



Comparison and effectiveness of classroom and online learning in the background of COVID19: A case study on a tier ii engineering institute

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Abstract

The outbreak of COVID-19 pandemic has resulted in engineering and technology institutes to be shut all across the world. In India about 25 lakh students are out of the classroom and are attending online classes from mid-March 2020. As a result, engineering education has changed dramatically, with the sudden distinctive rise of e-learning, whereby technical subjects are delivered remotely and through digital platforms. In order to Compare and study the Effectiveness of Classroom and Online delivery of the engineering subjects in a Tier II Engineering Institute a research survey was planned. The responses received were then used to compare and study the effectiveness of delivering the syllabus. The results show that there is not much change in the way students differentiate between online and offline courses. How we interpret, record, compare and understand students responses can define whether engineering online education develops as an opportunity for the future post COVID 19.

Keywords: online learning, classroom learning, offline learning, challenges and difficulties, engineering education

1. Introduction

Most of the tier II engineering institutes prefer classroom (offline) mode of instruction or pedagogy atleast in India. With the rapid onset of COVID19 pandemic the sudden shift away from the classroom in many engineering institutes, some are wondering whether online learning will BE the new normal post-pandemic and how such a shift would impact the engineering education. Even before COVID-19, there was already a steady growth and adoption of educational technology in engineering education through webinars, video tutorials or online learning software. Research suggests that online learning has been shown to increase retention of information, and take less time and that the changes coronavirus has caused might be here to stay. But unplanned and untrained rapid move to online learning with insufficient bandwidth and ill-equipped students will result in a poor response and utilization that is uncondutive to learning.

It is certain that the use of information technology in engineering education will be further accelerated and that online education will eventually become an integral component of engineering teaching. It is very sure that a new blended model of engineering education will emerge, with significant benefits. There have already been successful transitions of this nature amongst many Indian universities. The presence of proper hardware or gadgets like laptops and the network coverage for internet access are still the critical success factors for online education in Tier II cities. The current research paper presents a case study on the comparison and effectiveness of online classroom pedagogy in a Tier II engineering institute and Tier II city

2. Literature review

The sudden shift in online learning or out of the classroom learning in traditional institutes offering engineering courses is because of the lockdown declared due to COVID19. Many

Tier II institutes had to shift to online classes within a period of 7-10 days so that engineering syllabus delivery and administration was not stopped. Offline (classroom) learning is the most used learning mode of traditional higher education. In this learning mode, the subject content is delivered through face-to-face interaction between faculty and students in a physical classroom. [25]. Online learning, on the other hand, provides students with more abundant resources, allowing them to take the initiative toward independent or cooperative inquiry and to cultivate the spirit of exploration and innovation ability [15]. Several studies have been conducted to investigate the factors potentially impacting these two learning modes. Stewart *et al.* [7] analyzed approximately 1400 relevant query responses from multiple institutions and instructors using the principal component and maximum likelihood method, and they identified seven factors that underlie student evaluation of online learning and can affect their performance; web page appearance, hyperlinks and navigation, technical issues, online applications, class procedures and expectations, content delivery, and instructor and peer interaction.

Teaching learning process depends on multiple factors, but not limited to the experience of the faculty, engineering subject being taught, or student interest in the engineering subject. There is no clear picture as to which variables should be used to test student learning and whether online teaching is more effective than traditional in-class teaching. While some studies conclude that there is no significant difference in student learning [4,7-10], others have found that online lecturing improves student learning [6-10]. However, one should avoid drawing broad conclusions as integrating comparative studies on online courses is difficult due to differences in the degree of online lecturing with the methods and tools used, as well as the discipline of the course subject [24]. Reynolds [23] reported that partially-online education improved student learning and exam grades,

whereas Wellington ^[22] focused on adding an online component to a traditional course as a supplement, and reported that student participation and exam grades had decreased. Wilson ^[21] reports the importance of additional contact between the instructor and students in an online lecture setting in the form of electronic deadline reminders, progress updates, or through discussion boards and forums. El-Zein ^[23] reported that implementation of a partially-online teaching medium has reduced student failure rates, as well as improving student satisfaction with the course. Koenig ^[22] however, suggests both faculty and student satisfaction decreases in online learning compared with traditional classroom learning. In a study by Ibrahim ^[21], 126 higher education institutions were investigated, and 30% of universities offering engineering degrees in the United States were reported to offer online degree programs. While some engineering programs reported having based their education entirely over the internet, others use online tools to facilitate learning in engineering courses with a partially-online/hybrid approach ^[20, 17], and others have tested the use of virtual or remote labs for engineering courses ^[11-16]. A factor preventing further acceptance of online learning is the presumed difficulty involved with online lecturing of mathematics-based courses, as compared with the nature of courses that may be found in other disciplines ^[10]. The rapid development of the Internet and E-learning technology has revealed online learning to be a great potential solution to the problem faced by offline or classroom learning ^[9]. The web provides convenient access and interaction in oversized classes without sacrificing the necessary support and retention ^[8]. In the meantime, in-class learning still plays a majority role in higher education.

3. Methodology

This section outlines the methodology used to compare and study the students perception of online learning with the classroom learning and then to identify the reasons behind the results. The gap in the current relevant literature motivates this research in the background of the outbreak of COVID19. In this research study, two key questions are addressed: (1) what is the student response to online learning and the challenges faced (2) What is the preparedness of faculty and the students' acceptability to online mode of teaching in comparison with offline mode. To help analyze these questions, the author designed and collected responses for a survey questionnaire. The questionnaire was designed in such a way that the responses could address the key questions posed above. A sample size of about 950 students equally distributed in four years of 5 engineering disciplines of a tier II engineering college in a tier II city were asked to compare the classroom (offline) and online delivery of the syllabus and give their responses. The set of questions in the questionnaire is presented below, followed by the results or the responses. Finally, the authors' conclusions and a further research discussion in last section will end this paper.

3.1 Questionnaire

1. How well did the faculty deliver/ teach through online mode?
2. Are the faculty proficient enough to teach online?
3. How effectively was the syllabus taught through online mode?
4. How much value are you getting from the course

- content delivered online?
5. Which do you feel is the most effective platform to deliver online classes?
6. Was the e-content delivered relevant to the course of study and better than the notes given in class?
7. Do you feel that you are now more competent in the subjects delivered through online mode than through classroom mode?
8. How would you rate the Quality of the teaching faculty during your online learning experience in comparison with classroom learning?
9. How would you rate the Academic advising/ clarification of doubts during your online learning experience in comparison with classroom learning?
10. How would you rate the academic reputation of YIT during online learning experience in comparison with classroom learning?
11. How satisfied are you with online learning in comparison with classroom learning?
12. What are the areas of online learning methodology you would like to be improved?
13. If given a chance what would be the mode of learning would you prefer to continue with?
14. How did you access the online learning material or participate in online classes?
15. In which mode did you access the online learning material or participate in online classes?
16. Did you access online books or material through e-resources from e-libraries?
17. Did you interact more with your classmates regarding online content or e-learning more than that you would have interacted during classroom learning?
18. What is that you like about online classes and e-learning in general?
19. Do you feel that you get more leisure time while pursuing online learning than that in classroom learning?
20. What are the other activities that you have involved in during online learning that you could not have taken up during classroom learning?
21. Do you feel online certifications (udemy, coursera, Alison etc.) may be allowed with credits acquired to be transferred to the assessment for the course you are studying?
22. Which are the assessment tools you prefer the most for online assessment?
23. Do you agree that online learning is the new normal for engineering education from now on?
24. Do you have network or internet connectivity issues hampering e-learning during lock down period?

4. Results and Discussions

A 10-year-old tier II engineering institute situated in a tier II city which was imparting undergraduate engineering education in Electronics & Communication (ECE), Electronics & Electrical (EEE), Computer Science (CSE), Information Science (ISE), Mechanical (ME) was selected for the study on online classes during COVID19 and its challenges. Around 956 responses were recorded out of which 177 students belonged to ECE, 133 to EEE, 198 to CSE, 191 to ISE and 257 to ME branch of engineering. Further 25.9% belonged to first year engineering, 26.7% to second year, 26.7% to third year and 20.7% belonged to final year engineering. The distribution of students from

different branches was random but the distribution of students across the different years was aimed at more than 20% as far as possible as the perceptions are likely to change as the years of engineering study progresses.

19.9% students felt that online teaching of faculty did not change when compared to classroom teaching whereas only 3.7% felt that the online teaching of faculty was better when compared to classroom teaching in the institute. The point to be considered here is that all students in this college had undergone classroom learning for about 45% of the syllabus who were now learning the balance of the same syllabus delivered online by the same faculty due to COVID19 lockdown. 59.5% of the students feel that the faculty are proficient to teach through online mode whereas 6.7% students feel that they are not proficient. Only 9.9% students are of the opinion that the subjects taught to them through offline mode (classroom) were better taught through online mode. On the value proposition of online classes 15% students felt that they are getting 100% value for the subject content delivered online by and large google classroom was the most preferred mode of attending classes online as 88.7% students found it to be easy to use platform.

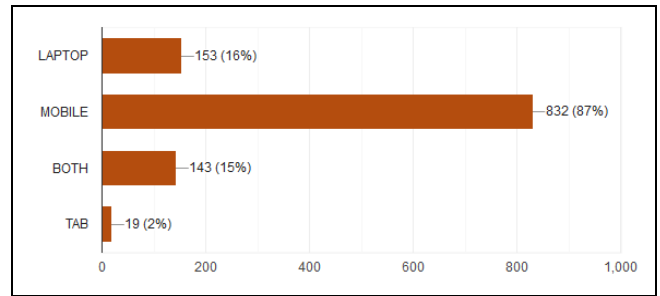


Fig 2: Mode or Gadget Used to Access Online Classes

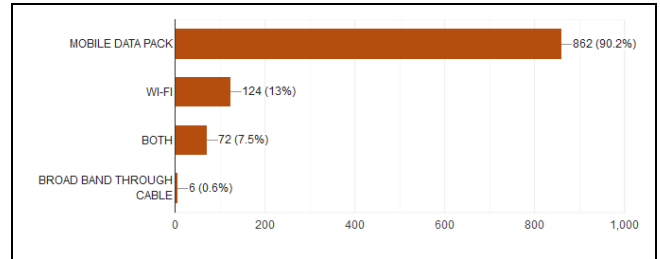


Fig 3: Mode of Access of Internet for Online Classes

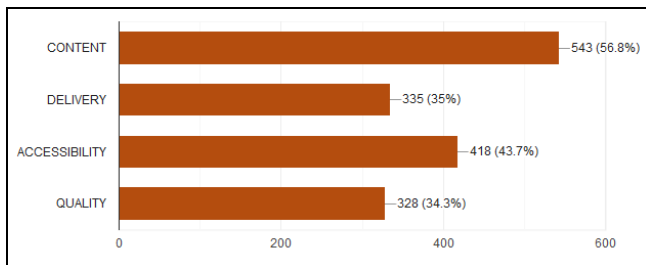


Fig 1: Some Aspects of Online Delivery of Classes that Need to be Improved

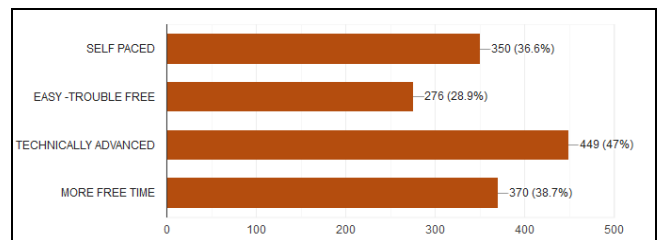


Fig 4: Feel Good Factors of Online Classes Based on the Responses

For a survey question on the relevance of e-content delivered 41.4% students feel that they have received more content than that given through classroom notes, 33.8% disagree to this and 24.8% students feel no difference in the content received. In continuation it is obvious and is supported by 27.8% students that they are better competent in the subjects that were otherwise taught in the classroom, whereas 33.1% students disagree to this. It is to be noted that 19.2% students agree that the quality of teaching by the faculty is better when they were teaching online

In case of online learning face to face faculty interaction is not existent but 22% students felt that the faculty were better in academic advising or doubt clarification than that in a classroom. The fact that 14.1% of the students feel that the reputation of the institute has improved when it has switched over to online classes is to be noted. On a scale of 0 to 10 a total of 89.2% students rate the value of online classes to be 5 and more whereas 5.3% students are not at all satisfied with online classes. The students feel that some aspects of online delivery of classes need to be improved in general and the responses are presented in Figure 1.

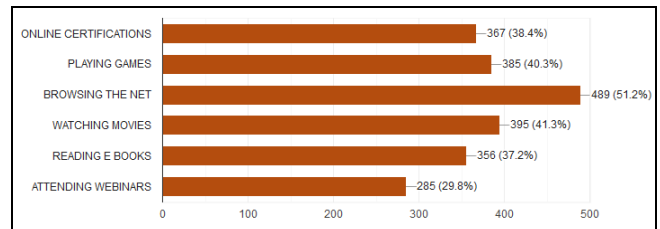


Fig 5: Other Activities Performed that would not have Been Possible during Classroom Learning

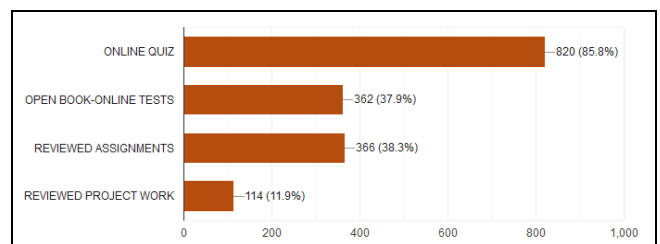


Fig 6: Students Preferences of Online Assessment Tools

Based on the responses for the preferred delivery mode of

Syllabus 41.2% of students still preferred the offline or classroom mode. The mode or gadget used to access online classes is presented in Figure 2 and the mode of access of online classes is presented in Figure 3. Out of the total students only 35.8% accessed e-books from online libraries. Though the classroom mode involves more opportunities of interaction between students 51.1% students interacted with their classmates more than that they would have done in a classroom regarding academic matters. The benefits or the feel good factors of online classes based on the responses is presented in Figure 4 and the other activities performed that would not have been possible during classroom learning are presented in Figure 5. Among the students 47.3% students of the tier II college feel that online certifications may be considered to earn credits while pursuing their regular curriculum. Further 59.7% students are fully satisfied by the online assessment tools used for assessment and 9.16% feel that practical/lab sessions can be effectively conducted online. Figure 6 shows the students' preferences of online assessment tools. Based on the location of accessing the online learning platform 52.1% students faced problems due to poor internet connectivity. Finally 50.7% students agree that online classes or e-learning will be the new normal in engineering education post COVID19.

5. Conclusions

Drastic changes in various domains occur when unexpected events force widespread experimentation with a new method or system. When the IT sector faced the Y2K problem there was a sudden surge in employment for Indian software engineers. The success of Indian software engineers established their credentials, and brought them to limelight as world leaders in addressing technology problems. Currently, the Coronavirus pandemic is forcing global experimentation with remote teaching and online learning. There are many indicators that this crisis is going to transform many aspects of life, engineering education could be one of them if remote teaching proves to be a success. As this crisis-driven adoption of new method is gathering steam, efforts are being made in collecting data and paying attention to the challenges faced by higher education in general and engineering education in particular. How we interpret, record, compare and understand students' responses can define whether engineering online education develops as an opportunity for the future post COVID 19.

The results of this study support arguments that online classes can be an equally effective teaching method when the faculty are trained for online teaching, proper gadgets and internet connectivity is ensured to students. There was no significant difference in student satisfaction between the two methods of learning for same courses in general.

As per the responses have indicated there are hardware and software issues that must be addressed before online learning can really take off. The internet bandwidth capacity and digital inequalities need addressing among the stakeholders. Students having the latest laptops, better bandwidths, more stable wifi connections, and more sophisticated audio-visual gadgets stand to benefit when compared to those who are devoid of these. Even in a considerably big classroom, a faculty can sense if students are absorbing the information, and can change the pace of the syllabus delivery accordingly. This study has been aimed bringing out the pain points of students so that the rest of the stakeholders can facilitate and understand

development requirements in those areas.

Online teaching also requires support of instructional designers, trainers, and mentors to ensure student learning and course completion. Digital divide also exists among faculty and colleges of different levels and their financial powers, which have become apparent in the current situation. All faculty members may not be comfortable with virtual classrooms and there is a capacity gap among those who have never used even the basic audio-visual equipment, relying on blackboards and younger faculty who are tech savvy. As students in Tier II cities and colleges entered online classrooms they became aware to the fact that many faculty are not trained to design multimedia presentations, with elaborate notations and graphics, which has been supported by the responses recorded. Colleges and faculty need to use this information to identify the training need and roll out plans for training. Attending online classes students feel that they don't belong to a peer group or institute, which in real life instils a sense of competition, belonging and motivation. Currently the participation of students of engineering in online classes can be pointed out to two factors (i) the supervision and monitoring by parents who were present in the homes due to COVID19 lockdown. (ii) the undeterred attention of students to classes as they have no other avenues of distraction outside due to lockdown.

In India developing e-learning infrastructure for engineering education might face unique challenges if the e-content related to the syllabus is not adequately designed as it has to deal with different levels of learners. Combining different technology is complex and influenced by factors that may not only differ from institution to institution but may also have different contributing factors. Therefore, a thorough study of critical success factors (CSFs) along with prior recognized factors and probable challenges must be undertaken. This can help the stake holders to frame e-learning policy suitable for all tiers of engineering education. Certain manipulations and drastic changes to teaching methodology and presentation using IT are necessary to use online classroom tools effectively and increased research and discussion of the strategies and methods associated with online learning are also required. The presence of proper hardware or gadgets like laptops and the network coverage for internet access are still the critical success factors for online education in Tier II cities.

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