

# Enhancing the Online Engineering Education during COVID-19 Period: A Blended Approach of Online Tools

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**Abstract**—An unplanned shift into educational sector, from physical education to virtual, online education has been caused by the COVID-19 pandemic. Within no time, the passionate educators and learners sought the support of e-Learning where teaching is being done through remote, digital platforms.

In this paper, an approach pursued by us has been presented that was used for delivering the enhanced online engineering education to our students in the period of COVID-19 pandemic. Through use of technologies such as GoTo Webinar tool, Udemmy online learning platform and the Learnico student mobile application, the approach has achieved a soothed quality education delivery. The approach has demonstrated a touch of personalized and on-demand learning with improved engagement of the online attendees. This approach has generated promising statistics about the learning inclination, understanding levels and adaption rate percentage by the online attendees including their reviews and feedbacks. The motivating statistics of the students embracing to this approach has been the proof of its impact.

**Keywords**—e-Learning, personalized learning, on-demand learning.

**JEET Category**— Research, Practice.

## I. INTRODUCTION

WITH the advent of COVID-19 pandemic from Wuhan, China all the areas of life, including the education got affected all over the world. As the countries announced total lockdown, it resulted in shut down of educational institutes. To sustain the educational progress of the students, the passionate educators came forward and different tools and technologies were adopted with an unpredicted pace. e-Learning which was underutilized before the pandemic, suddenly became the regular practice. (Basilaia G et. al. 2020). Other than the famous, trendy e-Learning or meeting platforms, the teaching-learning community cracked various supporting online tools and/or services for better user experience and fruitful outcomes. Although this shift to virtual learning was not free from hurdles (Lassoued Z. et.al. 2020), many Edu-Tech Start-ups showed up during the time of pandemic (Shivangi D., 2020) to serve the various needs of online trainers and learners.

In this paper, a rigorously followed approach that was adopted by us, for delivering better teaching-learning experience amongst the engineering graduates has been

presented. When the online teaching process commenced at the organization, the following goals were finalized.

1. To opt the tools which could be effective yet simple for both the trainers and learners (engineering graduates) allowing them to focus on the core activities.
2. To elevate the classroom experience of the students by better engagement.
3. To offer the students a way to learn on-demand.

To accomplish these specific goals along with other goals under e-Learning (Anderson J, 2005), the use of three such online tools and services for enhancing the quality of online education was done for the engineering graduates. Along with the traditional and trendy tools like GoToWebinar (GoToWebinar) the presented approach made use of online on-demand learning platform namely Udemmy (Udemmy) and to improve engagement of attendees the Learnico platform (Learnico) developed by Maharashtra Knowledge Corporation Limited, (MKCL) India (MKCL) was used. The usage of these three methods combined in an effective way helped to deliver quality education to the students and the students reverted with an overwhelming response which illustrates the effectiveness of the approach. In this paper, the same approach that was followed compromising these three tools has been presented.

The rest of the paper has been organized as described next. The section II provides the details of the approach followed including the tools used and with adequate justification on selection of these tools. The next section III elucidates the details and the statistics of the approach. And the last section IV provides the concluding remarks with the comments on the future plans.

## II. THE APPROACH

During the pandemic period of COVID-19, the execution of the lockdown and the social distancing in the maximum of the countries all over the world, had been indispensable to spread the infection. This resulted in complete shut of the educational activities (Vishal S., 2020). However, as the initial period of the threat passed, the educators turned to e-Learning tools to make the academic year progress and stop any educational loss of the students (UNESCO).

Initially, the popular tools were adopted by the majority of

the teaching community to serve the purpose of being in touch with the students were the online meeting platform tools like Zoom or Google online meets. These tools later become the platforms for regular coaching (Putri G., 2021). The basic versions of both the above tools are free with limitation of meeting duration. However, more than just the video conferencing either for training or for learning, both the teachers and the students require much more (Baiyere A, 2016). In accordance with this point and the goals stated in section I, the use of following three tools was made. The following points highlight the related details.

#### *A. The GoTo Webinar Tool.*

The Zoom or Google online meets are more of the online meeting platforms. However, a webinar platform is much more than mere video conferencing. If a trainer pertains to an organization or academic institute, he or she needs to manage much more than just the delivery of the session. And exactly this support has been availed by GoToWebinar. The utilization of this tool proved supportive in the following ways.

##### *1) Ensure the activeness of the students towards all the online sessions conducted.*

This became possible through the feature of sending the registration link to the students. After monitoring the response to the registrations, the insight about how many students have not registered was generated which resulted in effort to contact the students to let know their technical as well other problems for not being able to be in academic flow. This enhanced the personal touch with the students, improved the number of attendees and also helped to make the students aligned to academic activities.

##### *2) Limit the number of attendees for an online session for personalized attention.*

This feature made the sessions less crowded and allowed us to interact with precise number of the online attendees. This resulted in letting the students get the feeling of personalized attention which in turn helped to improve their response and attentiveness during conduction of the sessions.

##### *3) Improve engagement of the attendees.*

The feature of conducting the polls during the sessions, kept the students alert and attentive towards session delivery. In fact, the students enjoyed to test their learnings by appearing to such polls conducted.

##### *4) Get attendance analytics and reports.*

Another job of a trainer during the conduction of the online sessions is to record the attendance of the students. Pertaining to different organizations there are different criteria for the students to become eligible for appearing to the exams, on the basis of the attendance they show up during the academic activities. So, to tackle with this need the feature of auto generated attendance reports was used and that relieved the trainers from marking the attendance manually.

##### *5) Provide activity certificates to the students.*

This added feature helped to deliver the instant, digital certificates to the attendees who were present at specialized online, hands-on workshops conducted.

Thus other than regular features of online meeting like allowing participants to interact, share screens, group chat, recordings, the above mentioned features were effectively used to deliver the course contents meritoriously and with betterment in participation levels of the students. The use of the said tool caused hassle free experience at both the ends of teaching and learning community letting them to concentrate on the core task.

#### *B. The LearnCo Web Platform.*

This is a techno-pedagogic tool developed by Maharashtra Knowledge Corporation Limited (MKCL) which comes under department of higher and technical education, Government of Maharashtra (GoM), India. The presented approach used this outstanding web platform extensively to simulate the classroom experience for the students. It comes from that experience that to generate the classroom experience for the students, they need to be engaged in live activities like problem solving, brain storming, appearing to short test etc. From this point of view, the said tool was opted. Using this, the teachers can configure the short tests and presentations in advance and the students can do live interaction with these activities through the use of LearnCo mobile application in a live class. This could accomplish the mindful, online participation from the students as they got involved in such live activities and could test their understanding levels. The tool enabled us to get every student's performance and insight about his/her understanding of the topic, on the fly. Hence this helped to bring to us each student's strengths and weaknesses related to grasping of the contents and could interact with them to solve their difficulties. This bridged the gap between online teaching and learning communities.

#### *C. The UdeMy platform.*

As academic progress of delivering the course contents progressed, it was found that those individual students or those students for whom any of the family members faced health issues due to pandemic, were not able to cope up with the pace of online sessions and they started lagging behind the entire class. This was also burdening their mental health too. So, to resolve this, the alternative was thought of creating online, on-demand leaning resources which the students could use at their ease, comfort and when the time permitted. To accomplish this, the extensive use of the UdeMy stood up. This is an online teaching and learning place. The decision was made to opt for this platform as it provides the detailed analysis of the attendees. Many of the faculties created free courses pertaining to their areas and uploaded the same on UdeMy. This helped to provide useful resource material through the platform and also the engagement statistics like location of the attendees, duration for which the course is learned, levels where students were either in expected pace or got out of pace in leaning process, reviews and feedbacks about the contents became available.

These analytics helped to bring the students who were out-of-pace again into the learning stream.

Thus, the approach made extensive use of above online resources to make the online engineering education, effective one.

The next section presents the statistics of our approach.

### III. THE STATISTICS OF THE APPROACH

In the COVID-19 pandemic period, the conduction of the course namely 'Honors course in Data Science' was carried out under which the subject 'Machine Learning and Data Science' was taught online for the final year, engineering graduates. As the course attendees were engineering students, who were technically capable of handling professional tools, the usage of the tools mentioned in section II was preferred to deliver more than just conducting the online-sessions. Some of the evidences of these efforts, have been presented in points covered next.

1) *The adoption of the LearnCo Web Platform for availing the students a better classroom experience through live-classroom problem solving sessions.*

On this web portal, configuration of the multiple choice questions for the students was done in advance and later during the session conduction, quiz-classroom was made live. The students could enter the live classroom-pin to join them. These quiz sessions were created topic wise for every unit under the syllabus and were made live post the GoTo webinar session conducted for the related topic. Thus post the content delivery, this tool was utilized so that the students could review their understanding levels through the test appearance and by reviewing the performance report generated at the end of such tests and we as the trainers used these reports to check the grasping capacities as well as the engagement intensities of the students. The reports generated helped to poke the students who were either not observed on in the live classroom or who had been observed at low grasping levels to resolve their related difficulties. The Fig. 1 given below, exhibits the student-engagement GUI availed by the platform.



Fig. 1. The view on LearnCo Mobile Application of the students which they get on their mobile phone during live class conduction.

2) *Availing the students a way to learn on-demand through Udemy.*

There were scenarios in the teaching-learning process where either the students or their family members were affected due to the pandemic and hence the students were not in position to attend all the online sessions and hence failed to keep the pace with the rest of the class. Hence the focus was given to the on-demand learning resource namely the Udemy platform. To suit to the subject of 'Machine Learning and Data Science', two such online courses were created at the Udemy platform whose names and URLs are given next.

A) *Data Visualization* (<https://www.udemy.com/course/data-visualization-rdkulkarni>)

This course was created to an intention to cover the contents of the unit namely 'Data Visualization'.

B) *Google Data Studio* (<https://www.udemy.com/course/google-data-studio-made-easy-rdkulkarni>)

This course was created keeping the goal of letting the students have the hands-on experience on the data visualization tool.

The online course creation helped the students to engage themselves in doing the practical activities related to the topic those were covered during the sessions. To our findings later, these courses were adopted by not only the targeted students of our engineering institute but also by the learners worldwide. The Fig. 2 given below, showcases some of the statistics of the course titled 'Data Visualization' like enrollments, reviews, course engagement, feedbacks, grasping and the performance levels of the attendees.

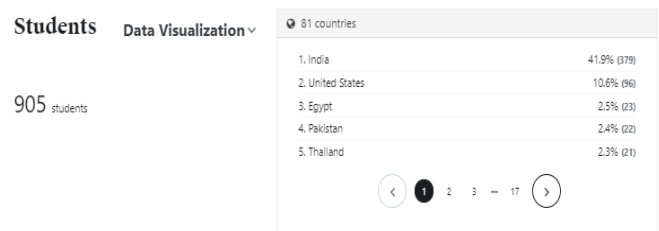


Fig. 2(a). The number and the country-wise percentage of students enrolled for the course 'Data Visualization'.

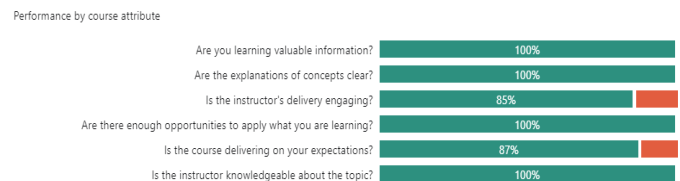


Fig. 2(b). The statistics of the reviews given by the students who enrolled for the course 'Data Visualization'.

## Course engagement Data Visualization

Last 12 months

4,065 minutes taught 230 active students

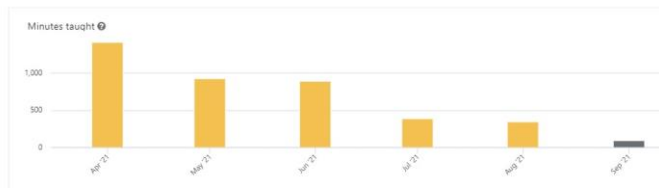


Fig. 2(c). The statistics of the 'student engagement' in the units 'minutes-taught' for the students who enrolled for the course 'Data Visualization'.

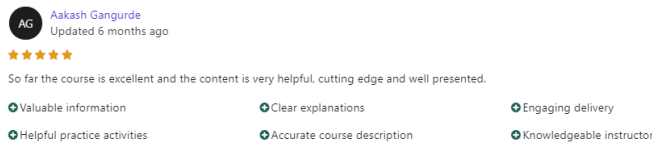


Fig. 2(d). The feedback from the student who enrolled for the course 'Data Visualization'.

Unit Wise Classroom Performance : Hons Machine Learning and Data Science-21-22 - BEACOMP 21-22

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Unit Name	Correctness	Confidence
Clustering Methods	31.39	50.25
Lab Session on Assign 2	50.89	70.75
Unit 5	37.5	70

Fig. 2(e). A snapshot of the LearnCo Report which helped to demonstrate the grasping levels of the attendees. This helped to focus on the out-pace learners.

## SWOT Analysis

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Unit Name	Topic Name	Correctness
Clustering Methods	Hierarchical Clustering.	75
Clustering Methods	K means Clusters	22.22
Clustering Methods	Density Based Clustering	59.09
Lab Session on Assign 2	ANN.	88.89

Fig. 2(f). A snapshot of the LearnCo Report which helped to demonstrate the performance levels of the attendees (SWOT Analysis) topic wise. This helped to conduct and focus on the difficulty-solving sessions.

The Fig. 2(a) depicts that as the on demand course contents were made available, the students from not only ours but other 80 countries took the benefits. They could get guidance on trying some of the hands-on-techniques and hence were more aligned to this type of learning. The Fig. 2(b) asserts this from the encouraging reviews obtained by the course. The Fig. 2(c) exhibits the time-engagements in units of 'online minutes taught'. The course adaption rates were high in initial period of the course launch which confirms the students were focused on the course. The later decreasing shift has come due to the end of the course delivery. The Fig. 2(d) shows the feedback obtained on each of the topic. The feedback and reviews on the

courses helped for doing betterment in the course contents. The Fig. 2(d) and 2(e) denote the grasping level and performance statistics of the online attendees. These insights helped the trainers to focus on the slow or out of pace learners.

Thus, the figures depict that, the followed approach could avail the students the platforms for the mindful engagement in the online classes. The students were facilitated with online courses for learning at their ease and as per the time they could have. The statistics shown by Udemy has proven that stated goals in section I, were achieved for the 'improved trainers' as well as the 'active learners'. A combination of the professional and proven online tools, helped us develop an effective model for future use.

The next section presents the conclusions for our experiment with highlighting the major achievements.

## IV. CONCLUSION

During, the COVID-19 pandemic, the educators have strived to provide the continual learning for the students to help prevent any financial loss of the learners. The major attempts of the educators were diverting attention of the graduates towards the continual, online learning process, engage them into this process and support those learners who were affected by the corona disease. The faculties at engineering academics, were also part of these noble efforts. To provide quality and mindful e-Learning facilities to our engineering graduates, the followed approach was developed and followed.

1. Making use of GoTo Webinar online sessions to avail the content delivery to the engineering students.
2. Adopting the LearnCo platform developed by Maharashtra Knowledge Corporation Limited to engage the students in learning process and thereby avail enhanced classroom experience.
3. Seeking help of Udemy on-demand teaching-learning web platform to support the students who were affected by the pandemic and wished to learn at their own pace and time availability.

This approach of using a combination of selective, professional tools helped us deliver more, better and impactful contents than conducting the mere online sessions. The approach helped us to achieve the goals like

1. Letting the trainers have easy, superior controls on the online attendees and thereby focus on the core activity of content delivery. This support was availed by GoTo Webinar tool.
2. Registering, monitoring, reviewing the online presence of the online attendees, resulting in improved participation levels of them. The GoTo Webinar tool eased this process.
3. Engaging the graduates in the test-solving activity through LearnCo platform to make their classroom experience richer.
4. Making the course contents available to the students through the Udemy web platform so that the students effected by the pandemic could learn on demand. This



also helped the slow or out-of-pace learners.

5. Letting the graduates practice the tools needful as under curriculum by making the demonstration available at all the times through online course created at Udemy.

The increased and sustained attendance levels, the mindful participation in live classroom activities and the increased number of enrollments for the online contents demonstrated the success of our approach.

Irrespective of the pandemic, the observed e-Learning pattern may be here to stay for a long. Hence it will keep everyone to look for the other betterments possible for enhancing the process of teaching-learning. The activities like making a customized, institute-level learning platform to avail all mentioned facilities of the three utilized tools under single roof and creating more online, on-demand contents are there on the to-do lists.

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