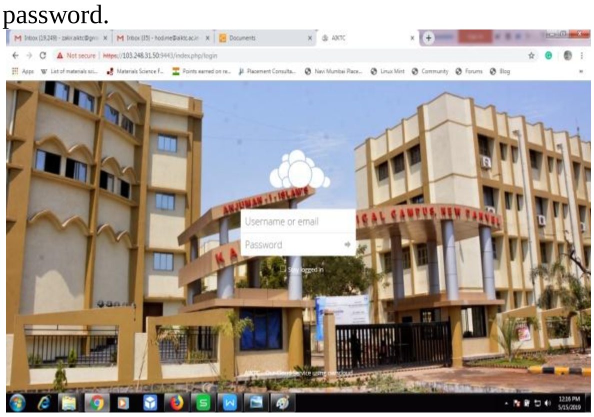


Fig.4 The front screen of own cloud

The relevant data was kept in separate folders for different academic years and access of the same was given to all the course owners. Fig. 5 shows the academic calendar folder kept on the cloud and shared with all the faculty and staff of that program such that they can access it remotely from any location and get the details.

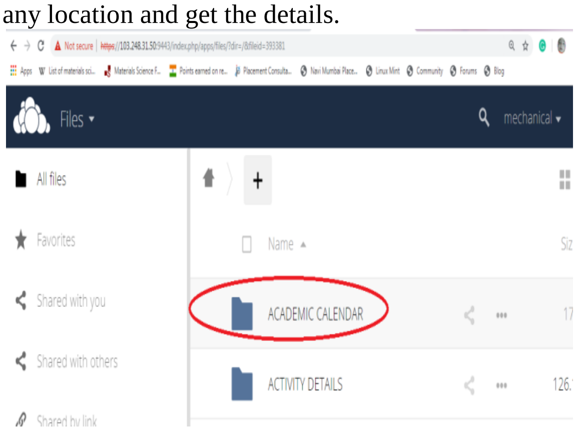


Fig. 5 Academic Calendar folder on cloud

The academic calendar folder contains the respective years' academic calendars in excel format as indicated in Fig.6

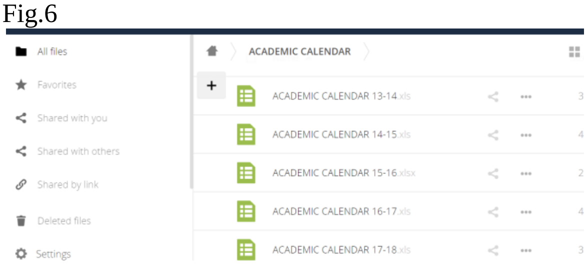


Fig. 6 Academic Calendars of last five years

The users can download and print the academic calendar so as to keep it in their respective files.

5. Conclusions and Future Scope

It is therefore concluded that, the use of cloud computing for administrative purposes at educational institution would lead to following advantages

1. Reducing the efforts of an individual to provide same data to multiple users.
2. Update of the data at one place would ensure that all the users can get the updated copy.
3. Easy sharing of relevant information among different user groups requiring the same data.
4. The required information about number of faculty publications, trainings etc would be readily available to the concerned program owner at any point of time.

A lot of literature is available on the use of cloud computing for e-Learning and mobile based learning. The same cloud which is proposed here could be used as a Learning Management System (LMS). The students can be given access and they can be provided with learning materials through the cloud in future.

References

Vaishali Pardeshi (2014) Cloud Computing for Higher Education Institutes: Architecture, Strategy and Recommendations for Effective Adaptation, Procedia: Economics and Finance 11, 589-599.

Deka Ganesh, Robin Singh Bhadoria (2012),Cloud Computing Model for National e-Governance Plan (NeGP), Fourth International Conference on Computational Intelligence and Communication Networks,520-524.

Mohini Bhardwaj, Amarjeet Singh (2011), Automated Integrated University Examination System, Himachal P University Journal, Himachal P University Journal,1-10.

Kishori lal bansal,sanjay kumar sharma, satish sood (2012), Impact of Cloud Computing in Implementing Cost Effective e governance operations, GIAN JYOTI E-JOURNAL, Volume 1, Issue 2.

Tuncay Ercan (2010), Effective use of cloud computing in educational institutions, Procedia: social and behavioural sciences 2, 938-942.

Md. Anwar Hossain Masud,Xiaodi Huang (2012),An E-learning System Architecture based on Cloud Computing, World Academy of Science, Engineering and Technology Vol:6 2012-02-21,736-740.

Ibrahim Arpaci, (2019),A hybrid modeling approach for predicting the educational use of mobile cloud computing services in higher education, Computers in Human Behaviour, 181-187.

Md. Anwar Hossain Masud, Xiaodi Huang (2013), A Cloud Based M- learning Architecture for Higher Education, Archives Des Sciences, 751-760.

Ji-Seong Jeong, Mihye Kim, Kwan-Hee Yoo (2013), A Content Oriented Smart Education System based on Cloud Computing, International Journal of Multimedia and Ubiquitous Engineering Vol.8, No.6 (2013), 313-328.

Kashish Ara Shakil, Shuchi Sethi, Mansaf Alam, An Effective Framework for Managing University Data using a Cloud based Environment.

S. Sasikala, S. Prema (2010), Massive Centralised Cloud Computing (MCCC) Exploration in Higher Education, International Conference on e-resources in higher education: Issues, Developments, Opportunities and Challenges, 322-324.

Mohssen M. Alabbadi, Cloud Computing for Education and Learning: Education and Learning as a Service (ELaaS), 14th International Conference on Interactive Collaborative Learning (ICL2011), 589-594.

Niall Scalter, Policy Brief of UNESCO Institute for Information Technology in Education (2010),Cloud Computing in Education,1-13.

Deka Ganesh Chandra, Malaya Dutta Borah (2012), Role of Cloud Computing in Education, International Conference on Computing, Electronics and Electrical Technologies [ICCEET], 832-836.

Anjali Jain, U. S Pandey (2013), Role of Cloud Computing in Higher Education, International Journal of Advanced Research in Computer Science and Software Engineering, 966-972.

Robert Fogel, (2010), The Education Cloud: Delivering Education as a Service, White paper of Intel world ahead: cloud computing, 1-10

Md. Anwar Hossain Masud, Xiaodi Huang, Jianming Y ong (2012), Cloud Computing for Higher Education: A Roadmap, Proceedings of the 2012 IEEE 16th International Conference on Computer Supported

Institutional Repository: A Novel Outlook to Preserve and Disseminate Knowledge in Higher Education

Magar R. B[1], Momin S. S.[2], Honnutagi A. H[3], Khan Tabrez[4]

[1,2,3,4] Anjuman-I- Islam's Kalsekar Technical campus New Panvel, Maharashtra, University of Mumbai
[1]hod.ce@aiktc.ac.in, [2]librarian@aiktc.ac.in,[3]director@aiktc.ac.in, [4]hod.co@aiktc.ac.in
Track No: 06
Track Name: Academic Governance

Abstract: The Institutional Repository (IR) is a very vital tool which can serve as an engine to change the academic functioning of any Institution significantly. It is now need of an hour that Information Center and Libraries of educational institutions need to be established as per the end users' requirements.

In the current circumstances, IR is forming a necessary component for information and knowledge sharing in the scholarly world. In addition, it also facilitates in showcasing scholarly and research output to the wider community and in turn, provides a help in institutional advancement and outreach to a large extent. In this paper, an attempt has been made to discuss the effective implementation of IR at Anjuman-I-Islam's Kalsekar Technical Campus (AIKTC), New Panvel Maharashtra. The sole purpose of creation of IR is to collect, carefully preserve and disseminate the knowledge and technical know-how to wide spectrum of human resources. This significantly acts as one of the effective tools to result in to scholarly communication and preserve institution's knowledge. The Knowledge Resources and Relay Center (KRRC) takes immense pride to host the repository and work for the dissemination and preservation of knowledge resource of AIKTC community.

Keywords: Open Source, Digital Library, Institutional Repository, Open access.

1. Introduction

Academic libraries cater to the need of creating and managing the institutional repositories which focus on preserving and more importantly, disseminating the scholarly material produced by the faculty and the learners. This comprises of article pre-prints, manuscripts, technical reports, conference proceedings, data sets, software, as well as thesis and dissertations. Electronic submission, storage, and dissemination of student theses and dissertations have been increasing more commonly in universities and colleges. For libraries, ETDs (Electronic Theses and Dissertations) are the starters for an institutional repository program, and represent an opportunity to engage graduate learners and their faculty members (Welburn and Fyffe, 2008).

Roosendaal and Geurts (1997) took note of significant functions of this process of scholarly communication i.e., registration, identifying the 'owner' of the intellectual property, certification, establishing the quality of the research, awareness, making the research open to others and archiving, long-term conservation to make the literature accessible to the future needs of the concerned people. Institutional repositories act as an exact way of disseminating research, managing academic resources output of the institute. More vitally, it has enormous potential to be an innovative format of scholarly communication (Lynch, 2003).

Though institutional repository bears an objective of collecting, preserving and disseminating specialized literature, the current depositing estimates unfortunately gives the statistics that only between 15% and 30% of eligible scholars and researchers deposit their work in institutional repositories (Cullen and Chawner, 2011).

Institutional repositories are collections in the form of digital property which capture and conserve the intellectual output of faculty members (Sharma, et al., 2008). Institutional repository nowadays plays a significant and key role in the world of open access. The institutional repository must cater to the need of preserving the intellectual output of learners, faculty members and associated staff. An institutional repository is a bunch of provisions that an institute offers to all stakeholders for the dissemination resources in the digital from (Mandhirasalam and Srinivasaragavan, 2014). This is the right place where one can self-archive one's own Research Papers, CD's Content, Question Papers, Syllabus, Project Reports, eCourse ware.

The institutional repository is strategic approach academic library service in the current scenario (Alvite and Barrionuevo, 2011). Ware and Mabe (2009) stressed upon the fact that the institutional repositories in academic libraries are the vital tools for academic publishing and a novel strategy of innovation of scholarly communication. Formation of repositories acts a much needed solution in order to provide e-resources amidst the expensive subscription. It may be an alternative to curtail the library's budget in providing highly valued resources through the commercial online databases subscription (Young, 2009; Moss of, 2015). Stanton and Liew (2011) and Ogbomo and Muokebe (2015) brought it to the light that the awareness and the attitudes of the institute lecturers are the vital and essential factors that contribute to the successful functioning of institutional repositories. Jain et al. (2010) attempted to put forth the benefits and difficulties of setting up an IR, and librarians' and authors' roles in the effective management of an IR. Strength and advantages of DSpace can only be optimized through effective IRs, and it tries to recommend that an IR be considered as the principal benchmark of digital scholarship. Sharma et al. (2008), extensively provided the literature on the contents of IRs and skill required for the implementation of the Institutional Repository. Further, authors discussed the benefits, standard, sustainability and funding, legal considerations and current scenario of the IR in the Indian context. Authors also discussed the Open Source Software and Commercial Digital Repository Software; about the softwares that are readily available to create and maintain institutional repositories. Khan and Das (2008) stressed that the current status of IR in India by its collection type, subject coverage and the total number of digital repository collections available to the academic community as open sources. Ivwighreghweta (2012), analysed the challenges of institutional repositories development in few academic institutions in Nigeria. Five research questions were raised and the descriptive survey design was employed for his study. Vishala and Bhandi (2007), discussed about an overview of IR and its benefits to the institutions and also described the role of the library in building an Institutional Repository. Richardson, and Wolski, (2012) thoroughly made an analysis of the current literature on the topic and shared their experiences about a number of initiatives, particularly in Australia, which include repositories within the learner lifecycle. The paper culminates with an important note about how repositories could be better utilised to cope up with the requirements of the learners in higher education.

Shahin and Gaonkar (2016) made a detailed study of the web performance of AIKTC institutional repositories and analysed the performance in archiving and sharing based on the Ranking Web of Repositories (RWR) was also analyzed. The main objective of ranking and registration was to promote the development of open access by providing timely information about the growth and status of repositories throughout the world.

Cho (2017) conducted an exploratory analysis of the operation of
institutional repositories in Asian countries listed in OpenDOAR and RWWR. The author
reported that IR in Japan, Korea, India, Taiwan, Indonesia, China, Turkey, and Malaysia
showed relatively higher levels of maturity in offering IRs.

Cho (2017) conducted an exploratory analysis of the operation of
institutional repositories in Asian countries listed in OpenDOAR and RWWR. The author
reported that IR in Japan, Korea, India, Taiwan, Indonesia, China, Turkey, and Malaysia
showed relatively higher levels of maturity in offering IRs.

Cho (2017) conducted an exploratory analysis of the operation of institutional repositories in Asian countries listed in OpenDOAR and RWWR. The author
reported that IR in Japan, Korea, India, Taiwan, Indonesia, China, Turkey, and Malaysia
showed relatively higher levels of maturity in offering IRs.

Cho (2017) carried out a practical analysis of the procedure of institutional repositories in Asian countries listed in Open Directory of Open Access Repositories (DOAR) and Ranking Web of World Repositories (RWWR). The author brought it to the light that IR in Japan, Korea, India, Taiwan, Indonesia, China, Turkey, and Malaysia showed comparatively enhanced levels of maturity in offering IRs.

Open DOAR has been monitoring the world-wide OA repositories for more than a decade. Open DOAR provides a quality-assured listing for the world-wide audience (Seo, 2018).

2. Case study:

Anjuman–I-Islam's Kalsekar Technical Campus (AIKTC) having three-degree level schools located at New Panvel is recognized by the Directorate of Technical Education (Maharashtra), approved by All India Council of Technical Education (AICTE), New Delhi and affiliated to University of Mumbai. The AIKTC houses state-of-the-art infrastructure and instructional facilities for undergraduate learners in various functional areas of specialization, viz, School of Engineering and Technology (Civil, Computer, Electrical, Electronics and Telecommunications and Mechanical), School of Pharmacy and School of Architecture. The Knowledge Resources and Relay Center (Central Library) takes paramount pride and privilege to host the repository and work for the dissemination and preservation of knowledge resource of AIKTC community. The Campus constantly thrives to mold the learners into a complete Human Resource which could meet the professional expectations of the industry, in particular and the society, in general. It also instils higher capabilities among the learners to face the challenges of ever changing technological world. Fig 1 shows location map of AIKTC.

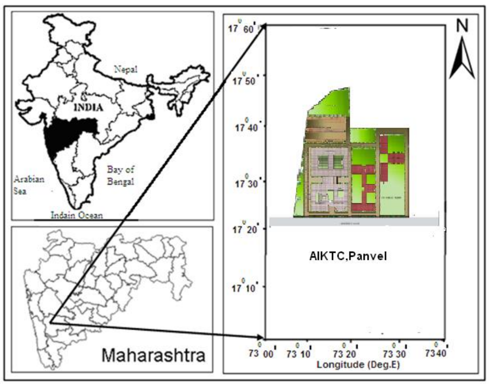


Fig 1: Location map of AIKTC, New Panvel

3. Need for institutional repository(IR)

The Research Promotion Cell of AIKTC strives hard to nurture research culture in the institute by a way of promoting research in newly emerging and challenging areas of engineering, architecture, and pharmacy. It consistently encourages the Undergraduate and Postgraduate learners to sneak into research in newly emerging frontier areas of the institute including multidisciplinary fields. This facilitates in improving the global research capability of budding technocrats through the acts of participating in conferences, seminars, workshops, project competition, etc. Many research scholars do not easily give free access to their research output to the colleagues in any organization. IRs provides scholars with a common and much needed platform so that everyone in the institution can contribute scholarly material in order to promote cross-campus interdisciplinary research. Few of the long term objectives for having an institutional repository are to provide open access to institutional research output by self-archiving it, to create global visibility for an institution's scholarly research, and to store and preserve other institutional digital assets, including unpublished or otherwise easily lost ("grey") literature such as thesis, working papers or technical reports. AIKTC library plays a significant and key role of supporting higher education and research by creating IR where AIKTCians can store their academic materials such as published papers, ppts, lecture notes, handouts, learning resources, question papers, etc. on a digital platform.

4. Selection of Software:

The library has given due preference to utilize an open source software, both for the operating system as well as the digital repository software. Open source software is advisable; however, if Library does not have the technical expertise in-house, a commercial package may be an obvious option. The Library Team carried out comparative studies of the different software options available in Google Group of ILOSC (Indian Library Open Study Circle) and Librarian's WhatsApp Groups. Finally, the team could gather necessary information about the wide range of OSS for repository development. The key players in the field are E-Prints, DSpace, Fedora. Before final selection, the team also went through the Directory of Open Access Repositories (Open DOAR) and Registry of Open Access Repositories (ROAR), where more than 80 known softwares are utilized for building the digital repositories, and the most registered repositories use DSpace along.

AIKTC was fortunate enough to have an adequate technical support to opt for an open source product "DSpace." This software offered a decent web-interface and also had the functionality to hold various file formats (including image and multi-media).

Installation of DSpace and other components is done by following step by step commands of DSpace installation documentation available at Duraspace in March 2013, an effort is made here to design and develop comprehensive and effective IR taking AIKTC publications as a case study. AIKTC IR launched in July 2013 within Intranet and in November 2014 opens to the public at: http://www.aiktcdspace.org.

5. Collection accessibility:

Based on the category of collection and the Copyright, the accessibility was decided. Free access was provided to Syllabus, Question Papers, Project Reports, Thesis, Faculty Learning Materials, Faculty and Students Publications in Open Access (OA) Journals. CD/DVD contents and Faculty publications in paid journals access is confined only to the AIKTC Faculty and learners.

6. Gathering of content:

Collection of the faculty publications from all the three schools commenced in the year 2013. Faculty members who already had their publications in OA Journals were identified as significant contributors, as a starting step. This lead to a collection of a set of around 10-15 papers. The service has now being more widely publicized. The service was launched formally in November 2014. Simultaneously, the collection of syllabus and question papers was started. The entire collection as on date is presented in Table 1.

Table 1: Collection in AIKTC Library

Sr. No.	Particulars	No. of Items
1	Question Papers	728
2	Staff/Students Publications	141
3	MU Syllabus	25
4	Master Thesis	14
5	CD Library	171
6	Learning Resources (notes, ppts, etc.)	172
7	Students Project Reports	407
8	Others	474

Faculty members were highly encouraged and motivated to deposit their learning resources (ppts, notes, question banks, Audio Video Lectures etc…). However, in certain cases, it was very successful, but few faculty members were found to be unaware about the principles of OA and the benefits of IRs.

Conclusions:

KRRC believes in consistently encouraging the AIKTC authors to submit their valuable work to the Repository or an open access disciplinary repository owing to the fact that an open access largely helps in broadening, disseminating, increasing the use, citation, and impact, and maximizing the return on investment in research. However, as a matter of fact, convincing the academicians about the benefits of an IR seemed to be the project's major challenge. Many academicians were of the opinion that due to the paucity of time; they might not easily cope up with the need in conformity with repository services. Currently, faculty members are not being asked to self-archive; instead, it is done within the Library itself. This exercise was directed towards a ray of hope that the approach would encourage them to participate without any reservations in mind. Few academicians are gravely concerned about quality issues, or uncertainty of assurance from the library end regarding the possibility of publishers not permitting to deposit their work.

Future Scope:

The pragmatic challenge is to spread awareness and motivate all the AIKTC faculty members and research scholars, regarding the repository system in the AIKTC. The AIKTC repository can be made highly useful and resourceful by encouraging all the faculty members and research scholars and authors to deposit their work viz., teaching materials like Google Classroom, youtube videos, blog, photocopying etc. in the repository.

References

Alvite, L. and Barrionuevo, L. (2011) Libraries for users: services in academic libraries. Oxford: Chandos Publishing.

Cho, J. (2017). Exploratory analysis of the operation of institutional repositories in Asian countries. Information Development, 14.

Cullen, R., and Chawner, B. (2011). Institutional repositories, open access, and scholarly communication: A study of conflicting paradigms. The Journal of Academic Librarianship, 37(6), 460-470. http://doi.org/10.1016/j.acalib.2011.07.002.

Ivwighreghweta, O (2012). An investigation to the challenges of institutional repositories development in six academic institutions in Nigeria. International Journal of Digital Library Services, 2(4), Oct.-Sept., 1-33.

Jain, P. Bentley, G. and Oladiran, M. (2010). The Role of Institutional Repository in Digital Scholarly Communications. Retrieved on 5/31/2013 from http://www.ais.up.ac.za/digi/docs/jain_paper.pdf

Khan, B. and Das, A. K. (2008). Assessment on Present Situation of Institutional Digital Repositories in India: A Study", 6th Convention PLANNER - 2008, November 06-07, 131-139. Paper presented in 6th Convention PLANNER Nagaland, India.

Lynch, C. A. (2003). Institutional repositories: Essential infrastructure for scholarship in the digital age. Portal: Libraries and the Academy, 3(2), 327-336.

Mandhirasalam, M., and Srinivasaragavan, S. (2014). Institutional repository initiatives in higher education institutions in Tamil Nadu: A study. International Journal of Information Dissemination and Technology, 4(1).21-27.

Momin, S. S. and Gaonkar, R. C. (2016). Intuitional Repository – A Gateway of Global Visibility: Case Study. Research Dimensions, VIII (2), 103-110. ISSN 0976-8564.

Mossoff, A. (2015). How Copyright Drives Innovation: A Case Study of Scholarly Publishing in the Digital World. Michigan State Law Review, 13-25.

Ogbomo, E.F., and Muokebe, B. O. (2015). Institutional repositories, as an emerging initiative in Nigeria University libraries. Information and Knowledge Management, 5(1).

"Repositories in India: A Study", 6th Convention PLANNER - 2008, Nagaland University, Nagaland, November 06-07, 131-139.

Richardson, J. and Wolski, M. (2012). Importance of repositories in supporting the learning lifecycle. Proceedings of ICERI2012 Conference 19th-21st November 2012, Madrid, Spain, ISBN: 978-84-616-0763-1.

Roosendaal, H. E., and Geurts, P. A. T. M. (1997) Forces and functions in scientific communication: an analysis of their interplay. Paper presented at CRISP 97 Cooperative Research Information Systems in Physics, University of Oldenburg, Germany.

Seo, T.S. (2018). Open access full-text databases in Asian countries. Sci Editing, 5(1), 26-31.

Sharma, A.K.; Meichieo, K. and Saha, N.C. (2008). Institutional Repositories and Skills Requirements, a New Horizon to Preserve the Intellectual Output: An Indian Perspective. 6th Convention PLANNER - 2008, Nagaland University, Nagaland. Stanton, K. V., and Liew, C. L. (2011). Open Access Theses in Institutional Repositories: An Exploratory Study of the Perceptions of Doctoral Students. Information Research: An International Electronic Journal, 16(4),

Young, P. (2009). Open access dissemination challenges: A case study. OCLC Systems and Services: International digital library perspectives(25), 2,93-104.

Vishala, B. K. and Bhandi, M. K. (2007). Building institutional repository (IR): role of the library. 5th International CALIBER -2007, Panjab Chandigarh, 08-10 February.

Ware, M., and Mabe, M. (2009). An overview of scientific and scholarly journal publishing. Oxford: The STM Report.

Welburn. W.C. and Fyffe, R.(2008). ETDs, Scholarly Communication, and Campus Collaboration, Published version. College and Research Library News, Vol. 69. No. 3, (March 2008), pp. 152-55

Institutes run by K. K. Wagh Education Society, Nashik

Name of College / Polytechnic / School

1. K. K. Wagh Institute of Engineering Education & Research, Nashik
2. K. K. Wagh Polytechnic, Nashik
3. K. K. Wagh Pharmacy College, Nashik.
4. K. K. Wagh Institute of Pharmacy College, Chandori, Tal: Niphad, Dist.:Nashik
5. K. K. Wagh Polytechnic, Chandori, Tal. Niphad, Dist. Nashik
6. K. K. Wagh College of Agricultural Engineering & Technology, Nashik
7. K. K. Wagh College of Agriculture, Nashik
8. K. K. Wagh College of Agricultural Bio-Technology, Nashik
9. K. K. Wagh College of Food Technology, Nashik
10. K. K. Wagh College of Agriculture Business Management, Nashik
11. K. K. Wagh College of Horticulture, Nashik
12. K. K. Wagh College of Nursing, Nashik
13. K. K. Wagh College of Arts, Commerce, Science & Computer Science College, Nashik
14. K. K. Wagh College of Arts, Commerce, Science & Computer Science College, Chandori, Tal. Niphad, Dist. Nashik
15. K. K. Wagh College of Arts, Commerce, Science & Computer Science College, Kakasahebnagar, Tal. Niphad, Dist. Nashik
16. K. K. Wagh College of Arts, Commerce, Science & Computer Science College, Bhausahebnagar, Tal. Niphad, Dist. Nashik
17. K. K. Wagh College of Education, Nashik
18. K. K. Wagh College of Fine Arts, Nashik
19. K. K. Wagh College of Performing Arts, Nashik
20. K. K. Wagh Vidyabhavan & Junior College, Bhausahebnagar, Tal. Niphad, Dist. Nashik.
21. Gitai Wagh Kanya Vidyalaya, Bhausahebnagar, Tal. Niphad, Dist. Nashik.
22. K. K. Wagh Secondary School, Pimplas (Ramache), Tal. Niphad, Dist. Nashik
23. K. K. Wagh Secondary School & Junior College, Puriya Park, Nashik
24. K. K. Wagh Junior College, Chandori, Tal. Niphad, Dist. Nashik
25. K. K. Wagh Junior College, Pimplas (Ramache), Tal. Niphad, Dist. Nashik
26. K. K. Wagh Junior College, Kakasahebnagar, Tal. Niphad, Dist. Nashik
27. K. K. Wagh English School (Primary + Secondary+Jr.College), Saraswatinagar, Panchavati, Nashik
28. K. K. Wagh English School, (Primary + Secondary), D.G.P. Nagar, Nashik
29. K. K. Wagh English School, Gangapur, Nashik
30. K. K. Wagh English School (Pre-Primary + Primary), Chandori, Tal. Niphad, Dist. Nashik
31. K. K. Wagh English School (Pre-Primary + Primary), Pimplas (Ramache), Tal. Niphad, Dist.Nashik
32. K. K. Wagh English School (Pre-Primary + Primary), Kakasahebnagar, Tal. Niphad, Dist.Nashik
33. K. K. Wagh Universal School, Saraswatinagar, Panchavati, Nashik
34. K. K. Wagh Universal School, D.G.P. Nagar, Nashik
35. K. K. Wagh Universal School, Bhausahebnagar, Tal. Niphad, Dist. Nashik.

Hostels

1. Gurukul Boys & Girls Hostel, Bhausahebnagar, Tal. Niphad, Dist. Nashik.
2. K. K. Wagh Institute of Engineering Education & Research & Polytechnic Hostel, Nashik.
3. K.K. Wagh Agricultural Engineering & Agriculture College Hostel, Nashik.

K. K. Wagh Institute of Engineering
Education & Research, Nashik