

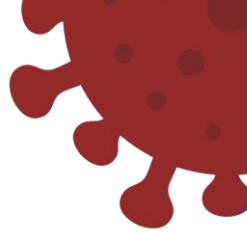
Online Teaching in Engineering Institutions in India during COVID-19 - a Study

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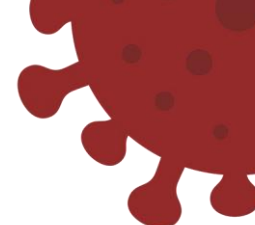


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It is hoped that the proposed recommendations will be useful to institutes and faculty for developing policies and guidelines for upgrading infrastructure and arranging required support and training to fine-tune future delivery of online courses.



Executive Summary

The complete lockdown caused by COVID-19 in March 2020, had serious impact on higher education in India. All universities and engineering institutions had to make a sudden transition to online teaching. This caused serious disruption to the system and inconvenienced the students, the faculty & the administration. In May, 2020, the health ministry announced that the number of COVID-19 cases was expected to peak in the month of August which meant that in all probability, the Fall semester of 2020 would also have to be delivered online. There was an urgent need to examine how engineering colleges in India managed during the Spring semester, and how they can be better prepared for online instruction in the coming semester and beyond.

Purpose of the Study

This study was undertaken with two clear objectives. First, to examine the major challenges faced by the engineering education community by the sudden transition to online teaching; identify lacunae in the infrastructure and pedagogy; and recommend steps for institutions to develop the required infrastructure, and for the faculty to develop required competencies to deliver courses (fully or partially) in the online mode.

The second and equally strong objective of undertaking this study was to initiate the practice of inter-institutional collaboration for undertaking joint studies/research. Thanks to *IUCEE International Engineering Educator Certification Program (IIEECP)*, a critical number of well-trained faculty are ready and eager to lead joint studies to address the issues common to most engineering colleges in India. Many of these issues are related to the socio-cultural or economic realities of the country and can be best resolved by local researchers.

It is in this spirit that this study was undertaken by six IIEECP certified faculty (Annexure I) from six different engineering colleges under the guidance of the Executive Director, IIEECP. The participating colleges represented different types of engineering institutions in India (affiliated, autonomous and university), from the southern, western, northern and central regions of India.

Methodology

To get a complete perspective of all stakeholders, three instruments were developed to get feedback from students (Annexure-II), faculty (Annexure-III), and administrators (Annexure-IV). Data received from 1470 students; 317 faculty members and 36 administrators was collated and analyzed to study the impact of six key pedagogical aspects of the emergency remote teaching: i) Accessibility to the internet and technology tools; ii) Content delivery & student engagement, iii) Quality and utilization of learning materials; iv) Assessment; v) Achievement of set outcomes; and vi) Impact of sudden transition on the personal response and growth of the faculty and the students. The recommendations made are based on the analysis of the survey data and the personal observations and experience of team members who were also a part of this sudden transition and had taught their courses online during COVID-19.

Key Findings:

The first and the most impressive fact that survey revealed was the amazingly positive response of to this emergency situation by the students, faculty and the administrators to complete all the courses in time. While administrators must be applauded for their efficiency in managing a quick



transition; the faculty must be applauded for their dedication and enthusiasm to do their best to cope with the situation. However, the survey showed a number of gaps in the infrastructure and faculty preparation that need immediate attention. The main lacunae in infrastructure were found to be the lack of adequate access to the internet and technology tools while the most challenging tasks for the faculty were in the areas of sustaining student attention; promoting student engagement; designing and implementing online assessment; controlling plagiarism and managing practical courses. Some of the key findings from the survey include:

1. About 90.77% of the students took online courses for the first time, and 76.55% of the faculty taught online courses for the first time during COVID-19 (Annexure II – Q.4, Annexure III –Q.1).
2. About 65.19% of the students used cell phones to connect to classes, and complete home assignments (Annexure II – Q.8).
3. In spite of India's tremendous progress in the area of telecommunication, network connectivity is not what it is generally believed to be. About 76% of the students and more than 70% of the faculty used the mobile hotspot for connectivity during classes (Fig. 2).
4. Nearly 56% of the faculty chose free software to conduct their online classes (Annexure III – Q. 6). **Zoom** was the most popular platform, while **Google Classroom** came a close second.
5. Most faculty members accepted having difficulty planning activities for student engagements and collaborative work. Also, most students confirmed that no office hours were offered to them.
6. Nearly 85% of the students reported missing social interaction with their peers, and more than 65% admitted that they did not find online learning joyful (Annexure II – Q.33 & Q.29).
7. The most challenging component was designing and implementing assessment. For the most part, assessment was limited to short quizzes and home assignments. Only 16.92% of the faculty attempted open-book assessment (Annexure III – Q.19).
8. As reported by 75% of the students, no lab classes were held (Annexure II – Q.7 and Annexure III – Q.4). The team members also confirmed that in their institutes, lab classes were only held in computer-mediated courses.
9. On a positive note, 96% of the faculty (Annexure III–Q.23), and 50% of the students (Annexure II – Q.31) confirmed that they had learned new skills during the lockdown period.

Recommendations:

Based on the findings from the survey, and the team members' personal observations and experience of teaching online courses during COVID-19, gaps were identified in three main areas; i) inadequate access to internet and technology tools; ii) insufficient technology and academic support for both faculty and students; and iii) need for faculty training in online pedagogy and technology management.

The following recommendations are made for addressing the identified issues:

1. Institutions must take pro-active steps to ensure that every member of the academic community has adequate access to the internet connectivity and required technology tools. To achieve this Institution should work with a reliable financial institution and/or a vendor to facilitate the purchase of desktops, laptops, smart phones and pre-paid data packages at subsidized prices.



2. Facilities should be provided to faculty for recording new audio/video learning materials as well as digitizing their existing exercises and notes so that these can be uploaded or easily made available to the students.
3. Institutions must invest in high quality software required for efficient online delivery of courses. At least four different types of software are required - a robust LMS; software for delivering synchronous lectures, specialized tools for designing and conducting assessment, and laboratory classes.
4. Institutions should set-up an efficient support system for students to help out with problems related to technology and academics. It is time for engineering colleges in India to start the practice of hiring senior or graduate students from within the institution to manage the technology and academic support system on the lines of a mini call center. This will be a true win-win situation for everyone - the students will get an opportunity to develop real world skills, and the institutions will get high quality service at a nominal cost.
5. Institutions should organize well-structured and scheduled training for faculty in different aspects of engineering pedagogy and technology management. For students, some training for managing online learning should also be included in the orientation programs.

Looking Ahead:

Both the set objectives for this study were fully achieved. It is expected that the findings and the recommendations discussed in the report will be helpful. The team members are now well-prepared and highly motivated to lead inter-institutional studies to address common problems faced by engineering education in the future.

The report will be sent out to all member colleges of the **Indo-Universal Consortium for Engineering Education (IUCEE)**, and made available to any other engineering college upon request (certification15@gmail.com). It is aspired that the recommendations made will help the institutions and faculty to be better prepared for including online instruction (fully or partially) as a viable option for delivering courses in the coming semesters.

The team proposes to undertake a sequel study in the month of December 2020 to review the changes made in the delivery of online instruction in the Fall (even) semester, and their impact on the general preparedness of faculty as well as on the academic performance and affective well-being of the students.

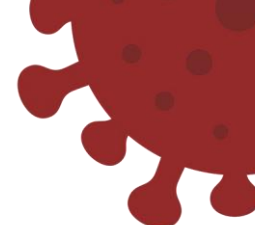
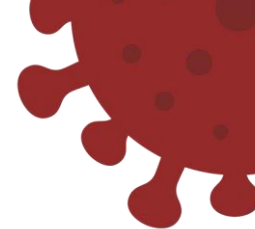


Table of Content

Preamble	7
1. Access to internet and technology tools	9
1. Accessibility to Internet	9
2. Technology tools for online instruction	9
2. Online delivery of courses & student engagement	11
1. Effective management of the LMS	11
2. The quality of 'live' lectures	11
3. Student engagement in class	12
4. Student engagement outside the class	12
5. Managing online lab courses	13
3. Quality and use of learning materials	13
1. Quality and Use of Pre-recorded lectures	14
2. Storage and accessibility of learning materials	14
4. Assessment	15
1. Major challenges in designing online assessment	15
2. Choice of assessment format	16
5. Achievement of set outcomes	16
6. Personal impact on students and faculty	17
1. Coping with crisis	17
2. Physical & mental comfort	18
3. Social interaction & joy of learning	18
4. Opportunity for acquiring new skills	18
7. Conclusions	18
8. Recommendations	19
1. Technology upgrade	20
2. Support system for students and faculty	21
3. Well-structured and scheduled training	22
Annexure I – List of authors	26
Annexure II – Instrument I – Student Survey	28
Annexure III - Instrument II – Faculty Survey	35
Annexure IV - Instrument III – Administrator Survey	42



Preamble

On March 19, 2020, the government of India announced a complete national lockdown to safeguard against the spread of the Coronavirus. All educational institutions including engineering colleges had to suddenly shift to online teaching. This unexpected transition in the middle of the semester caused a range of problems for students, faculty and the administration. In the month of May, 2020, the Indian Council for Medical Research (ICMR), officially announced that the number of COVID-19 cases in India are likely to peak in July-August, and it became clear that courses may still have to be taught online in the coming semester and beyond. These unusual developments are likely to have a permanent or semi-permanent impact on the structure and organization of higher and professional education across India. The situation merits a careful study of the circumstances and evaluation of the readiness of the institutions and faculty for including online instruction as a regular feature of engineering education in India.

Objectives of this study

The main aim of this study was to examine the system readiness of engineering institutions for online instruction at the level of infrastructure, faculty training and mental preparedness of students. The study is designed to collect essential information of how exactly different institutions coped during COVID-19, analyze problems faced by institutes, and then, present viable recommendations to address the identified lacunae.

A second, equally important objective was to initiate the practice of inter-institutional collaboration to conduct joint study or research on issues of common interest to engineering institutions in India. Thanks to ***IUCEE International Engineering Educator Certification Program (IIEECP)***, a critical number of well-trained engineering educators are ready and willing to lead the initiatives for collaborative research to address common problems faced in engineering institutions in India.

Methodology

To get a holistic picture of what was actually done by different institutions to cope with the situation created by COVID-19, three instruments were developed to get feedback from students (Annexure-II), faculty (Annexure-III), and administrators (Annexure-IV). To get a wider representation, data was collected from different types of engineering colleges – affiliated, autonomous and universities from southern, western, northern and central regions of India.

Responses received from 1470 students; 317 faculty members and 36 administrators were collated and interpreted. Some contradictions were observed in the responses provided by the administrators with those provided by the faculty and/or the students. As some respondents chose to skip some questions, the data had to be collated question-wise. Percentage. The data from all three instruments was analyzed and a set of recommendations proposed for getting the system



ready for part and full inclusion of online teaching in the coming semesters. The data collected was analyzed to study the following six key pedagogical aspects:

- Accessibility to the internet and technology tools
- Synchronous Online delivery of lectures & student engagement
- Quality and utilization of learning materials
- Assessment
- Achievement of set outcomes
- Impact on faculty and students' personal growth

Finally, the report ends with Conclusions and Recommendations.



1. Access to Internet Connectivity and Technology Tools

The entire process of online instruction is dependent on the quality of the internet connection available to the faculty and the individual students, and therefore that was the starting point of investigation.

1.1 Access to Internet Connectivity

The survey data brought out some rather surprising information regarding the state of availability of internet in the different parts of the country. Only 17.59% of the students had excellent to good connectivity while 35% of the students said that they had poor to very poor connectivity. If we look at the demographic spread of the students (Annexure II – Q.2), the numbers seem to show that the quality of internet connectivity varies from metro cities to small towns to rural areas.

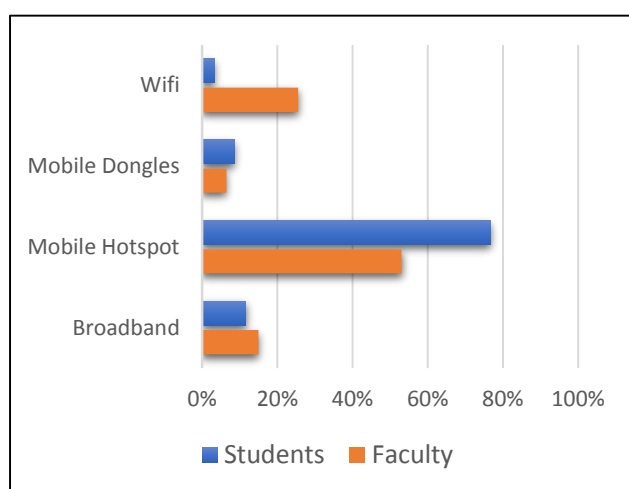


Fig. 1: Mode of Internet Connectivity used by students and faculty. (Annexure II – Q.9 & Annexure III – Q.5)

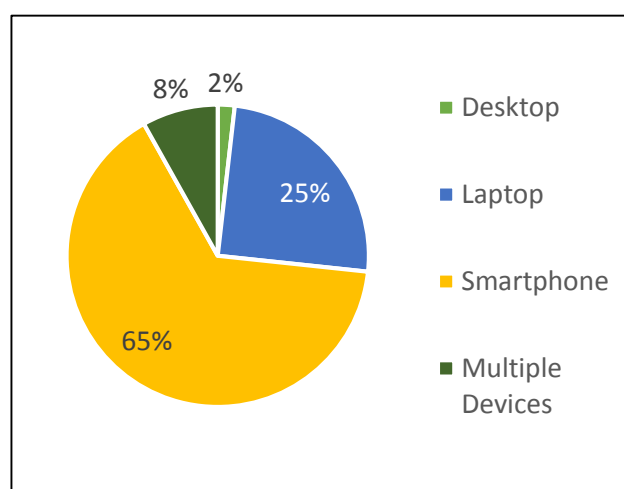


Fig. 2: Devices used for online learning (Annexure II – Q. 8)

About 65% of the students used cell phones to connect for classes. Apparently, to engage for 3-4 hours of online study a day (lectures plus homework), a student would need a minimum of 2 to 3 GB of data (3G or 4G). The survey revealed that Internet connectivity in India, in spite of being a national priority, is still not sufficient to fully support online mode of instruction, especially in the rural areas. A surprising 54.74% of faculty and 76.72% of students used mobile hotspot to access the Internet as shown in Fig. 1.

1.2 Technology tools for online instruction

The Survey showed that 90.77% of the students took online courses for the first time, and 76.55% of the faculty taught online first time during COVID-19 as shown in Fig. 3.

Ready accessibility to powerful and affordable technological tools is the key to successful implementation of online teaching. The survey showed that over 65 % of the students used cell phones to connect to their classes; only 25% of the students used laptops as indicated in Fig. 2.



As for access to appropriate software required for effective online teaching, a lot was wanting. Basically, five main categories of software are required for successful delivery of online instruction:

1. A Learning Management System (LMS) for hosting the course learning materials, assignments, grades and practice materials etc.,
2. A good videoconferencing software for delivering 'live' lectures,
3. Reliable tools for designing and implementing assessment for engineering courses. .
4. Software for creating/integrating student engagement activities and virtual labs.
5. Software for detecting plagiarism.

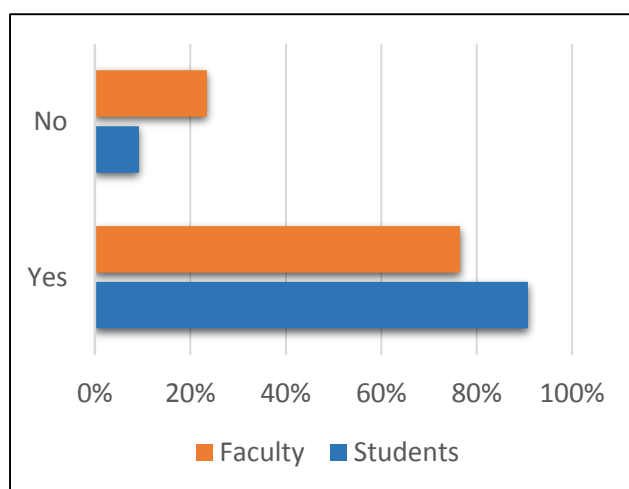


Fig. 3: Are you involved in online instruction for the first time? Students' and Faculty response (Annexure II - Q.4 & Annexure III – Q.1)

The first important tool for online instruction is a robust Learning Management System (LMS) as it serves a number of functions. In addition to hosting the course content, discussions, assignments and more, the LMS can be used very effectively to support both the low and high performing students. Most LMSs offer the possibility of designing simple assessment instruments like quizzes and short answer questions. *Google Classroom, Canvas, Moodle* and *MS Teams* are some of the popular options for LMS. Survey showed that most faculty members opted for a free LMS. About 37.56% used *Google Classroom* and 31.04% used the free version of *Canvas* for their online courses (Annexure III – Q.8).

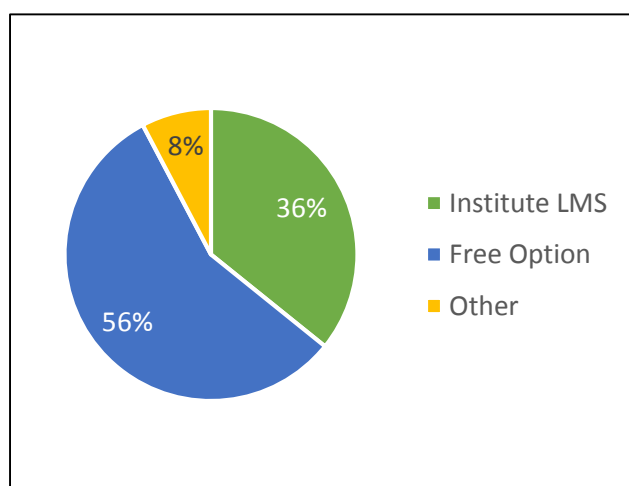
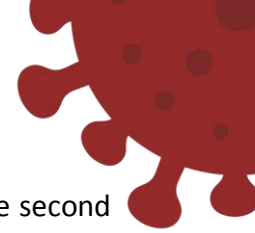


Fig.4: Use of LMS (Annexure III – Q.6)

Unless the LMS being used also offers the facility for videoconferencing, additional software is required for delivering *synchronous* lectures. The term *Synchronous* refers to lectures that are delivered to a 'live' audience. Sometimes, faculty members include pre-recorded materials in synchronous lectures. During COVID-19, 59% of the faculty members opted for 'live' delivery of lectures; others preferred to use pre-recorded lectures - 27% of them used their own-recorded lectures and about 14% used pre-recorded lectures by other experts (Annexure III–Q.7);. If designed and delivered well, 'live' lectures can be very powerful, especially when they include

activities to keep students engaged during and after the lecture.

To deliver 'live' lectures, several free video conferencing software are available. Some very popular options are *Zoom, Google Meet, GoToWebinar, Canvas Conference* etc. According to the survey,



Zoom appears to be the most popular (used by 48% faculty), *Google Meet* appeared as the second preference (used by 32% faculty) (Annexure III – Q.9) Most versions of the free software have limitations on the duration of the lecture as well as the number of students attending the lecture. This was a problem in some cases.

Apart from the free versions of LMS and Videoconferencing tools, the faculty mostly used *WhatsApp* to connect with their students within and outside the class.

2. Courses Delivery & Student Engagement

Effective delivery of online instruction involves efficient management of three components – the LMS, the video-conferencing tool, and student engagement activities.

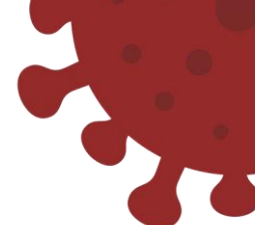
2.1 Effective management of the LMS

Today, very powerful LMSs are available at fairly reasonable price however, only a few institutions provide a licensed version of LMS to their faculty and students. Curiously, even though some faculty (36%) had access to an Institute provided LMS, most of them (56%) chose to use a free LMS (Annexure III – Q.6). From the academic point of view, it is very important that the same LMS is used across the institute. If each faculty member uses different software, it becomes very confusing and tedious for the students to cope with different software moving from course to course.

2.2 The quality of Live Lectures

During COVID-19, most engineering colleges attempted to replicate the conventional classroom teaching in the form of remote teaching through the internet. In this scenario, the quality of live lecture becomes very important in terms of delivering content efficiently and ensuring a meaningful and joyful learning experience for the students. The survey findings reflect that 54% of students were satisfied with the quality of ‘live’ lectures (Annexure II – Q.19). This is really heartening especially because over 76.55% of the faculty and 90.77 % of the students were experiencing fully online instruction for the first time (Fig. 3).

While planning online instruction, two important considerations are i) the number of lectures per day, and ii) the duration of each lecture. From the responses received, it appears that most institutions retained the schedule followed in regular semester. The survey reported that 42% of the faculty taught a maximum of 2 lectures a day; 11% taught 3 lectures a day, and 5% taught 4 lectures a day (Annexure III–Q.3). As for the duration of lectures, 51% of the students reported that the lectures were 60 minutes or longer though 34.21% of the students reported that their lectures were of 40 minutes (Annexure II–Q.6). One of the reasons for the reduced time could be that most free software have a session limit of 40 minutes. From pedagogically point of view, it is advisable to keep the lectures short. Longer online lectures must involve carefully designed student engagement activities which requires a lot of time and expertise on the part of the faculty. Furthermore, Intensive viewing on a small cell-phone screen for long hours is physically tiring. Many students reported experiencing physical strain caused by short-range viewing - 53.90 % of the students admitted having eye pain and headaches (Annexure II–Q.34).



2.3 Student engagement in class

Literature suggests that the biggest challenge of online learning is managing student engagement. Faculty members have to be very skillful at both designing activities and managing technology to be able to sustain social connection and peers interaction. Most scholars agree that student engagement, be it in regular or virtual classes, determines the efficiency and quality of the learning experience. Active student participation helps the faculty to promote attention, curiosity, interest, optimism, and passion while learning new concepts. The survey results showed that over 55% of the students appreciated the excellent efforts put in by faculty to keep them engaged during the live lectures, even though a small 13% expressed that there was no engagement in their online courses. (Annexure II – Q.21). The other complaint mentioned in the open-ended questions was about the *difficulty in taking notes* during the online classes. This can be easily overcome if faculty plans to make all learning materials available to the students either via the LMS or You Tube.

Most faculty members tried different strategies to get individual students actively involved. About

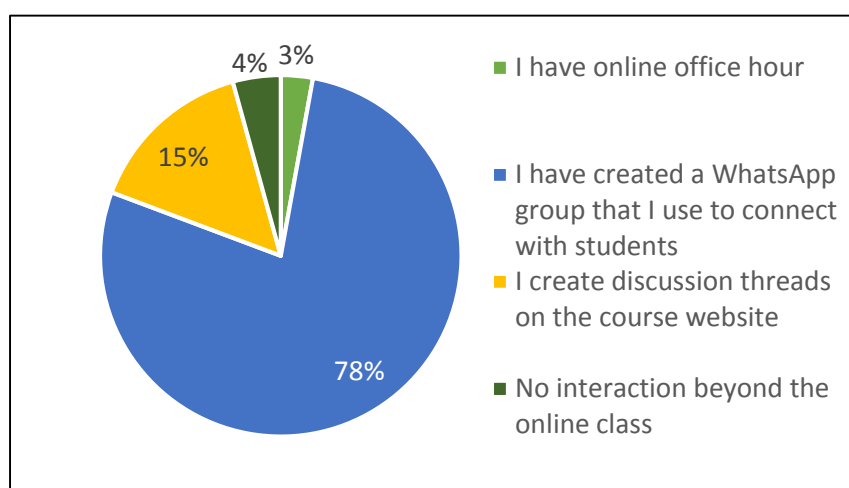


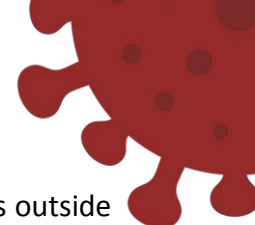
Fig.5: Interaction with Faculty outside the class (Annexure Iii – Q.18)

48% of the faculty indicated that they used the *Chat box* feature of the video conferencing tool to effectively promote interaction amongst students during live lectures. The most commonly used tool however, was *WhatsApp*. In addition, about 90% of the faculty allowed students to ask questions or clear doubts during the lectures by using audio/video feature of the video conferencing tool (Annexure III– Q.15). However, a small 9% of

the faculty members were unable to engage students in live classes, 57% of the faculty accepted not being able to design and implement collaborative or peer activities during their online teaching sessions (Annexure III– Q.14).

2.4 Student engagement outside the class

Connecting with students beyond regular lecture hours is even more important in the online environment than it is in the conventional classroom. Interacting with students outside the class enhances social presence and motivation. This interaction plays a key role in improving students' academic engagement and joy of learning. In the survey, around 65% of the students and 78% of the faculty indicated that they used *WhatsApp* as the main tool for communication outside the class (Annexure II-Q.21 & Annexure III–Q.18). Other media forms like e-mail and discussion forums were also used though not extensively. Surprisingly, around 12% of the students said that there was no opportunity to connect with their faculty after the online class. Even more surprising was the



fact that only 3% of the faculty offered “Online Office Hours” to connect with their students outside the class.

2.5 Managing lab courses

Laboratory courses are an important part of the engineering curriculum. The most difficult challenge faced by all engineering colleges during COVID-19 transition, was to conduct the lab classes online. For this particular question, contradictions were observed in the responses given by the administrators, the faculty and the students.

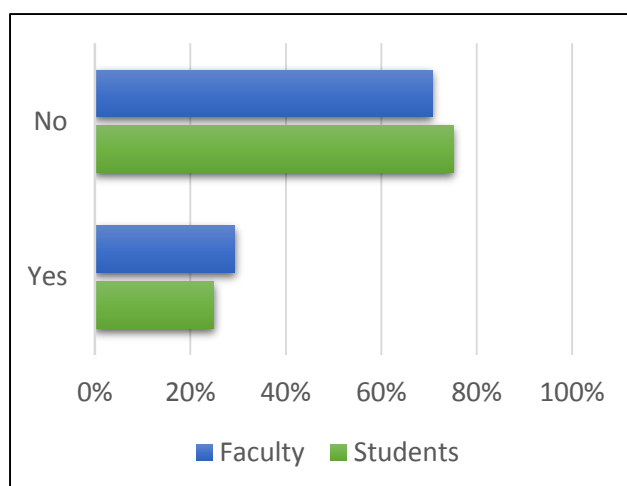


Fig.6: Did you engage in any lab courses during COVID-19? Faculty and students' response (Annexure II – Q7. & Annexure III – Q.4)

While 75% of the administrators said that facilities were offered for conducting practical classes, 71% of the faculty and 75% of the students confirmed that practical classes could not be held (fig. 6). Upon further investigation, it was found that labs for computer-mediated courses were held but no solution was found for conducting other laboratory-based classes. Very few faculty members used virtual labs. to address this problem. It can be assumed that even though institutions had some kind of arrangements for teaching lab classes online, faculty were not fully confident to conduct practical sessions online due to lack of training and hands-on experience.

It is time that the concept and resources for using virtual labs in the curriculum are seriously

explored; and the faculty is trained to effectively integrate them in both online and conventional classroom.

3. The Quality & the Use of Learning Materials

Appropriate design and effective use of the learning materials play a major role in engineering education. This role becomes even more important in the virtual environment. It is clear that the learning materials used in the online mode have to be different from the ones used in the regular face-to face classes. In addition to the regular power-point presentations and lecture notes, the faculty must use pre-recorded audio/video materials. The existing learning materials/notes have to be suitably modified in structure and organization for use in the online classes. All learning materials have also to be digitized for uploading. Responses from faculty showed that 26% of the faculty used the textbook, 17% pre-recorded their lectures, 15% used pre-recorded lectures by other experts, and 42% made the effort to specially design the learning materials (Annexure III – Q. 10).

In the open-ended questions, some faculty reported that “a lot of time is needed for material creation” (Annexure III–Q.32). Understandably, the task of selecting, restructuring or designing new materials is rather time-consuming. However, a very positive response was shown by nearly 88% of



the faculty who enthusiastically made effort to re-design content for their live lectures. Faculty needs to be applauded for their effort and positive attitude - 75 % of the faculty confirmed that the COVID-19 situation allowed them more time to prepare their lectures and learning materials (Annexure III – Q.22).

Two issues brought out by students responses to the open-ended questions were the need for providing “*Practice questions*”, and creating “*high quality learning materials*” for courses that involve extensive problem solving skills.

However, the quality and effectiveness of the materials used is hard to assess because 35% of the students rated it as *fair* while 19% students rated the quality of learning materials as *poor* to *very poor* (Annexure II – Q.16). On the other hand, if academic performance is to be used as the yardstick to measure the efficacy of the learning materials, the outcome is not very positive because nearly 63% of the students reported that their academic performance in online courses has been ‘*not as good*’ to ‘*poor*’ as compared to that in regular courses (Annexure II –Q. 25).

3.1 The Quality and the Use of Pre-recorded lectures

In addition to reading materials and notes, online mode requires a lot of visual and pre-recorded materials. Survey shows that nearly 27% of the faculty members took the trouble to pre-record their own lectures while another 14% used pre-recorded lectures by external experts (Annexure III – Q.10). In the absence of a dedicated LMS, in most cases, these lectures were uploaded on You Tube so that the students could access them at their convenience.

The strategies for using pre-recorded materials in ‘synchronous or asynchronous mode play an equally important role in sustaining students’ attention span and motivation. According to the survey 38.03% of the faculty asked the students to view the pre-recorded lectures on their own.

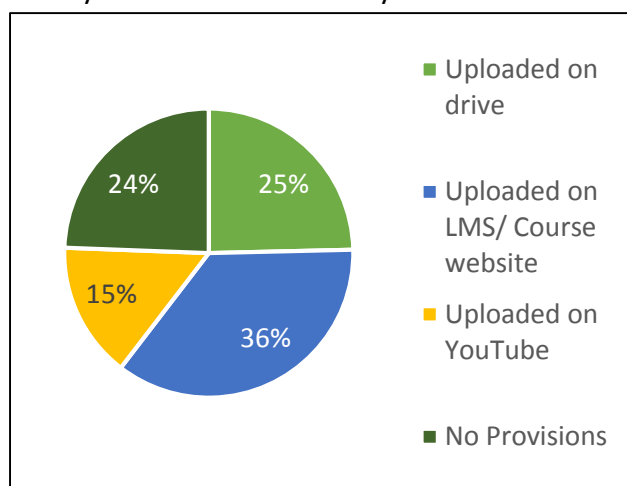


Fig.7: Facilities to access learning outside the class. (Annexure II – Q.18)

(Annexure III – Q.11). Around 13.73% of the faculty used the pre-recorded lectures during their live lectures. In the open-ended questions, some students reported that “*In Pre-recorded videos concepts are unclear*”- This is an important feedback for those faculty who tend to upload huge amounts of content in the pre-recorded form especially by external experts. Students often find these lectures by international experts very hard to follow because of the English pronunciation and expressions used. Moreover, the explanations and examples are not always relevant and/or aligned to the cultural context and course outcomes.

3.2 Storage and accessibility of learning materials

Many faculty members struggled with the issue of storing learning materials for easy access to the students. In online teaching, it is very important that the students have an easy access to all learning materials so that they can review them at their own pace and convenience, and especially



if one misses a class due to loss of connectivity or any other reason. This also reinforced the need for a dedicated LMS or a Course website. About 35.79% of the students responded that the learning materials were shared through LMS/Course websites, 24.63% said that the content was uploaded to Google drive, and 15.18% said that all pre-recorded lectures were uploaded in YouTube. However, it was disappointing to note that nearly 25% of the students had no access to the learning materials for review or in case they missed a class (Annexure II – Q.18).

4. Assessment

Planning and implementing assessment were among the most problematic areas in online teaching during COVID-19. As the transition happened when most engineering colleges were in the middle of the semester, the big challenge was to design and implement assessment in the online mode for the remaining part of the semester. To elicit maximum information on this issue, the faculty and the students were asked questions such as *“Was the assessment pattern modified?”*; *“Which format of assessment was found to be most effective?”*; *“Which technology was used?”* *“Was online assessment as effective as in conventional classes?”* and *“How do you compare your performance in the online assessment to that in the conventional mode?”*

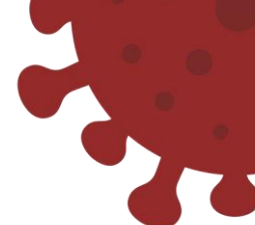
Data analyzed from the survey showed that 18% of the colleges adhered to the same assessment pattern that was planned for regular classes, 49% reported that it was somewhat different; 30% said it was very different and sadly, 3% students reported that no assessment was administered at all (Annexure II – Q.22). Some contradictions were noticed in the responses in this section. While 80 % of the faculty claimed that they made suitable modifications to the assessment pattern (Annexure III – Q.17); 63% of the students reported that their performance in the online tests was ‘not as good’ to ‘poor’ as compared to that in regular classes (Annexure II – Q.25).

4.1 Choice of assessment format

Once again, a lot of credit is due to faculty for attempting to modify or completely re-design assessment instruments to suit the online mode. Nearly 80% of the faculty said that they had made changes to the assessment, (Annexure III - Q.17), and 79% of the students confirmed that the assessment pattern used by faculty was quite different from the one used in their regular classes (Annexure II – Q.22).

In the absence of a dedicated LMS, most faculty members relied on free available resources for implementing assessment. *Google Forms* emerged a clear winner as far as the choice of software for implementing assessment is concerned.

Most of the faculty members relied on ‘short quizzes’. Both faculty members (34%) (Annexure iii - Q.19) and students (44%) (Annexure ii-Q.24), confirmed that short quizzes were used most frequently. Most of the assessment was based on home assignments. About 15% of the faculty were more innovative and created open book exams for their courses. However, not many faculty members designed collaborative assignments, and practically no one used the standard descriptive questions.



4.2 Major challenges in designing online assessment

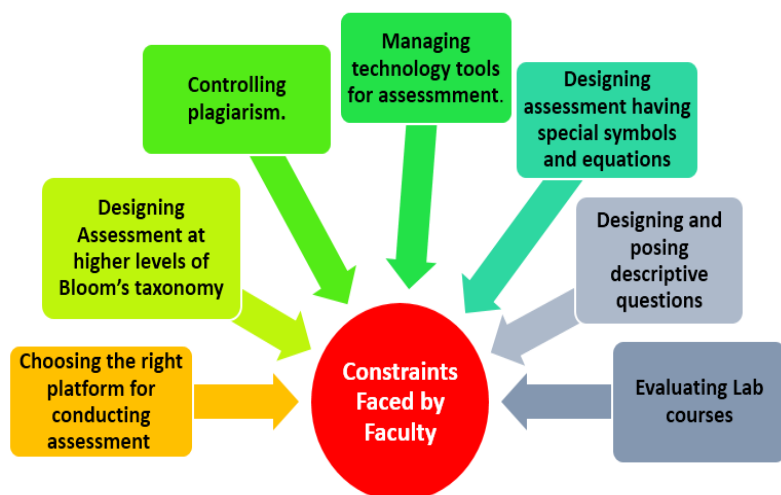


Fig.8: Challenges faced by the faculty while designing and administering online assessment

As mentioned earlier, the most challenging aspect of online teaching during COVID-19 was in the area of designing and administering assessment. Fig.8 lists the main constraints faced by the faculty while designing and implementing assessment online. No solution was found for creating descriptive questions at a higher order of Bloom's Taxonomy, and designing questions that require the use of special symbols and equations.

Controlling plagiarism was equally daunting. For students, the major

challenge was the availability of reliable network connectivity for completing the tests and exams.

5. Achievement of set outcomes

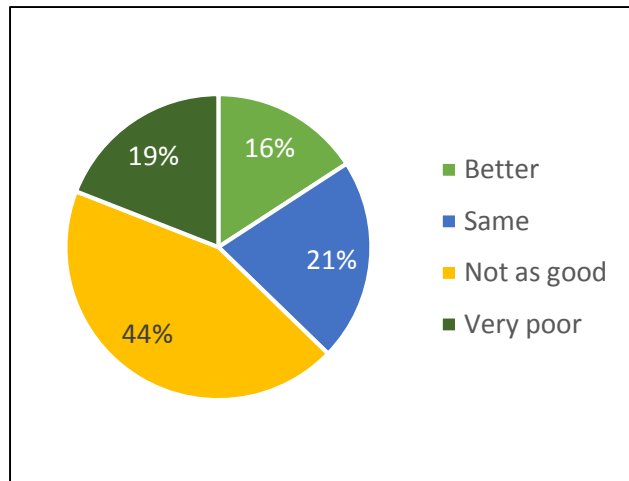


Fig.9: Comparison of academic performance in online courses and conventional courses. (Annexure II -Q.25)

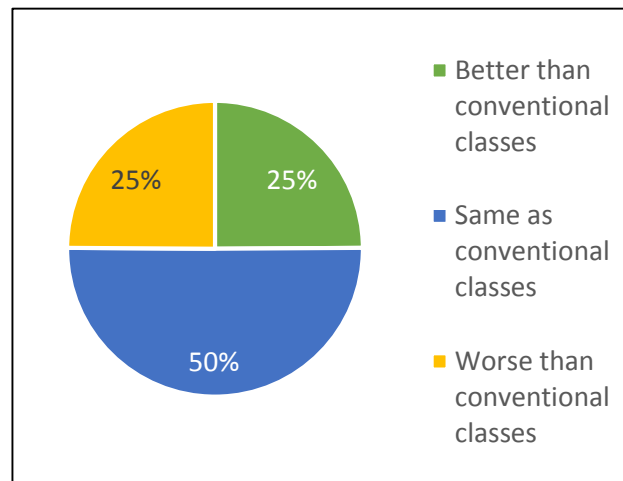


Fig.10: Comparison of efficiency in teaching online with regular classes? (Annexure III – Q. 21)

The ultimate success of any academic endeavor is measured by the extent to which the set learning outcomes have been achieved. The study attempted to assess this through the responses by different stakeholders by using differently worded questions. This was one area where some contradictions between the responses of the students and those of the administrators were observed.

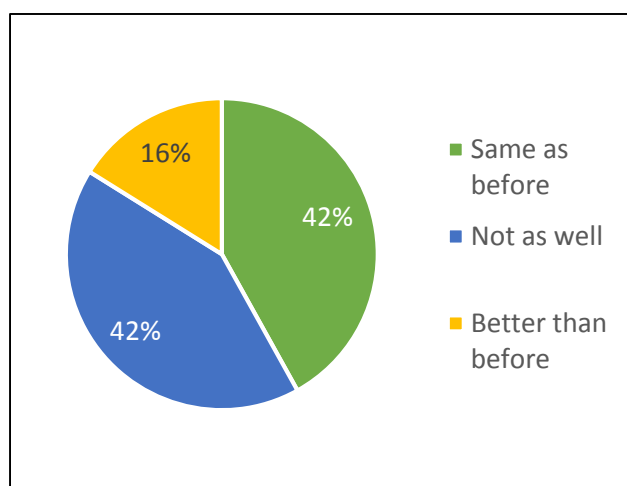


Fig.11: Achievement of specified outcomes in the online mode. (Annexure IV – Q. 22)

62.06% of the students admitted that their academic performance had been *poor* to *very poor* (Annexure II–Q.25); only 15% said that their performance had been actually better in the online mode.

The responses of the administrators, on the other hand were quite different. Nearly 58% of them felt that the outcomes had been achieved to the same or better level than in conventional classrooms: only 42 % felt that the outcomes were not fully achieved. However, it was difficult to come to a clear conclusion regarding this. The team members also confirmed that in their online teaching, the pre-defined course outcomes were

not fully achieved. The observations made by administrators were obviously based on the fact that the courses were completed in time. The lesson to be learned here is that course outcomes have to be re-defined for online instruction. This does not imply compromising standards but recalibrating the assessment instruments.

Faculty's responses on this were rather neutral. Only 25% of the faculty felt that they did not do as good a job as in their conventional classroom but nearly 50% of them felt that their efficiency in teaching online had been as good as in a regular classroom, and surprisingly, 25% said it was even better (Annexure III – Q. 21).

6. Personal impact of this sudden transition on students and faculty

This was a very challenging time for administrators, faculty, and students. A lot had changed and a lot had to be accomplished in a very short time. The objective of this section of the study was to learn how this unusual situation and sudden transition impacted the faculty and students personally in their response to the situation and the consequent growth experienced. Four aspects of student and faculty responses were studied: 1) Coping with the crisis; 2) Comfort level within the virtual space, 3) Impact on social interaction and the joy of learning, and 4) Opportunity to learn new skills.

6.1 Coping with the crisis

The survey confirms the tenacity and determination of all the three stakeholders – students, faculty and administrators to meet the challenge and successfully transit to the new mode of teaching and learning. The fact that, in most institutions across India, the running semester was completed successfully, confirms that both faculty and students coped well and faced the challenging situation enthusiastically. Even though 90.77% of the student and 76.5% of the faculty were engaged in an online course for the first time (Fig. 3), most of them managed to complete the courses



successfully. More than 75% of the faculty respondents were satisfied with their performance in teaching online (Annexure III – Q.21).

6.2 Comfort level in the virtual space

The other important issue was related to the physical and mental comfort level experienced by faculty and students in taking and delivering online classes. The responses here varied a great deal.

While 64% of the faculty found the online medium to be physically more comfortable and time-efficient, allowing them more time to prepare for their classes (Annexure III – Q.26 & 27), nearly 54% of the students reported physical discomfort like headaches, ear pain and eye strain because of the excessive use of cell phones and ear phones for attending online classes (Annexure II – Q.34).

6.3 Social interaction and joy of learning

The big issue during COVID-19, especially for students, was the lack of social interaction with peers that negatively impacted their joy of learning. While most of the faculty and students were satisfied with their participation and performance in the teaching-learning process in the virtual environment, both felt that lack of social interaction was a major negative of online instruction. About 88.12 % of the faculty (Annexure III – Q.31), and 85.30 % of the students said that they really missed social interaction with their peers. (Annexure II – Q.33).

More than 65% of the students admitted that they did not enjoy online learning. (Annexure II–Q.29). From the academic point of view, 54.02% of the faculty felt that even though online teaching was not time-efficient (Annexure III – Q.27), but they now felt more confident teaching online classes. This is supported by the fact that 72.80% of the faculty (Annexure III –Q.29), and 31.06% of the students said that they would be happy to take more courses in the online or blended format (Annexure II –Q.32).

6.4 Opportunity for learning new skills

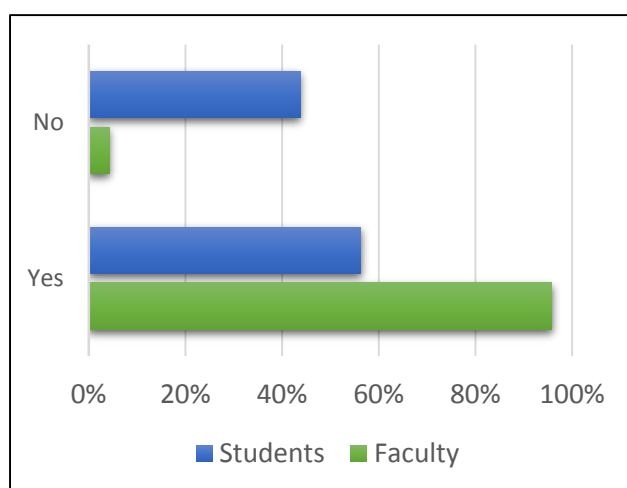
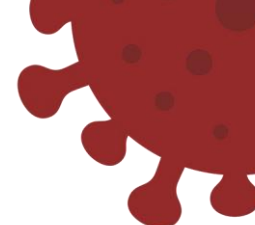


Fig.12: Opportunity for faculty and students to learn new skills during COVID 19 (Annexure II - Q.31: & Annexure III – Q.23)

Regarding the opportunity COVID-19 offered for learning new skills, the responses were more positive. More than 50% of the students said that they had learnt new skills; 25% were neutral and the remaining 25% said that they did not learn any new skills. (Annexure II –Q.31). Further analysis of the responses to different questions revealed that 93% of the 25% who did not learn any new skills were mostly from rural background and were operating from their respective villages during the lockdown. Lack of adequate bandwidth and internet speed could be the main reason for this lack of opportunity. As for faculty, 90% were of the opinion that they were able to



7. Conclusions

On the whole, all three instruments were very successful in collecting base-level data from students, faculty and administrators. On review it was felt that some more questions could have been added/expanded to get more detailed information. However, an important consideration while developing the instruments was that the questionnaires should not become too long and cumbersome to discourage respondents.

The four major conclusions emerging from the data are:

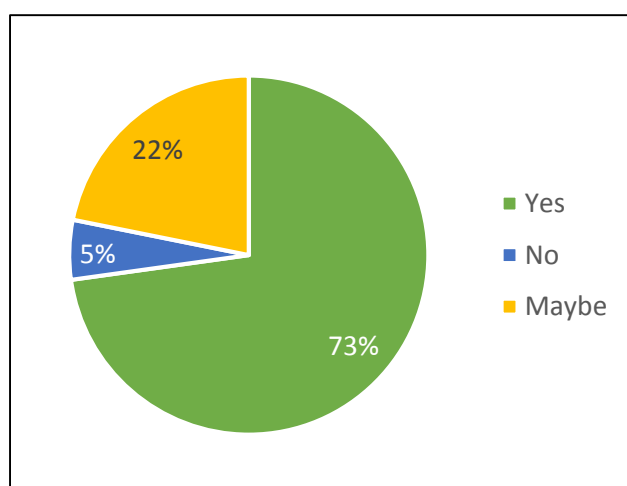


Fig.13: Do you think the Blended Mode is appropriate for engineering education? (Annex III – Q.29)

Positive response to COVID-19 crisis – The emergency response by all three stakeholders was amazingly positive. Most administrators confirmed that they had little to no problem transitioning to online teaching and had full support of the faculty and students. 76% of them reported that they took as little as one week to complete the process of transition to online teaching. (Annexure IV – Q.17)

Online instruction is here to stay – The general response of faculty was quite enthusiastic - 75% of them said that they would definitely like to teach online again and 21.84% said 'maybe' (Annexure III–Q. 28). About 36% said, they found online teaching physically more comfortable and

even a higher percentage (45.9%) found it to be more efficient. (Annexure III–Q.26-27) Nearly 73% of the faculty approved of *Blended Mode of Instruction* as being appropriate for teaching engineering (Fig. 13).

Need for providing/upgrading network facilities – Even though India has made tremendous progress in digital advancement, many of the rural areas still have limited connectivity. 76% of the students and more than 70% of the faculty used the mobile hub for online teaching-learning activities (Fig. 1)

Need for providing student support services – The comparatively lower academic performance of the students in the online courses showed that the students would benefit a great deal if proper orientation in the use of technology, and support services in academics are provided to them.

Need for faculty/student training – In spite of a very brave attempt by the faculty to meet the challenges posed by COVID-19, it was clear that there is urgent need for training faculty in several different areas of managing online instruction.

8. Recommendations

The Covid-19 pandemic has forced the entire higher education community to explore the potential of online learning. It is easy to anticipate that even post COVID-19, some component of online



teaching is going to stay. While it is easy to see the benefits and enrichment that inclusion of online instruction can bring to higher education, it is clear that it can only happen if the institutions are willing to invest in the preparation and organization of facilities and training in key areas. Focused preparations are required in three main areas – i) providing adequate access to connectivity & specialized software, ii) setting-up an efficient support system for students, and iii) organizing faculty training.

The study makes the following set of very focused recommendations in the three areas identified above.

8.1 Adequate Access to Connectivity & Specialized Software

The study identified four main areas where technology up-gradation is required for making online (or blended instruction) more effective. These are i) adequate connectivity and networking facilities; ii) availability of a robust LMS, iii) facilities for recording audio/video materials, iv) specialized software for designing and implementing online assessment, and detecting plagiarism

8.1.1 Ensuring adequate connectivity & networking facilities

Good Internet connectivity is the very first requirement for successful online teaching. The survey showed that only 27% of the students had *excellent* to *good* connectivity, and the remaining 73% ranked their connectivity between *fair* to *very poor* (Annexure II–Q.13). About 36% of the students came from rural areas (Annexure II–Q.2) where connectivity issues are well known. Nearly 77% of the students and 54.74% of the faculty used mobile hotspot for connectivity (Fig.1). The first responsibility of the Institute is to see that every student and every faculty has adequate access to connectivity.

The survey also showed that very few faculty or students used desktop or laptop computers. Nearly 65% students used cellphones to access the online classroom (Fig.2)

Recommendations –

- *The Institutions must take pro-active steps to identify faculty and students who live in areas where network connectivity is a recognized problem. These members of the academic community must be provided with Pre-paid dongles and data packages for free, or at a highly subsidized rate.*
- *Institution should tie up with a financial agency and/or a vendor to facilitate easy purchase of desktops, laptops, smart phones and data packages. Facilities should also be provided for digitizing learning materials produced by faculty so that it can be uploaded or disseminated to the students for free or at a very nominal cost.*

8.1.2 Availability of a robust Learning Management System (LMS).

Although 82% of the administrators said that they offered the faculty a licensed LMS (Annexure III – Q.10), most faculty members opted for a free version of LMS like Canvas, Moodle or Microsoft Teams. It can be concluded that faculty from those institutions were not fully conversant with the LMS provided by the institute. However, from the pedagogical point of view, it is important that all online courses in all departments of a university or an engineering institute are delivered through



same LMS. When each faculty uses a different LMS, it becomes very tedious and confusing for the students, and it negatively impacts their academic performance, and the joy of learning. A common LMS can be a great organizational tool for maintaining different databases across the institute.

Recommendation –

- *Engineering institutions must invest in a robust LMS and free access should be provided to all faculty and students. Today, a number of options are available at a very reasonable cost.*
- *The institution must ensure that both faculty and students have training to make the best use of LMS.*

8.1.3 Specialized software for online assessment

Designing effective online assessment for engineering courses delivered online can be very challenging and institutions must pay special attention to this need. In the survey both students and faculty confirmed that for courses delivered during COVID-19, the assessment mostly consisted of short quizzes (Annexure II –Q.22 & Annexure III –Q.19), and that is clearly not an acceptable option for evaluating engineering courses. Given a choice most engineering colleges would prefer to give proctored online exams. This can be done either by outsourcing the process to an outside agency or using specialized software. Both options need a lot of planning on the part of the institution. Outsourcing can be rather expensive and difficult to monitor, and using specialized software would require organizing faculty training especially for courses that involve complicated formulae and equations or coding.

Recommendations –

- *Institutions must take the issue of online assessment very seriously and make adequate arrangements either with an outside agency to conduct proctored exams. or invest in specialized assessment software that are customizable and provide controls for conducting proctored exams; designing exams for courses requiring coding; generating analysis reports etc.*
- *Proper training should be provided to faculty for designing and implementing online assessment*
- *Also, tools for detecting and controlling plagiarism must be made available at the institute level. It may be worth choosing an LMS that has inbuilt facilities for detecting plagiarism.*

8.2 Online Student Support System

Transition to online instruction (full or partial) will require a well-organized support system for students. They will need help in two different but equally important areas - technology and academics. The need for providing appropriate support cannot be over-emphasized when 90.77 % of the students and 76 % of the faculty are being exposed to formal online teaching for the first time (Fig. 3). *It is time for engineering colleges in India to start the practice of hiring senior or graduate students from within the institution to manage the technology and academic support system on the lines of a mini call center. This will be a win-win situation - the student-employees will*



get an opportunity to develop real world skills, and the institution will be able to provide high quality support service at a nominal cost.

In addition to support in resolving technology related questions, students also need help in academic area. The survey showed that over 53% of the students were uncomfortable in the online environment (Annexure II - Q. 26), while 63% of the students said that their academic performance had been poor (to very poor) as compared to their performance in conventional classroom (Annexure II – Q.25)

Recommendations–

A. Technology Support –

- *Institutions should set-up a call-center type facility where students can get help via phone and/or e-mail during extended periods of time. The helpline for resolving technology-related glitches can be managed by students hired from within the institute who are paid a nominal, per-hour remuneration. The students will work from home and resolve all kinds of issues that may be as simple as change of password or as complex as not being able to submit assignments.*

B . Academic Support –

- *A similar facility may be set-up for providing academic support to the students. This will be managed by another set of students (graduate or post-graduate) hired by the institute. They will also work from home and can be available to respond to academic questions over extended period of time.*
- *In addition, the institute should limit the class size to 40 students. Unfortunately, most administrators feel that more students can be accommodated in an online class but the fact is that students in the online class need more hand-holding than in conventional class.*
- *Faculty should be required to provide at least one (preferably, two), office hours per week to support the students. The survey showed that only 2% faculty offered office hour (Annexure II – Q.18); 17% of the students mentioned that they had no out of class contact with their teachers (Annexure II – Q.21).*
 - *Students needing additional support (first generation students, students from rural areas, low-performing students, etc.) should be identified right in the beginning of the semester. This list should be shared with the faculty of all online courses that the students are taking.*

8.3 Well-Structured and Scheduled Training

Training is required for both the students and the faculty. As reported earlier, over 76.55 % of the faculty and 90.77% of the students participated in a formal online course for the first time (Fig. 3). In this context, a major contradiction was noticed in the survey: while 83.12% of the administrators said that training for online teaching was provided to the faculty (Annexure IV – Q.15), 50% of the faculty accepted that they were not very confident in teaching online (Annexure III –Q.21). Which only confirms that attending training does not always translate into acquiring skills.



Thanks to the initiative taken by **Indo-Universal Consortium for Engineering Education (IUCEE)**, a number of engineering colleges now have Teaching Learning Centers (TLC) - 86.11% of the colleges surveyed said that they had a TLC (Annexure IV–Q.8) These Centers can take a lead role in organizing orientation for students and training for faculty in a well-structured and timely manner.

8.3.1 Student orientation

The institution and faculty must demonstrate to the students that online mode is not just a make-shift arrangement, it is a proper educational system that has evolved over the past 50 years, and is recognized by researchers across the globe as a very efficient mode of instruction. It is important to make students realize that online learning requires a different mindset, skill set, and a lot more discipline. Students must be provided the right tools and training to feel confident to succeed in the online environment by effectively managing time, technology, and their academic performance.

Recommendation –

- *Before the opening of the online course, the students should be given a walk through the different sections of the LMS to be used for online courses. In the survey, nearly 27% of the students said that they had trouble managing the LMS. (Annexure II – Q.12).*
- *Students also need to be given practical training in interpreting and using the learning materials in different forms - text, audio/video, simulations and virtual labs. etc.*
- *Orientation in participating in active and collaborative learning activities as well as following ethical practices should form an important part of the student training.*

Once the students are familiar with different software and their usage, it will help them to participate efficiently in online courses, enjoy the learning experience, and improve their academic performance.

8.3.2 Faculty Training

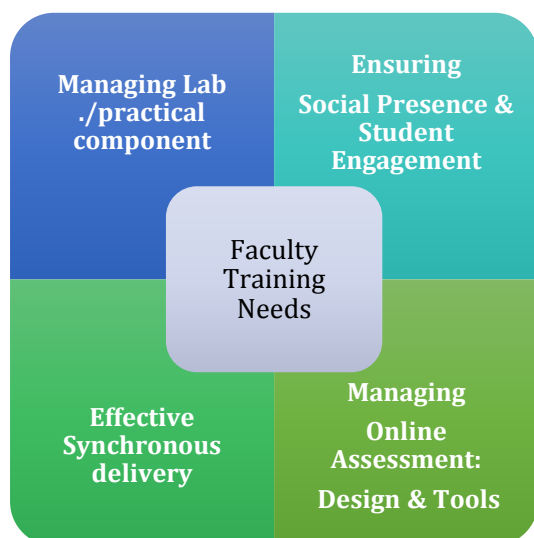


Fig.14: Four areas of faculty training for effective online teaching and learning

In the area of higher education, the big silver lining of the COVID-19 Pandemic has been the realization that teaching is as, if not more, important than research for preparing students for the real world. Even though faculty coped fairly well with the sudden transition due to COVID-19, there is strong indication from the students and faculty responses in the survey that there are big gaps and faculty will benefit a great deal from well-organized and structured training different area of online teaching. This is supported by that fact that 90% of the faculty accepted that they were not very comfortable teaching online (Annexure III – Q.24).

From the survey findings, four areas can be identified where faculty training is most needed. These are managing effective synchronous delivery; ii) ensuring



student engagement in and outside the online classroom iii) managing laboratory/practical classes; and iv) managing online assessment: design & implementation.

Recommendations-

- i) *Departments should create opportunities for faculty to share problematic areas and best practices to address some of the local logistics-related problems, through formal presentations during department meetings or informal lunch meetings.*
- ii) *For online pedagogy-related training, short practice-oriented workshops by experts should be organized focusing on different aspects of online teaching.*

Some topics focusing on developing single skill sets are suggested below:

- | | |
|--|---|
| 1. <i>Pedagogy for teaching online – the theoretical framework</i> | 9. <i>Designing effective assessment for online courses.</i> |
| 2. <i>Re-visiting course outcomes for online courses</i> | 10. <i>Humanizing online instruction</i> |
| 3. <i>Communicating in a vacuum</i> | 11. <i>Integrating content from external experts</i> |
| 4. <i>Effective synchronous (live) delivering of lectures</i> | 12. <i>Providing support to low and high performing students in online classes</i> |
| 5. <i>Selecting and packaging content for online delivery</i> | 13. <i>Optimizing online office hours for individuals and small groups</i> |
| 6. <i>Designing and implementing Flipped Class</i> | 14. <i>Designing collaborative activities for online courses</i> |
| 7. <i>Recording audio/video lectures, notes, and study guides</i> | 15. <i>Designing and implementing student engagement activities in the online environment</i> |
| 8. <i>Explaining difficult concepts virtually</i> | 16. <i>Using virtual labs.</i> |

Looking Ahead

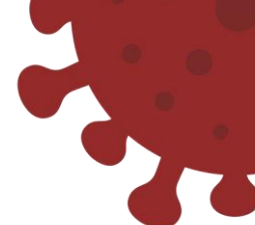
The study of the current scenario generated by COVID-19 confirmed that the online mode of instruction is going to make a big entry into the higher education space in India. Even though the sudden transition in the middle of the semester posed a number of problems for administrators, faculty and students, many positives came out of the experience. The crisis showed the tenacity and strong motivation of the administrators and faculty to meet the extreme challenge. 96% of the faculty confirmed having learnt new skills during this period (Annexure III – Q.23). This totally unexpected and unprepared trial run of online instruction showed that the online mode has the potential to promote problem solving and critical thinking skills as well as student autonomy and accountability that are so essential for making university and professional education in India more meaningful and productive.

One thing that became very clear was that this mode could eventually offer viable solutions to some of the problems hitherto considered insolvable. For example, given the right infrastructure, it could be successfully bail out universities and professional colleges located in remote areas where enrollment is low, and it is hard to attract highly qualified faculty.



The team proposes to widely circulate this report to all consortium member colleges of the **Indo-Universal Collaboration for Engineering Education (IUCEE)**. Any college, university or educational body can get a copy by sending a request certification15@gmail.com. It is hoped that the recommendations made will help the administrators and the faculty of engineering institutions and universities to be better prepared for including online instruction (fully or partially) as a viable option for delivering courses in the coming semesters.

The team proposes to undertake a sequel study in the month of December 2020 to review the steps taken by the institutions and faculty, and the impact of the enhancements in infrastructure and faculty training on the efficiency of delivery of online instruction.



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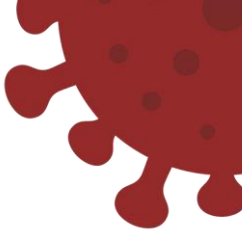
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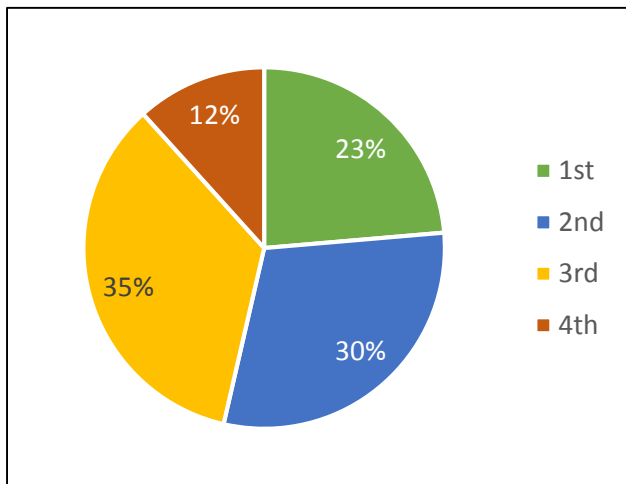


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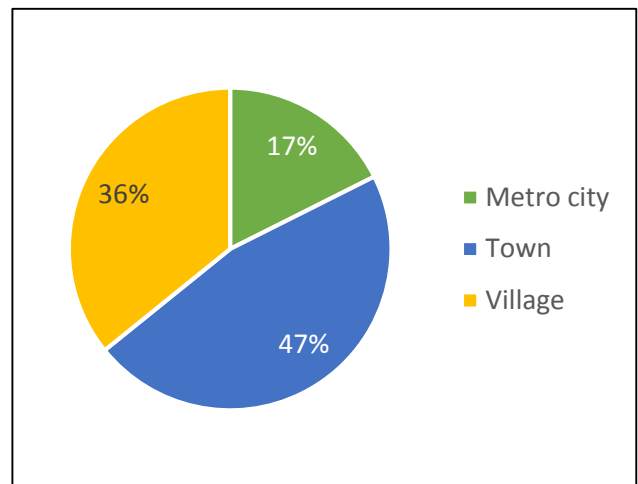
Keith R Fernandes – St Joseph College of Engineering, Mangalore. An IIEECP-IGIP certified faculty and active member of Indo Universal Collaboration for Engineering Education (IUCEE), Keith has made significant contribution in transforming engineering education in India. He has been passionately involved in training faculty specially in the area of online instruction. His research interests are in the area of Analog IC Design, Digital System Design, and Verification, ASIC Design, Engineering Education and Online Teaching. His current responsibilities include NBA Coordinator, Dept of ECE, Autonomy Coordinator, Chairperson for Student Amenities and Grievance Redressal Committee, and Chair of Student Activities, IEEE Mangalore Subsection.



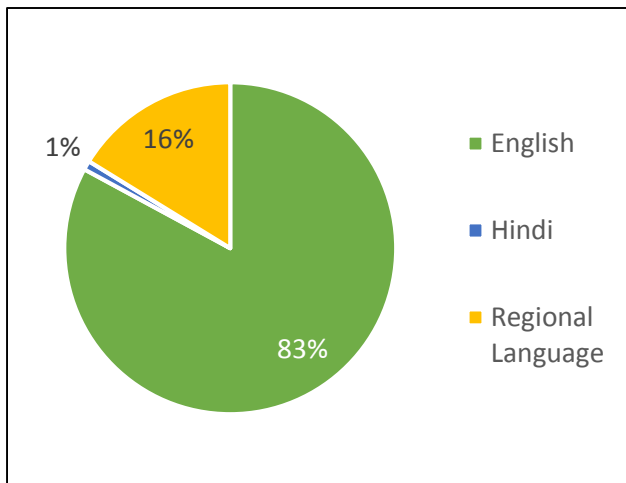
Annexure II: Student survey responses



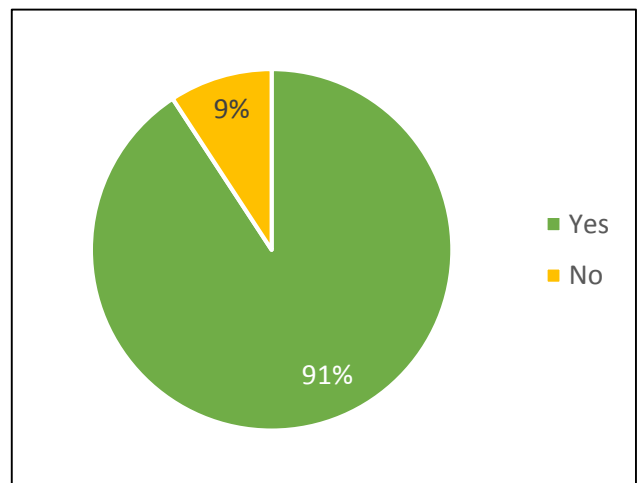
Q.1. Year of study at college.



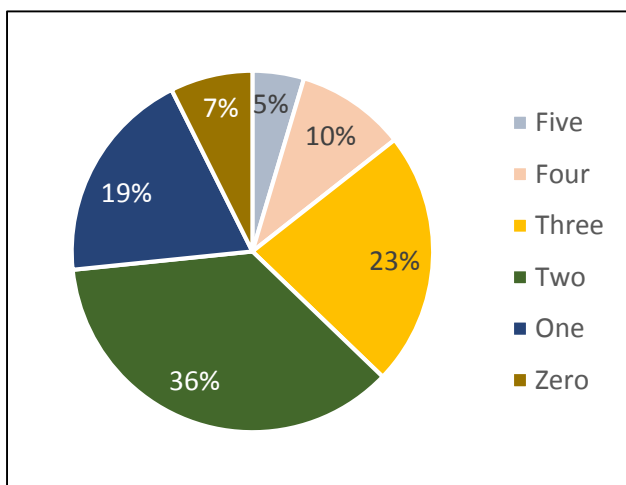
Q.2. Where do you come from?



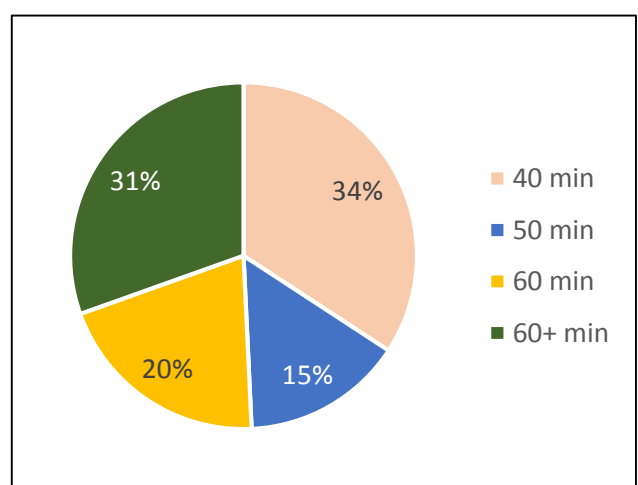
Q.3. The medium of instructions till High school



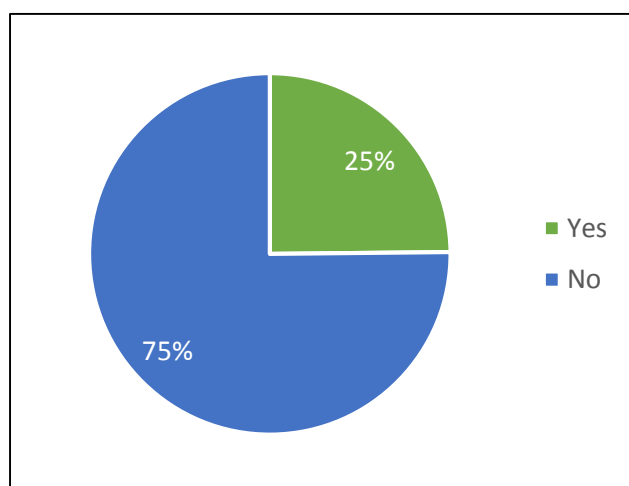
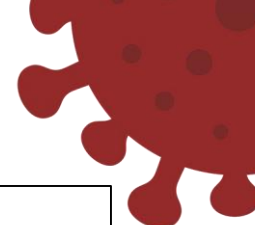
Q.4. Are you taking an online course from your college for the first time?



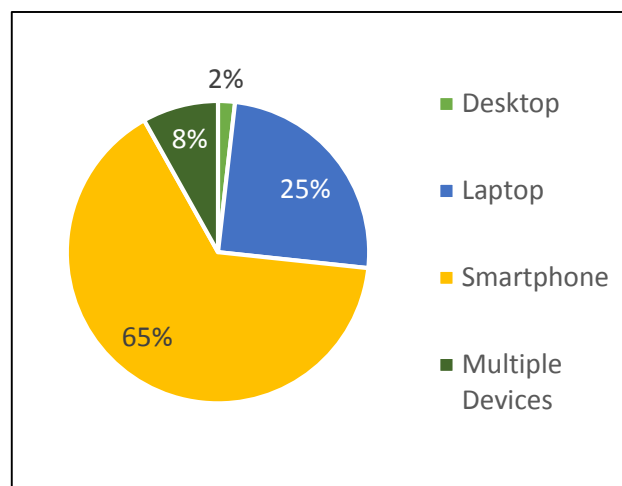
Q. 5. How many Online Lectures do you attend per day?



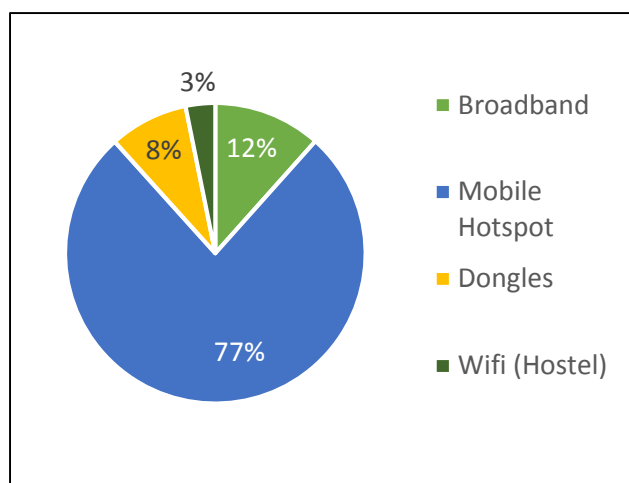
Q.6. What is the average duration per online lecture?



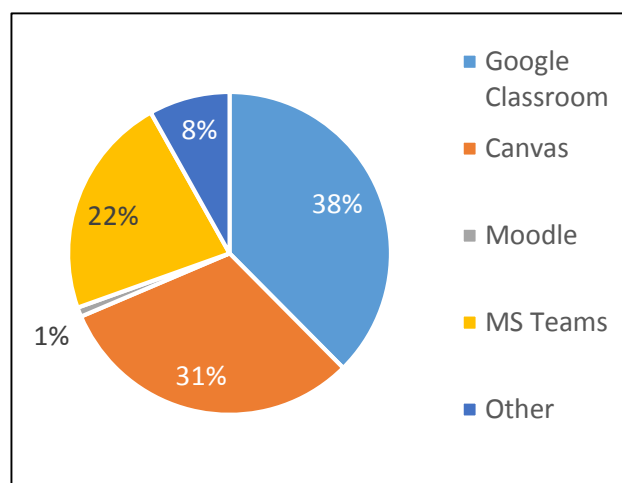
Q.7. Did you have Lab classes that are conducted online?



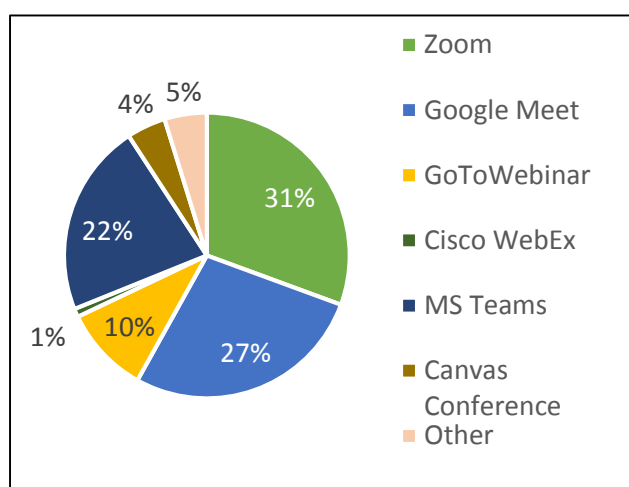
Q.8. How do you engage in online learning?



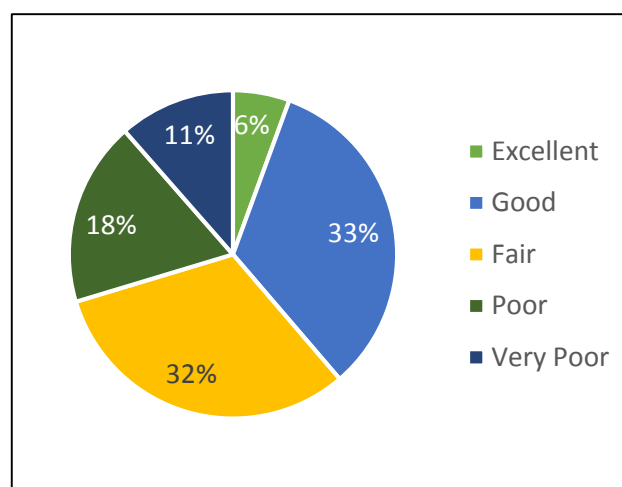
Q. 9. What is your mode of Internet Connectivity?



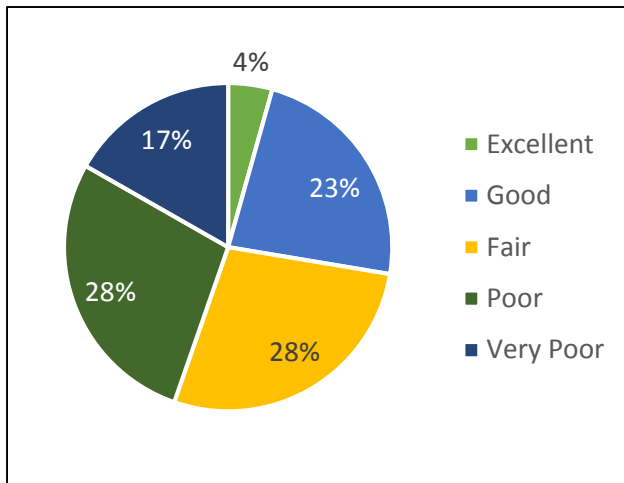
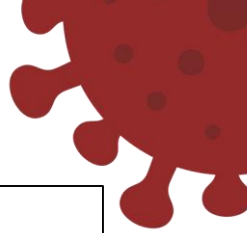
Q. 10. What is the Learning Management System/Software used for managing online courses?



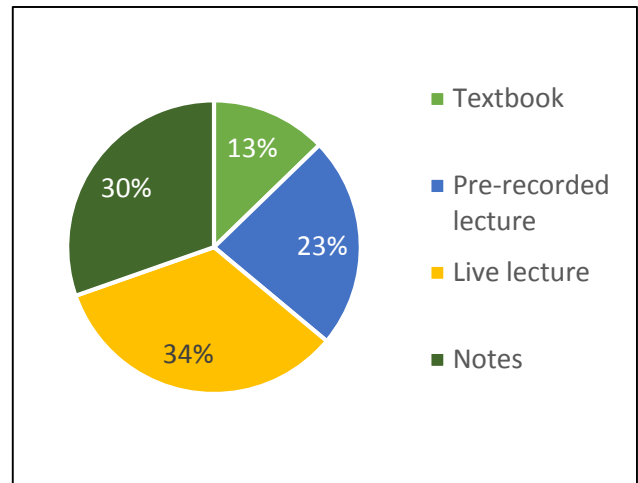
Q.11. Which Video conferencing tool does your Institute/faculty are using for delivering classes?



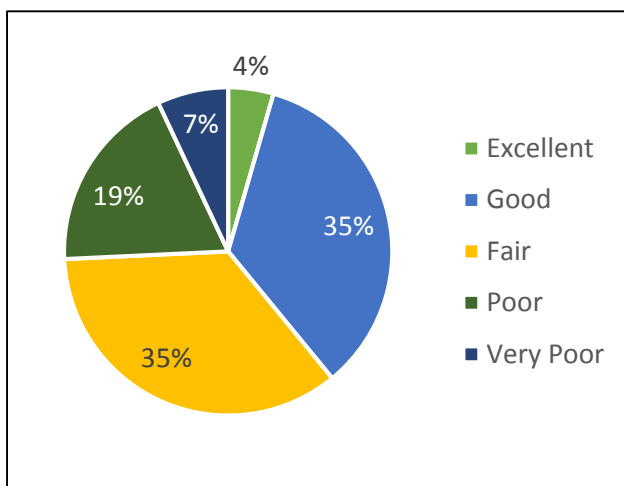
Q.12. How comfortable are you with the LMS/Software being used?



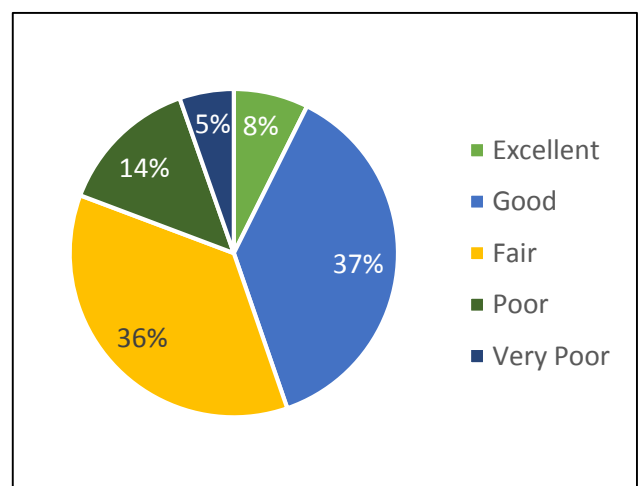
Q.13. How would you rate the quality of the Internet connection in your area?



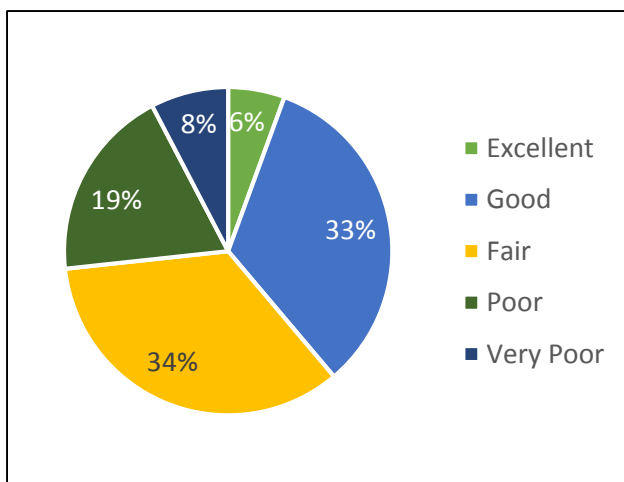
Q.14. What type of learning materials does your professor provide?



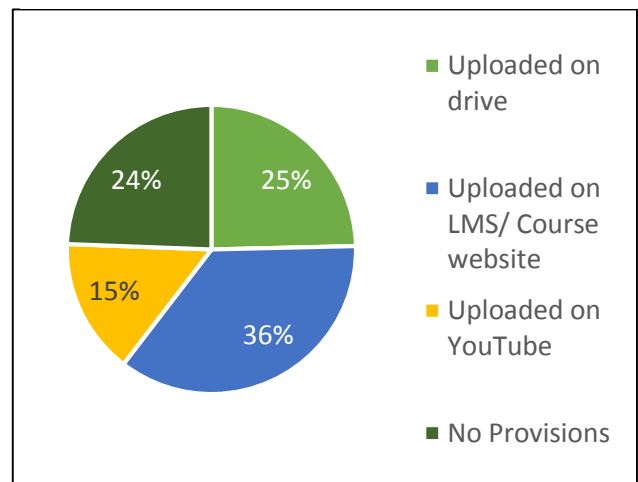
Q.15. How would you rate the quality of the pre-recorded lectures?



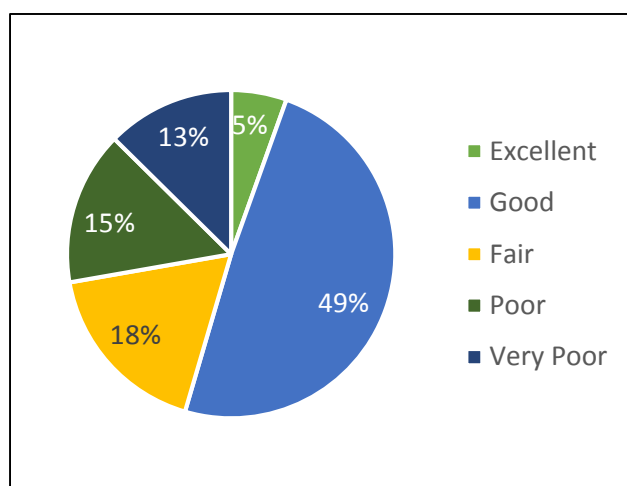
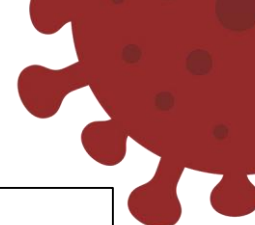
Q.16. How would you rate the quality of notes/supplementary materials provided by your faculty?



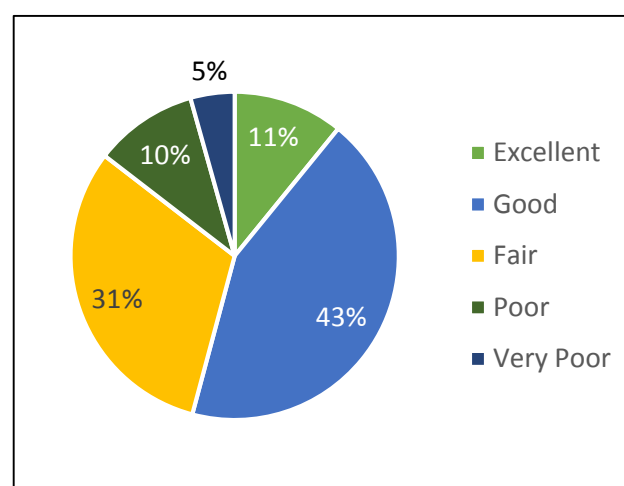
Q.17. How effective are the lectures/learning materials used for explaining the concepts?



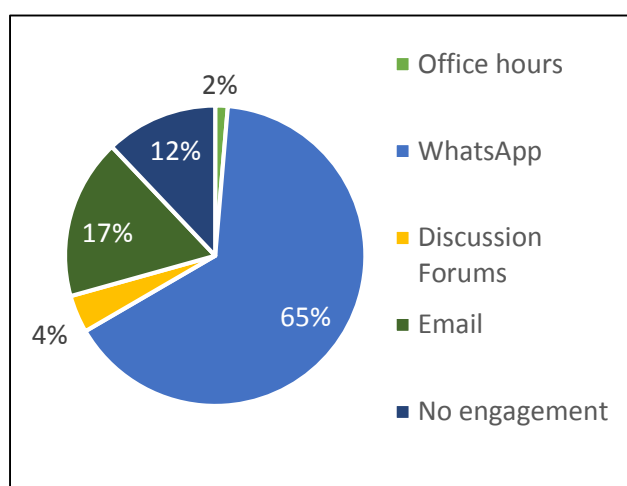
Q.18. Are there any provisions to access the lecture materials if you miss classes?



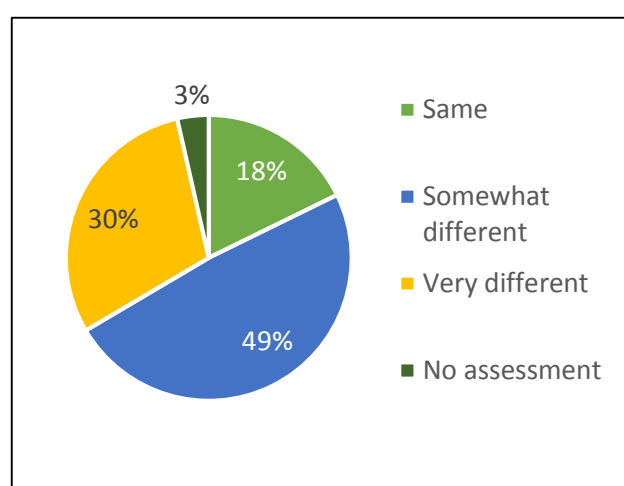
Q. 19. Quality of Live Lectures



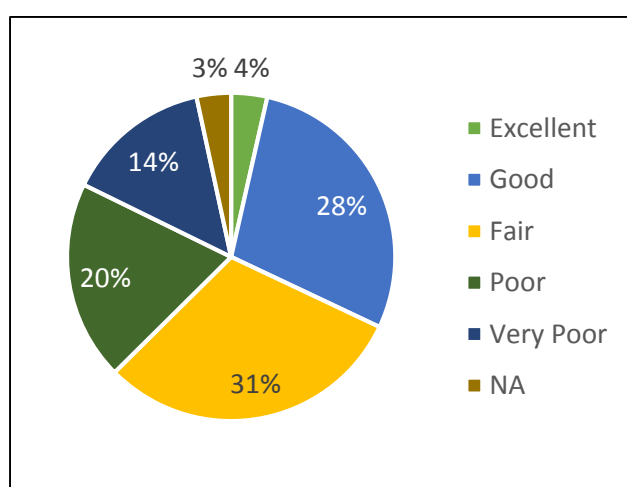
Q. 20. Effort made by faculty to engage the students during the lectures



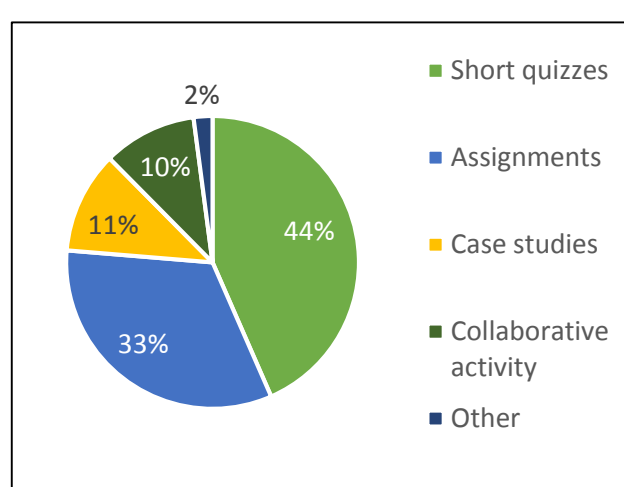
Q. 21. How does your faculty interact with you outside the online class?



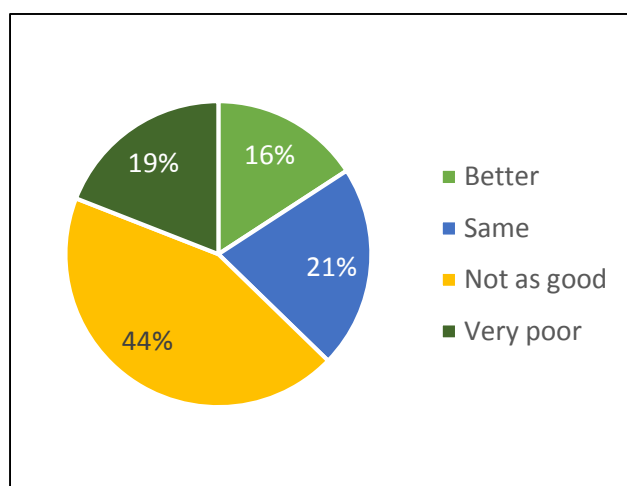
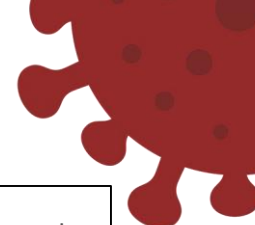
Q. 22. Is the assessment pattern used in online classes different from the one used in conventional classes?



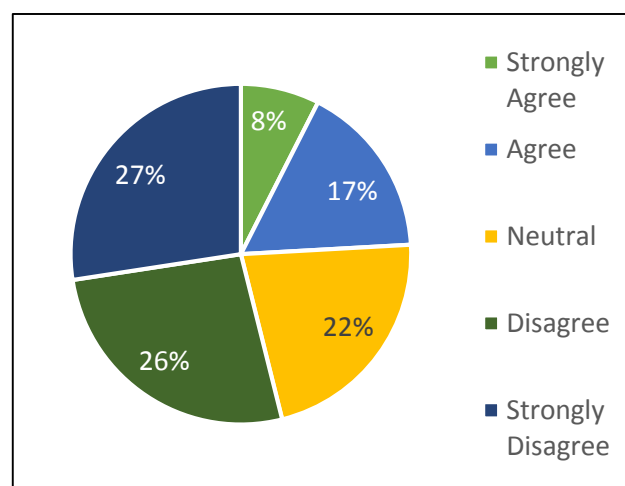
Q. 23. How effective is the assessment in your online class as compared with regular classes?



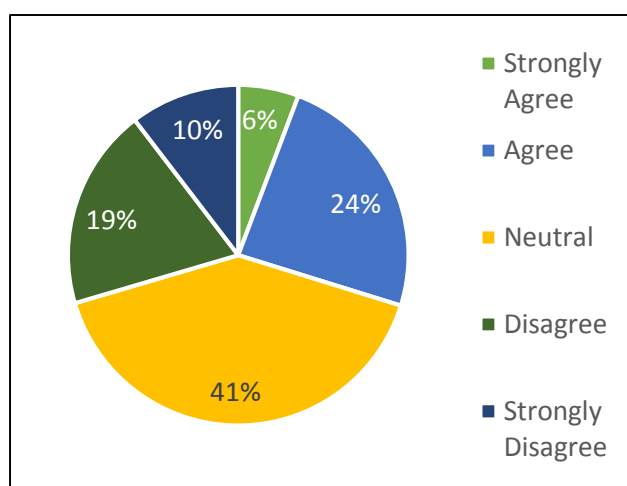
Q. 24. Which form of assessment do you find most effective for online mode?



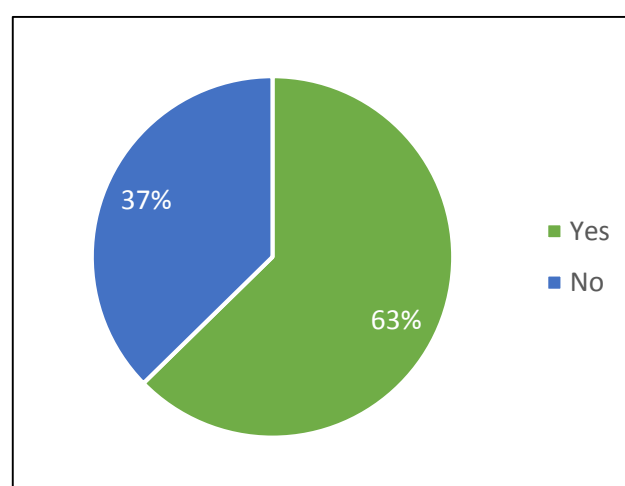
Q.25. How will you compare your academic performance in online courses as compared to in conventional courses?



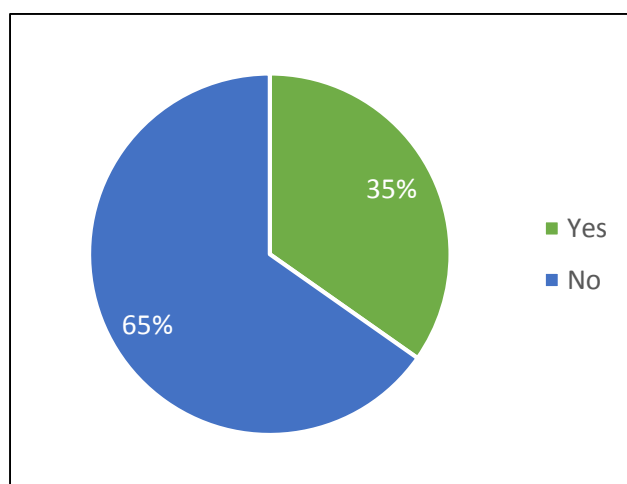
Q. 26. The online environment is physically more comfortable than being in a class?



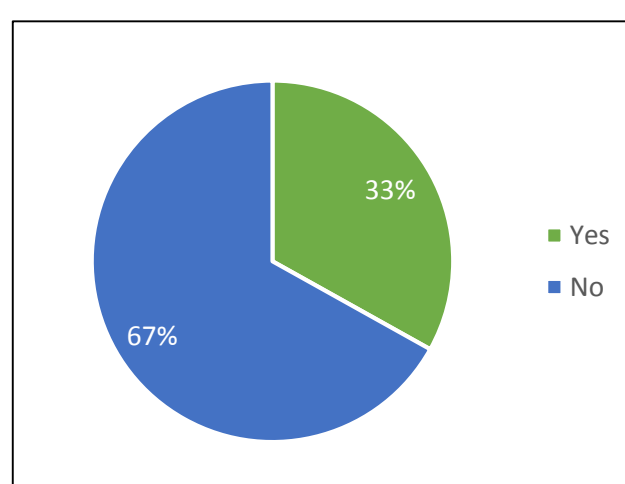
Q. 27. Time saved from commuting is used more productively



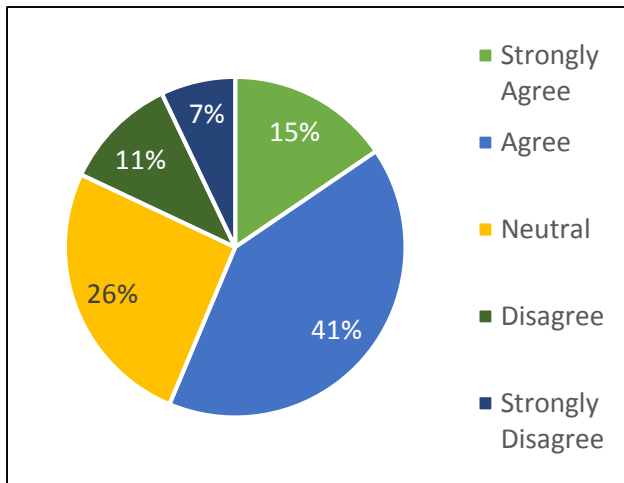
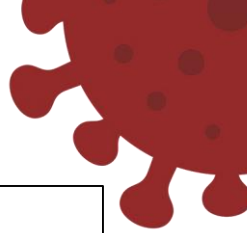
Q. 28. Does your Institution/Faculty have a mechanism for addressing grievances related to online courses?



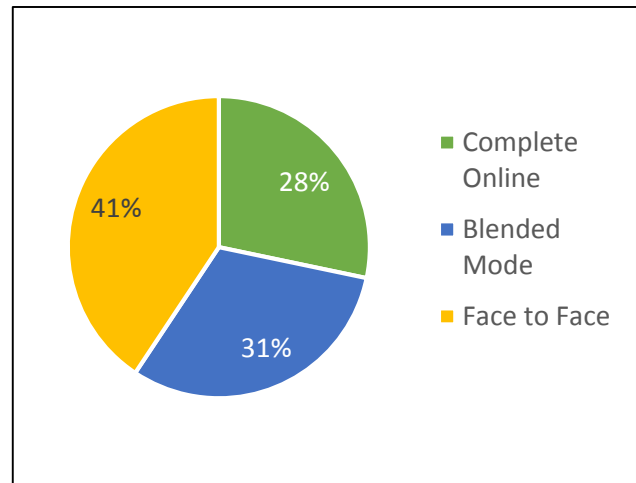
Q. 29. Do you find learning online joyful?



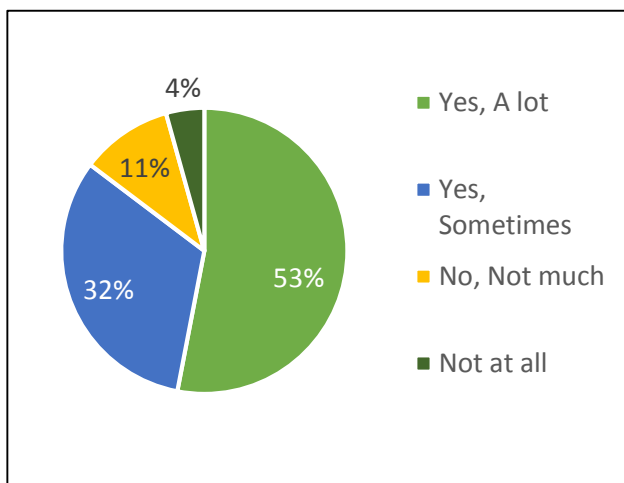
Q. 30. Do you find learning online motivating?



Q. 31. The 'COVID 19' crisis situation has allowed me to learn new skills



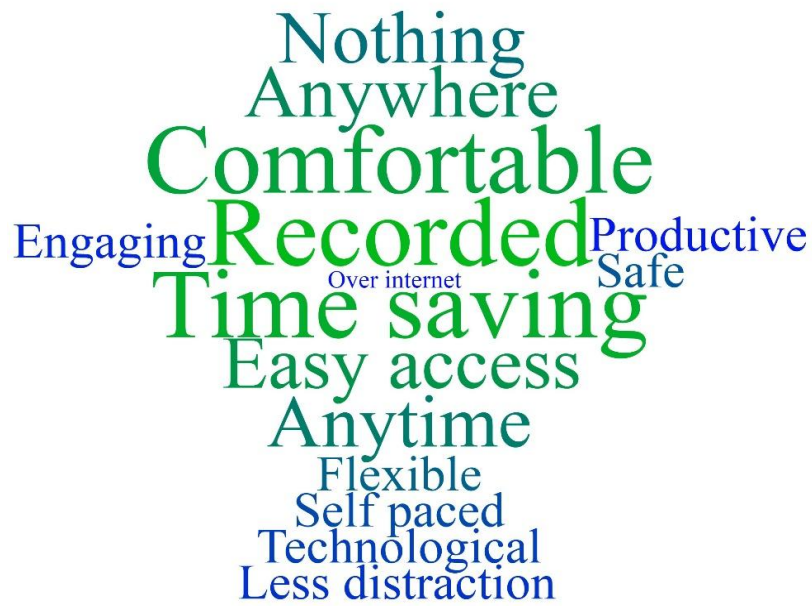
Q.32. How would like to take up courses post COVID - 19 Crisis?



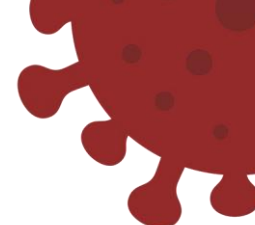
Q.33. Do you miss social interaction with your peers?



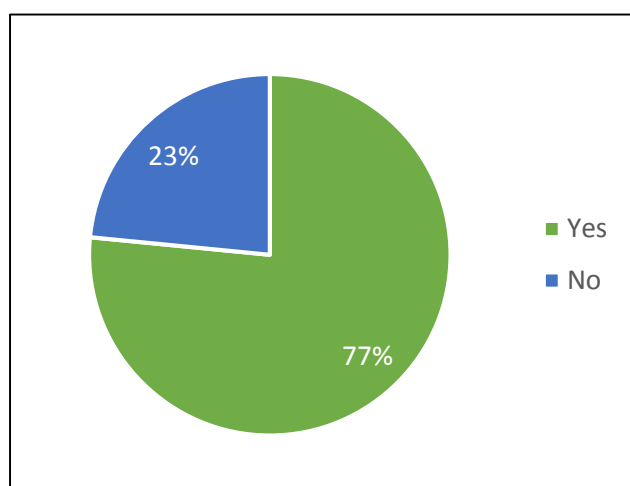
Q. 34. Negative aspects of online learning. Bigger the words mean more students said it.



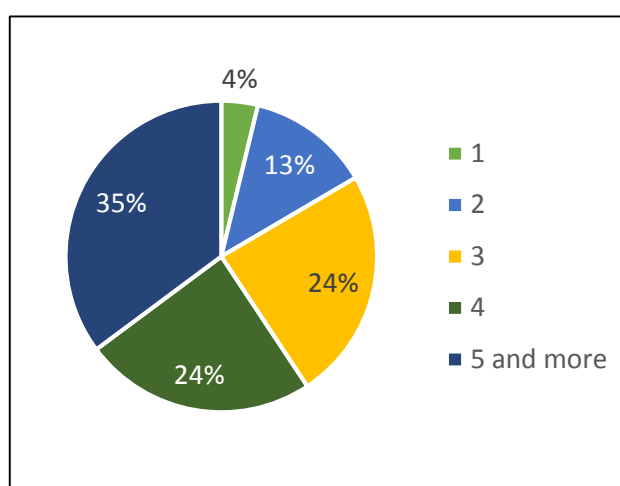
Q. 35. Positive aspects of online learning. Bigger the words mean more students said it.



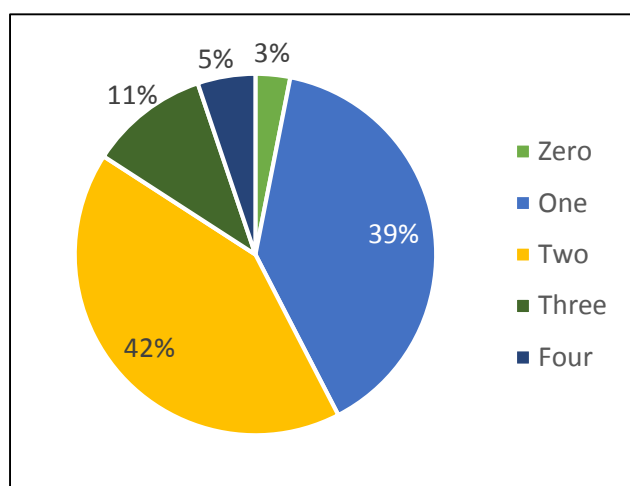
Annexure III: Faculty survey responses



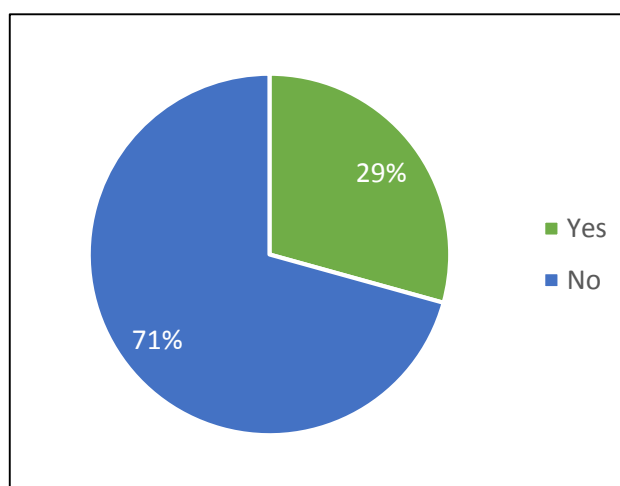
Q.1. Are you teaching online for the first time?



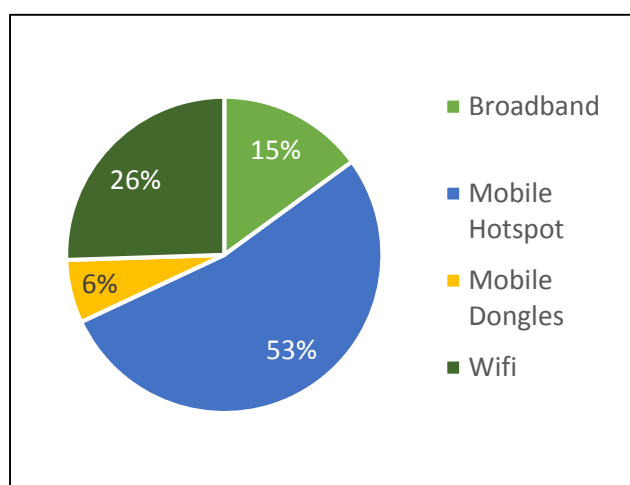
Q.2. What is the total number of online lectures you take per week?



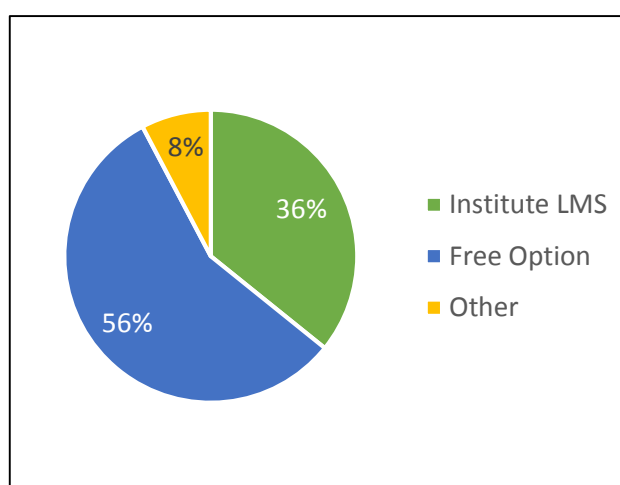
Q.3. What is the maximum number of online lectures you teach in a day?



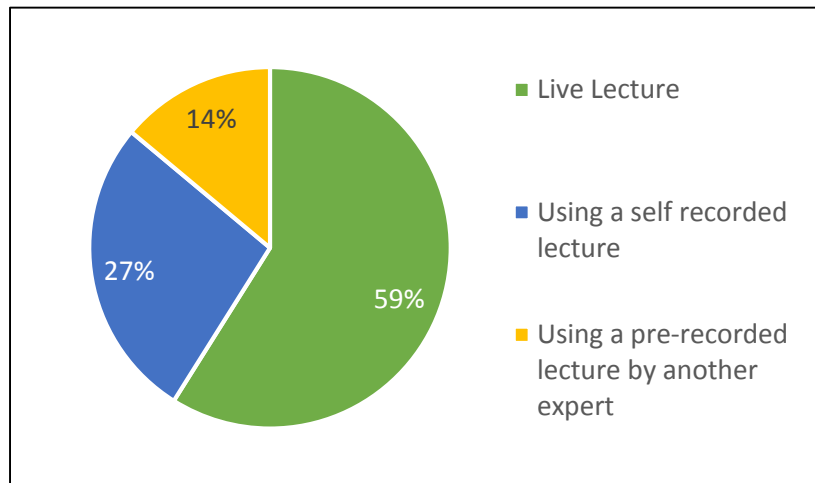
Q.4. Are you teaching any lab course online?



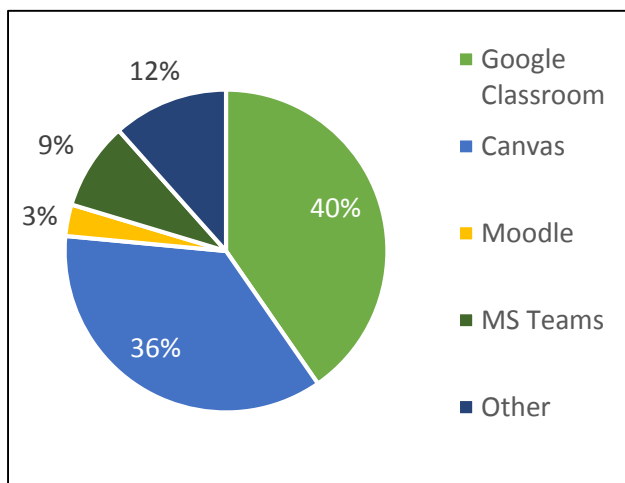
Q.5. What is your mode of internet connectivity?



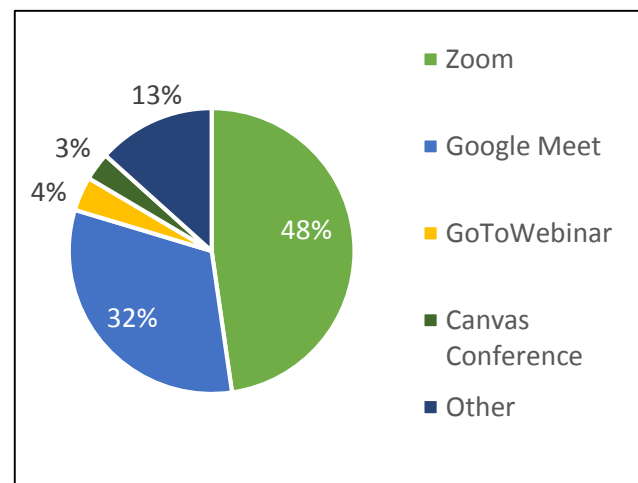
Q.6. Is the LMS provided by the institute or are you using a free option?



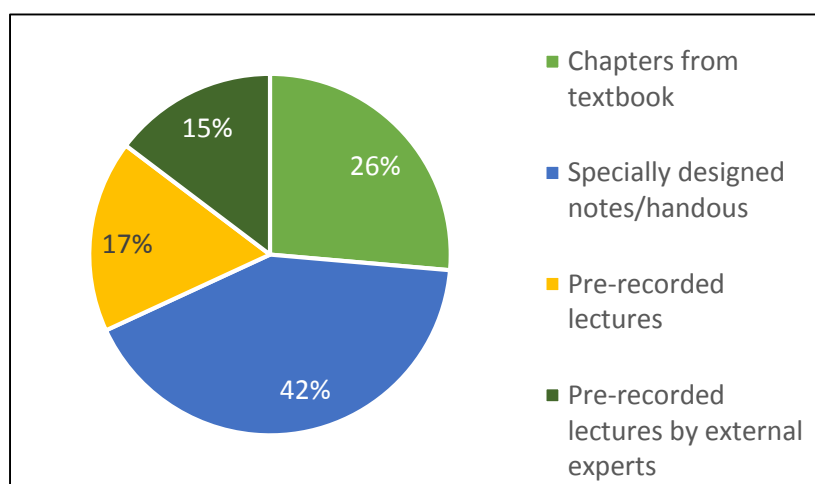
Q.7. What delivery mode are you using?



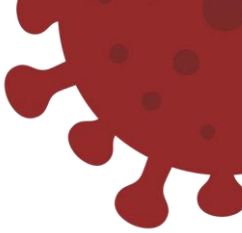
Q.8. What Learning Management System (LMS)/Software) are you using for managing your online courses?



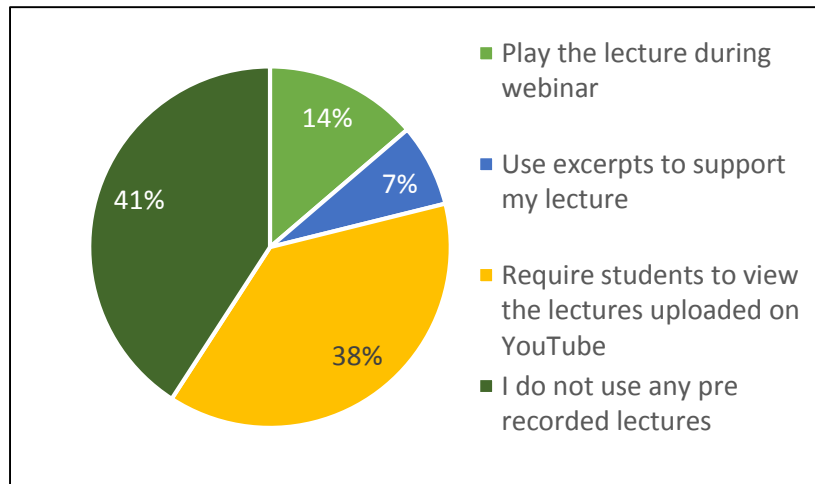
9. Which video conferencing software are using for teaching online?



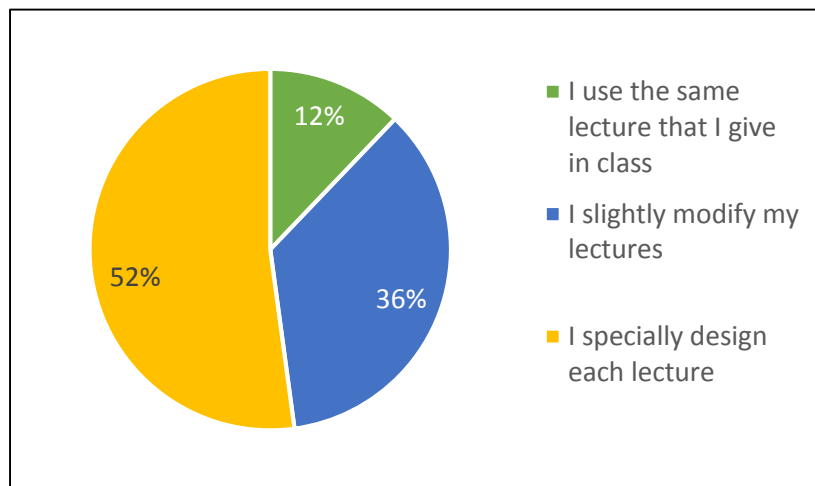
Q. 10. What type of learning materials are you using?



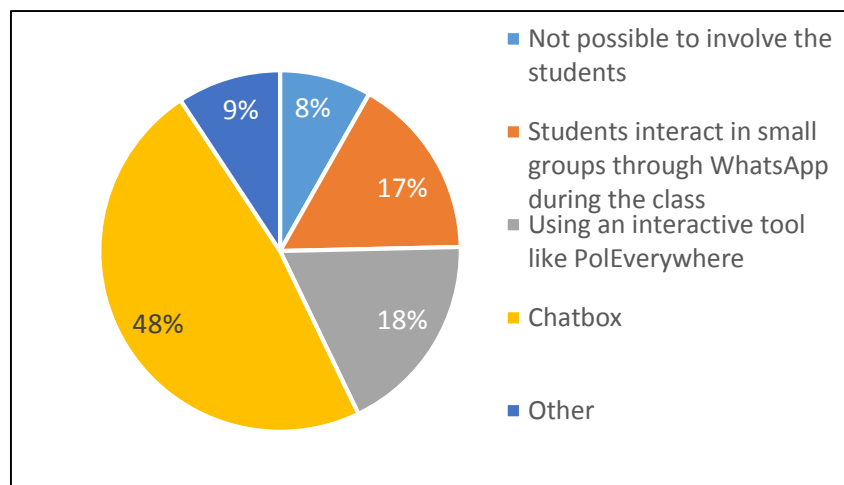
Q.



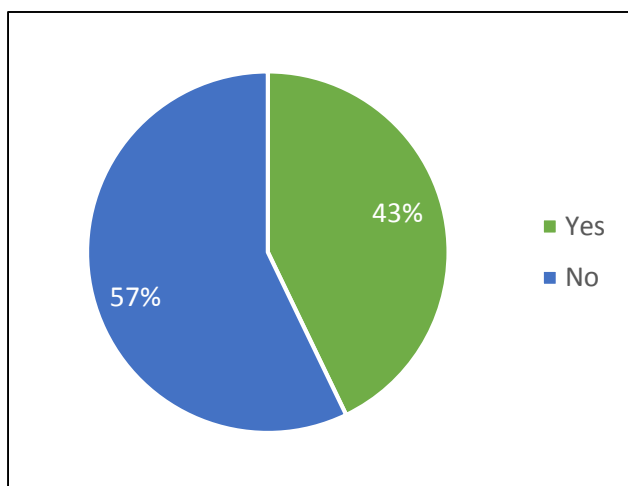
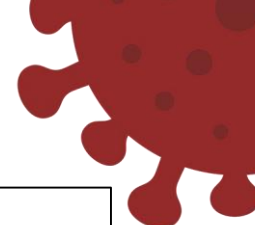
Q. 11. How do you use the pre-recorded lectures?



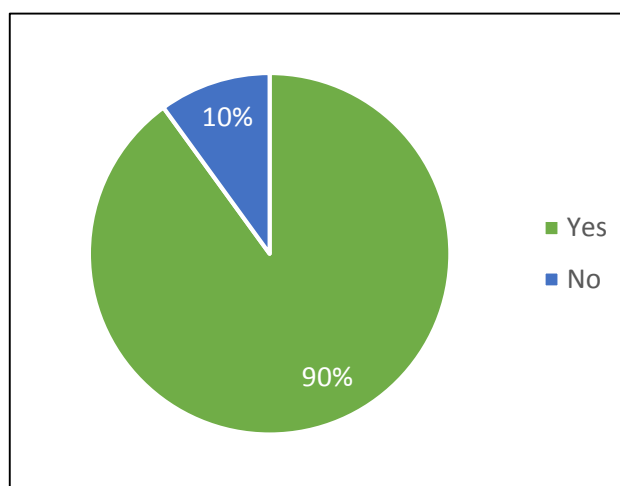
Q. 12. How do you prepare lectures for your online class?



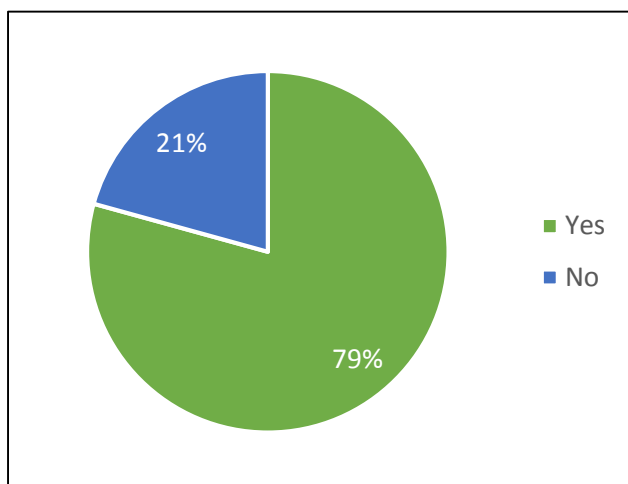
Q. 13. How are you engaging the student during the online classes?



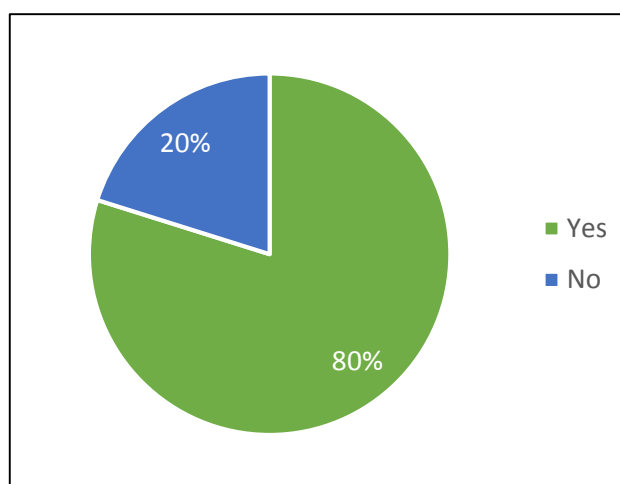
Q. 14. Are you creating any collaborative activities for your online classes?



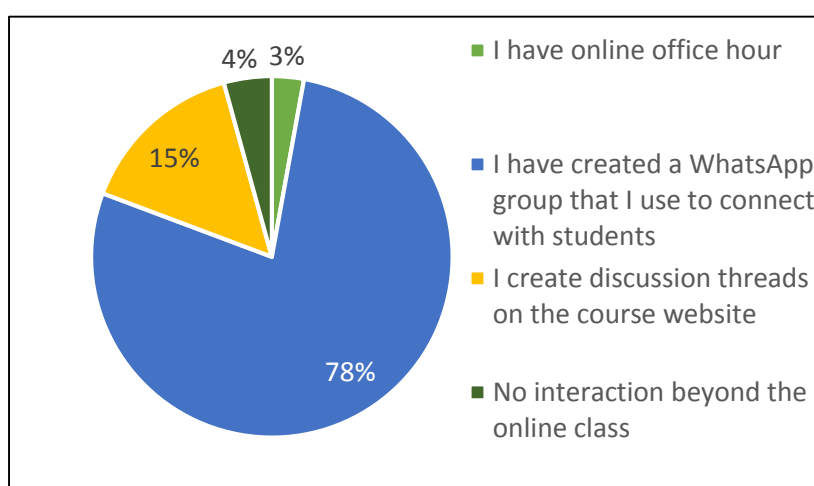
Q.15. During the lecture, do you allow students to use audio/video to ask questions or interact?



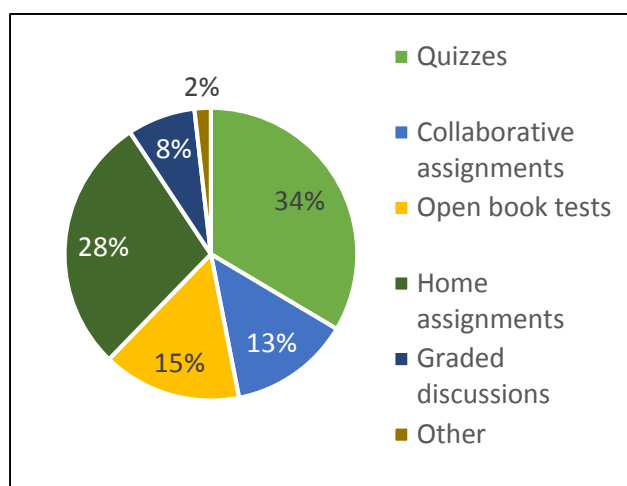
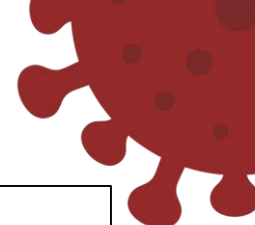
Q.16. Are you using chat box?



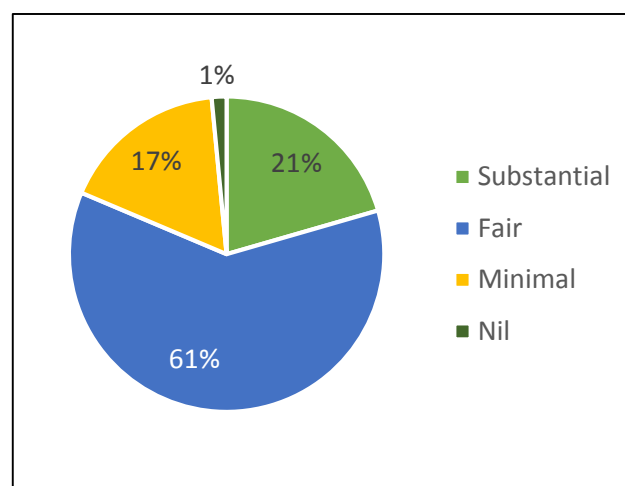
Q.17. Did you have to make any changes in the scheme of assessment for the online class?



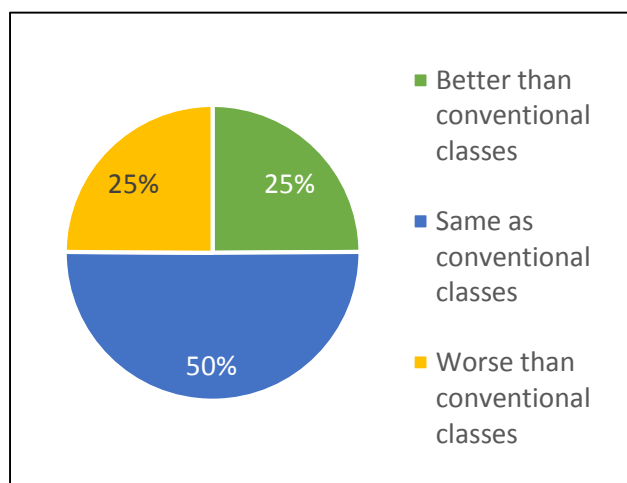
Q. 18. How do you interact with students outside your online class?



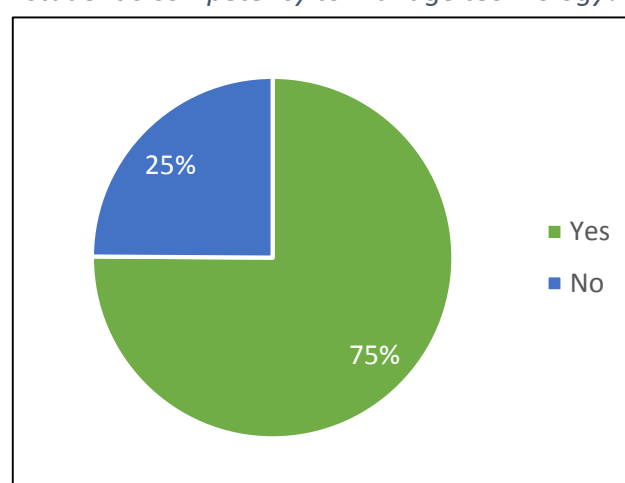
Q. 19. What types of assessment instruments do you use in your online class?



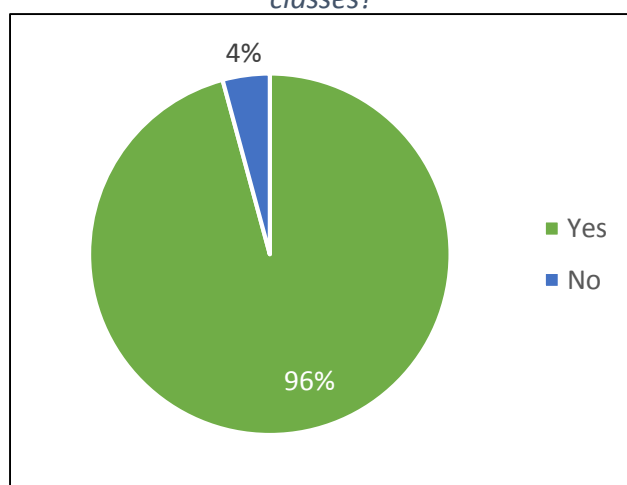
Q. 20. To what extent student performance in your online assessment is dependent on the student's competency to manage technology?



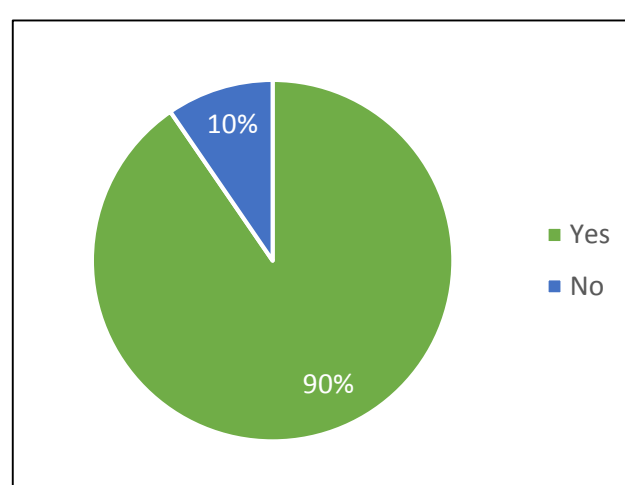
Q. 21. How would you evaluate your efficiency in online teaching as compare to regular classes?



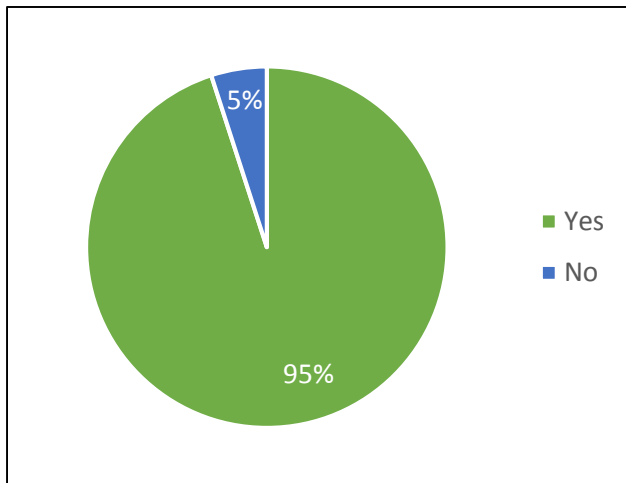
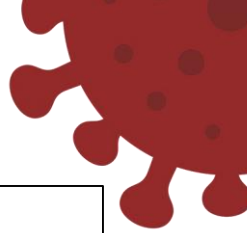
Q. 22. Do you now have more time to read and prepare better for your classes?



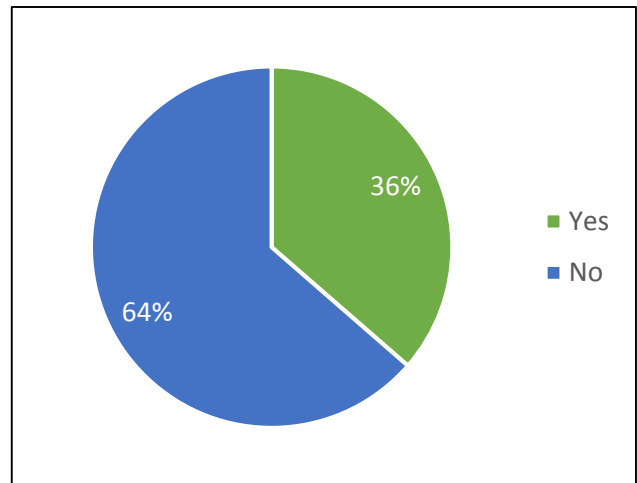
Q. 23. Do you think this situation has allowed you to learn new skills?



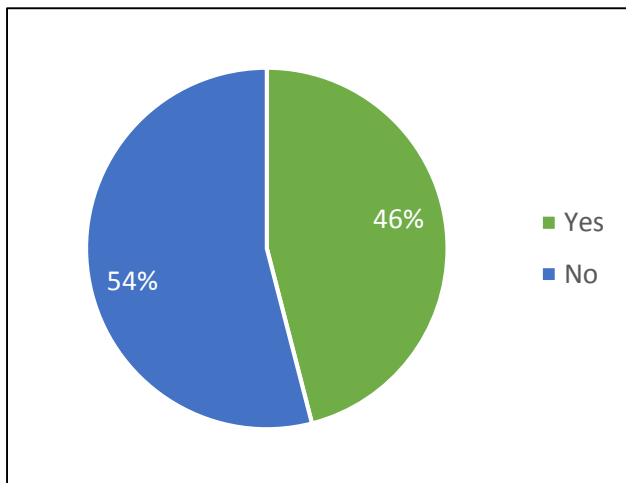
Q.24. Do you feel more confident in managing online teaching?



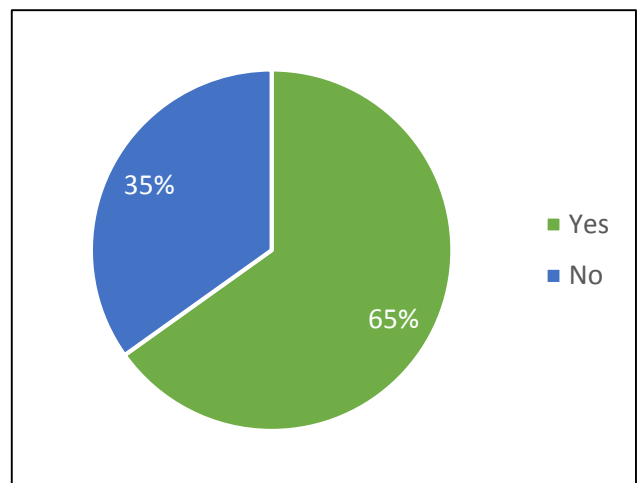
Q. 25. Do you feel more confident in exploring new technological tools?



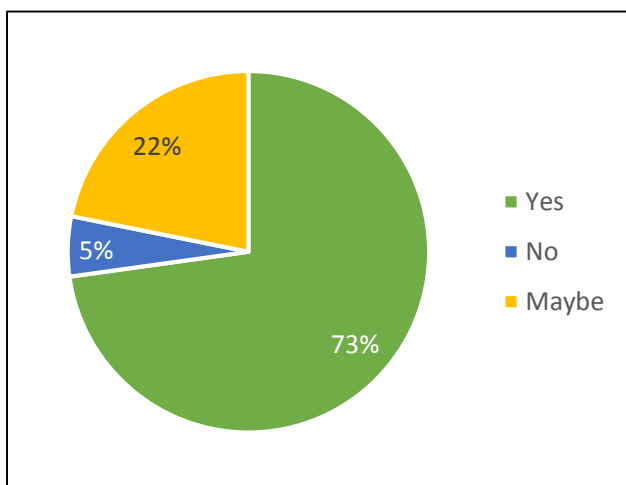
Q. 26. Do you find teaching online more comfortable than being in a class?



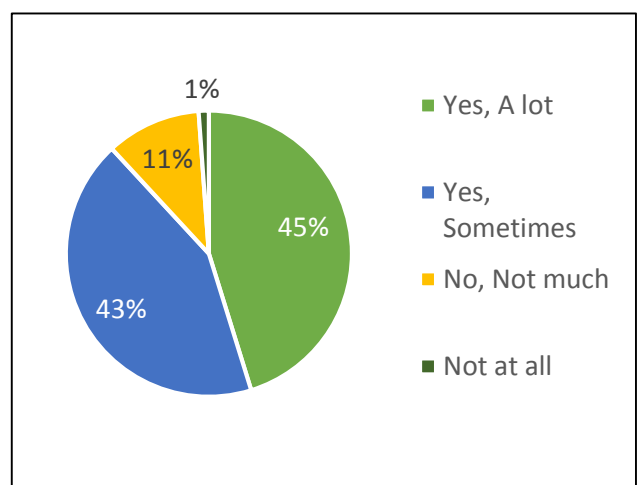
Q. 27. Do you find teaching online more time-efficient than being in a class?



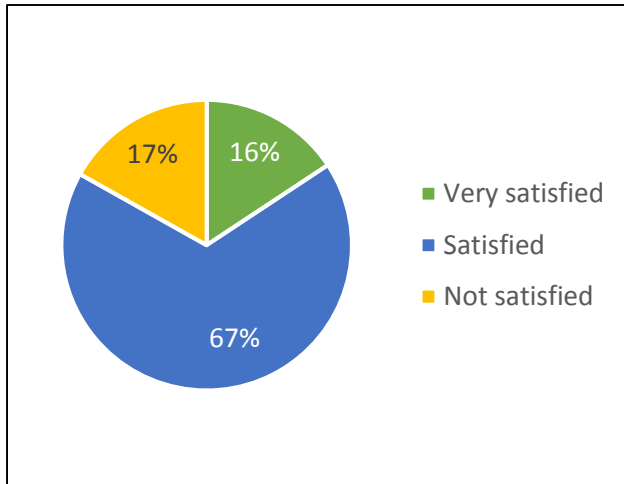
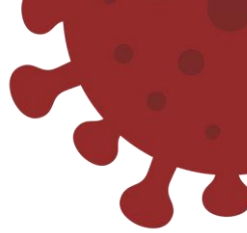
Q. 28. Would you like to take more courses in the online mode?



Q. 29. Do you think the Blended Mode (mix of conventional and online classes) is appropriate for engineering education?



Q. 30. Do you miss social interaction with your colleagues?



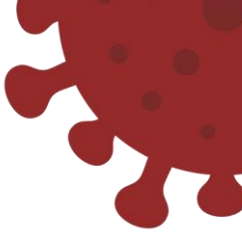
Q. 31. How satisfied are you with the academic exchange with your colleagues in the online environment?

Rural students
Lack of discipline
Difficult to engage
Data intensive
Internet issues
Social disconnect
Assessment
Technical skills
Student attention
Less interaction
Numericals
No training

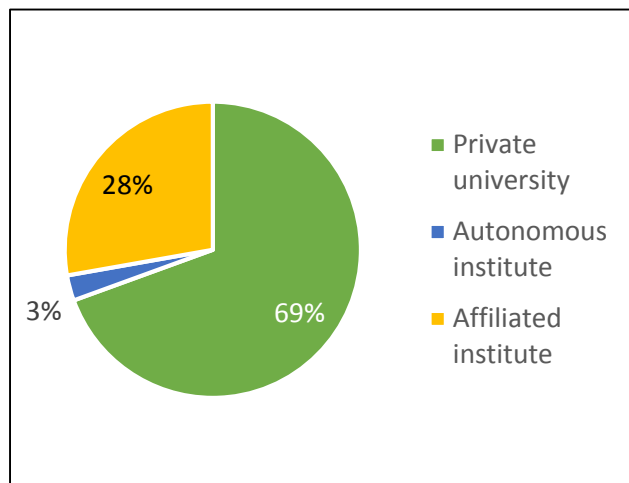
Q. 32. Challenges of online teaching and learning. Bigger the words mean more faculty have said it.

Interactive
Active
Easy
Large Class
Effective
Easy Assessment
Upgrade Skills
Safe
Less Infrastructure
No Benefits
Time Efficient
Less Distraction
Flexible
Recordable
Personalized Learning
Comfortable
Quality Content

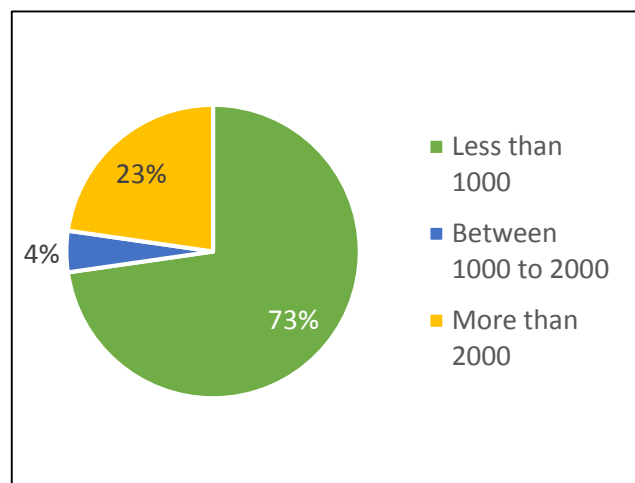
Q. 33. Benefits of online teaching and learning. Bigger the words mean more faculty have said it.



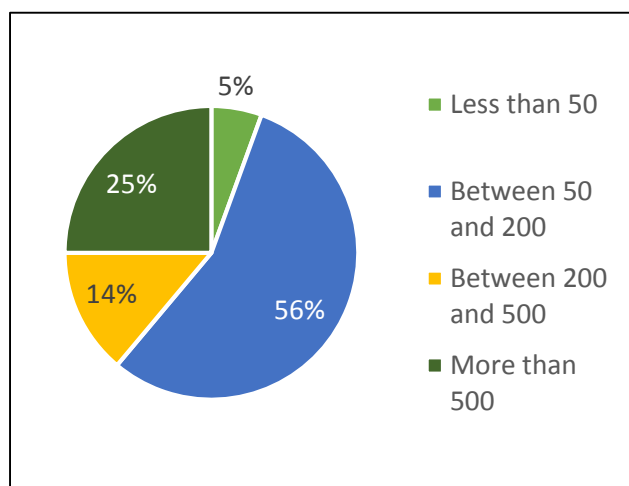
Annexure IV: Administrators' survey response



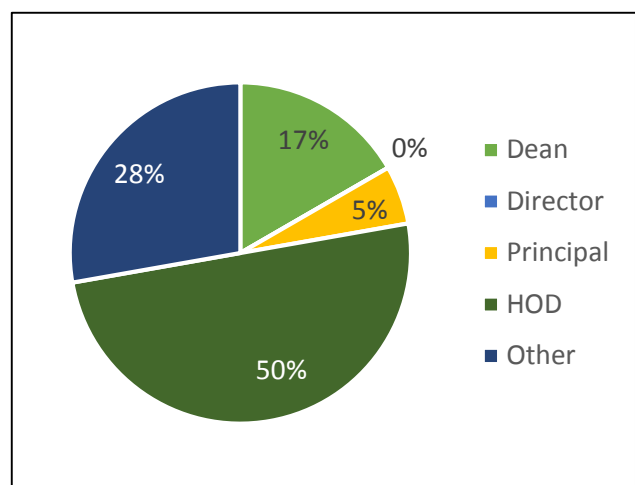
Q.1. Status of the Institute



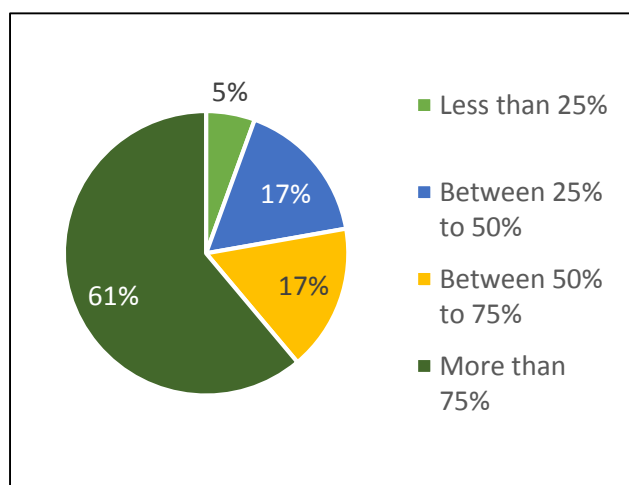
Q. 2. What is the intake number of students at your institute?



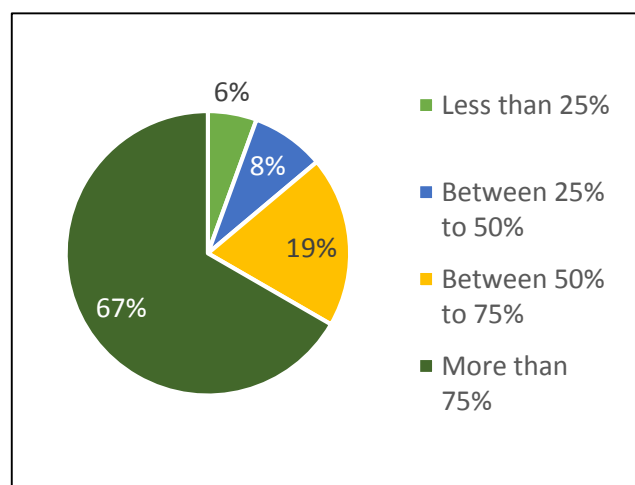
Q. 3. What is the total faculty strength at your institute?



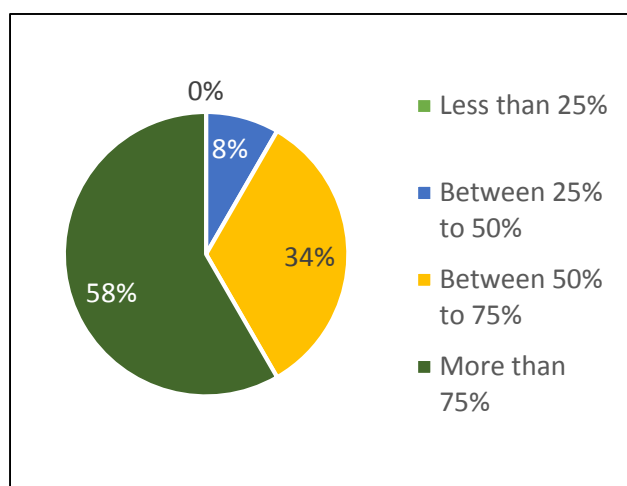
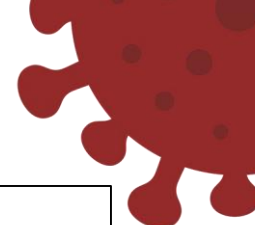
Q. 4. Your role at the institute



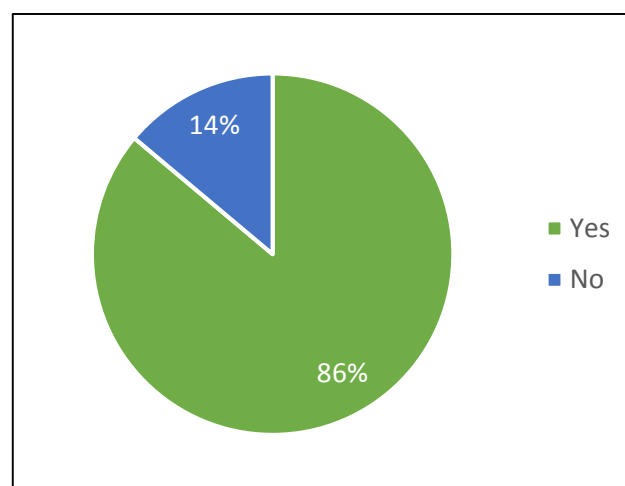
Q. 5. The total percentage of courses being delivered online at your institute



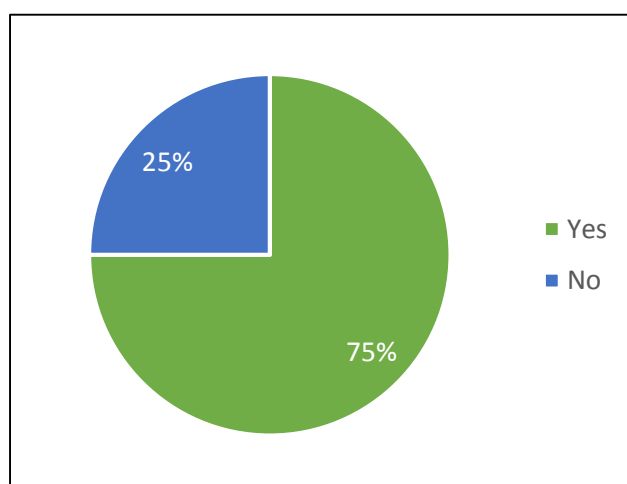
Q. 6. What percentage of faculty are involved in online teaching at your institute?



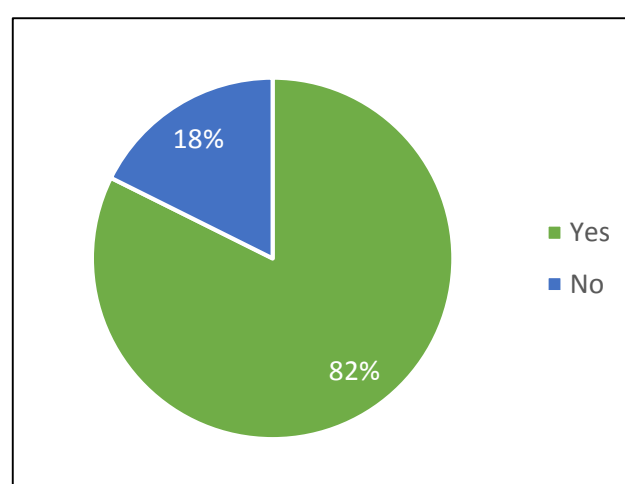
Q. 7. What percentage of faculty are fully confident to conduct online classes at your institute?



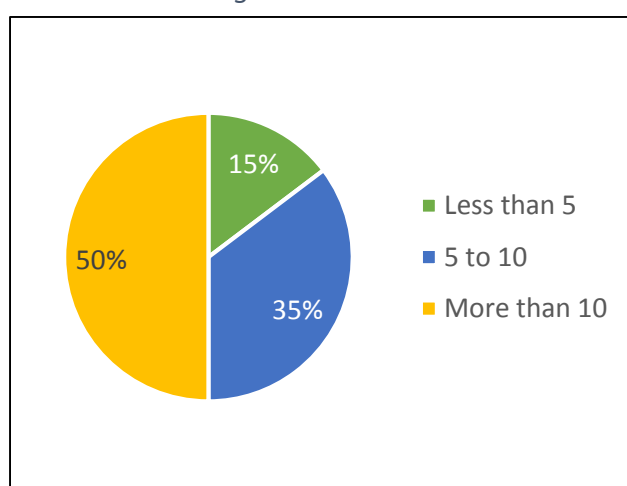
Q. 8. Does your college have a Teaching Learning Centre (TLC) to support the faculty in taking online classes?



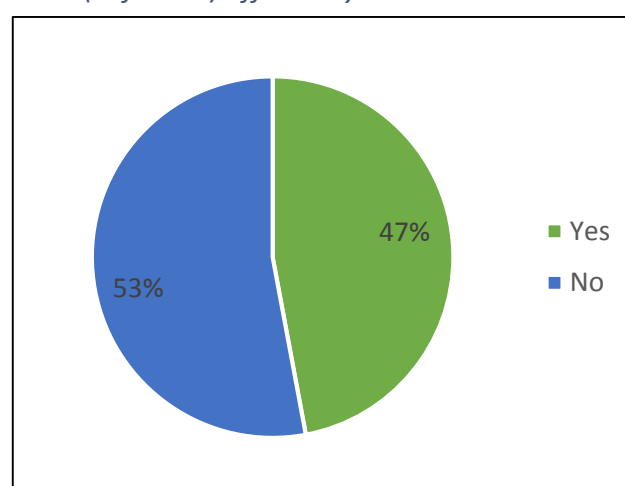
Q. 9. Does the Institute offer facilities for teaching lab courses online?



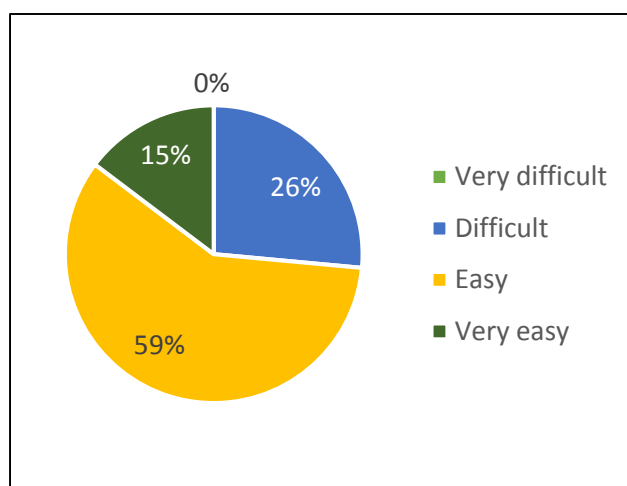
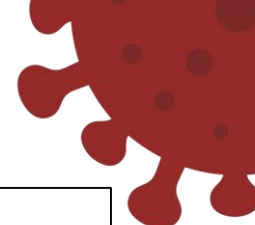
Q. 10. Is the Learning Management System (Software) offered by the institution?



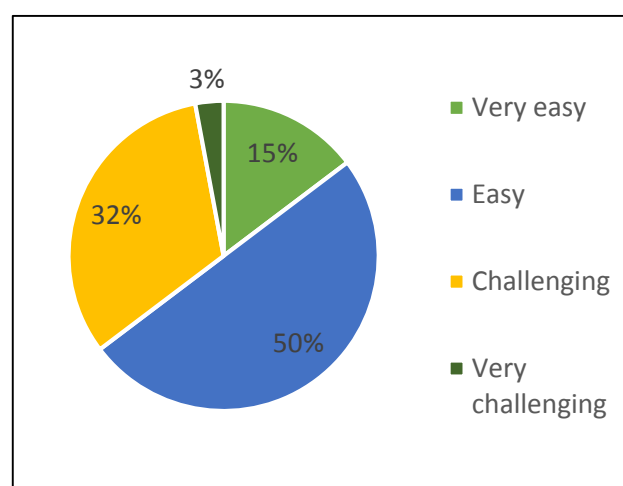
Q. 11. What is the size of the IT support team at your institute?



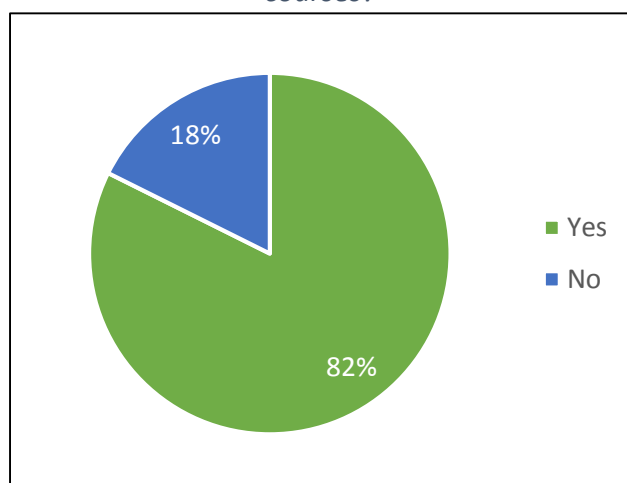
Q. 12. Were any courses offered online prior to the lockdown?



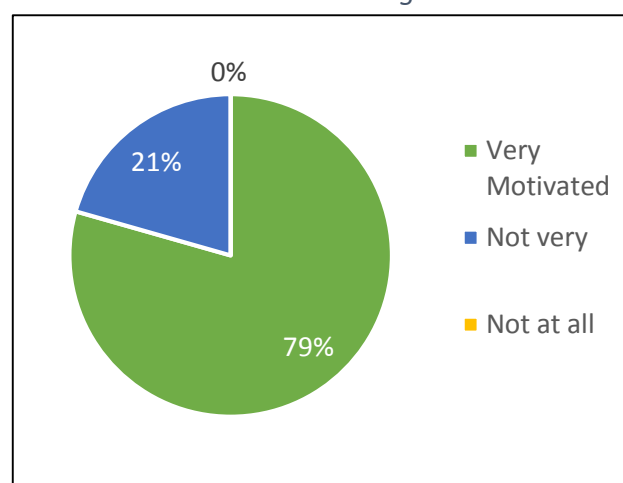
Q. 13. How difficult was it for the Institute to set up a system to transit to online delivery of courses?



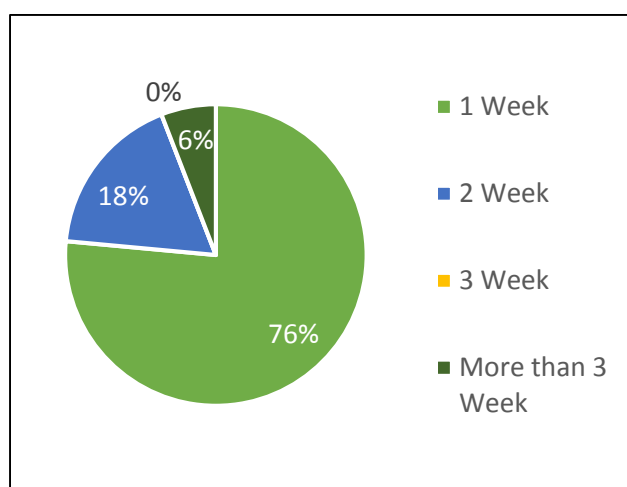
Q. 14. How easy was it for you to convince your colleagues towards this sudden change to online teaching?



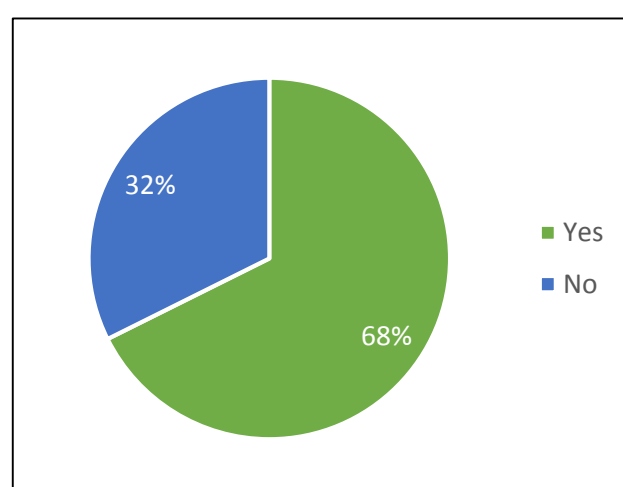
Q. 15. Was any training provided to your faculty members to adapt to teaching online?



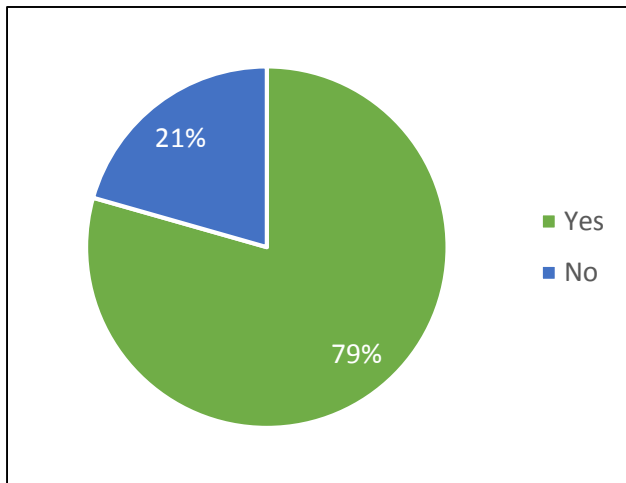
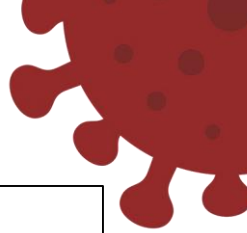
Q. 16. How would you rate the motivation of the faculty to cope with the transition?



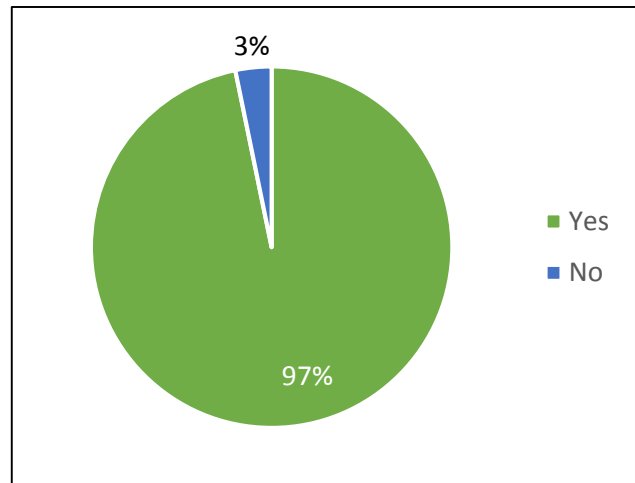
Q. 17. How much time was needed for your institute to transit to online teaching after lockdown?



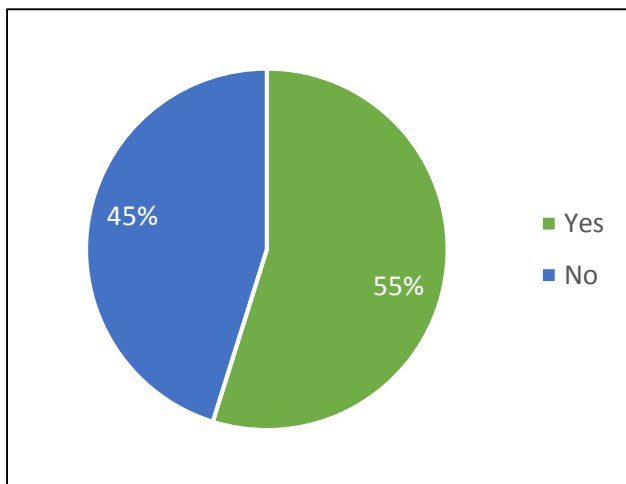
Q. 18. Does the institute have a system to monitor the delivery of online courses?



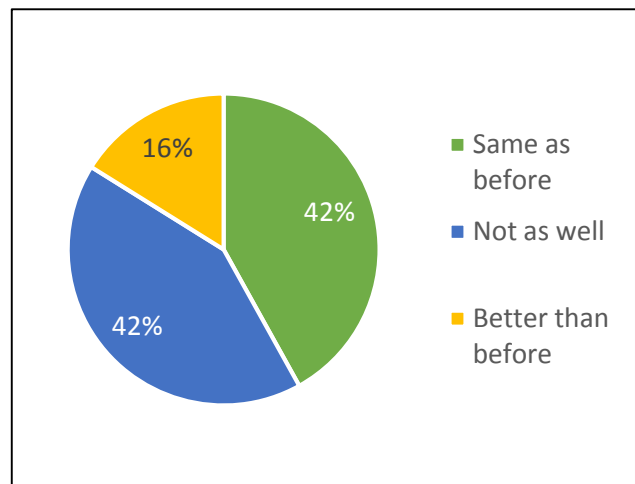
Q. 19. Does the Institute provide any assistance to faculty for teaching online?



Q. 20. What changes have been made for the assessment of courses which are now being taught online?



Q. 21. Does your institute provide any plagiarism detection software (like Urkund, Turnitin) to help faculty ensure fairness in the assignments?



Q. 22. To what extent you feel that the learning outcomes specified for regular courses are being achieved in the online mode?