

Practices of online teaching, learning and assessment of the students of the BSc in EEE programme during the COVID-2019 pandemic

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Abstract

Most of the educational institutions, from primary level to tertiary level, had to be closed when the coronavirus pandemic affected the world in 2020. Then, educators became concerned about the education of the students as they were completely relying and habituated on face-to-face teaching–learning processes. This paper reports on how the Department of Electrical and Electronic Engineering has faced that challenges in bringing the students to online classes as well as how they assessed and evaluated the students. A survey was conducted among the students who registered for the course with 14 survey questions. From the results, online classes are the best solution to the challenge; some students faced connectivity problems but it was concluded that the main purpose of teaching online is to continue the education process. Despite some challenges encountered, the teaching–learning process of the teachers and students was successful through this newly reformed system of education.

Keywords: Online assessment, online class, online teaching, online learning, COVID-19.

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1. Introduction

The epidemic of the unique coronavirus disease (COVID-19) started in Wuhan, China, in 2019. In the early part of 2020, the cases of COVID-19 had been identified in almost every country in the world (Vlachopoulos, 2020). The World Health Organisation (WHO, 2020) issued several technical guidelines to combat the novel coronavirus and also declared it a pandemic. The governments of all the countries advised their citizens to remain in their houses and not to come outside without any urgent necessity. Therefore, all types of educational institutions, including universities, were closed down and classes were postponed for an indefinite period all over the world. Several conferences, symposiums and other such events were also on-site cancelled to maintain social distancing. Bangladesh is not an exception in this case. The first coronavirus case was identified in Bangladesh on 8 March 2020 and the first death due to the coronavirus was reported on 18 March 2020, 10 days after reporting the first case of COVID-19 (WHO1, 2020). Since 18 March, Bangladesh started a lockdown across the whole country to decelerate the virus transmission process from person to person. No one was allowed to come outside their home. At that time, all educational institutions were closed down; therefore, institutions were trying to find out flexible ways of conducting educational activities by the teachers from their home to keep it continuous. However, this caused disruptions in student learning, impedance with evaluations and dropping of open appraisals for capabilities or they were supplanting with lower options (Yustina, Syafii & Vebrianto, 2020). The faculty members of most private universities were in the process of transitioning to an online teaching platform as per the decision of their respective universities. Southeast University (SEU) is not an exception. It also switched to the online mode of education, and thus online classes began on 22 March 2020.

Online education or e-learning or mobile-based classes or distance learning is a cutting-edge form of the current campus-based education system. It may be defined as a method of teaching–learning activities by using modern tools and techniques, such as computer or laptop or smartphone or tablet, stylus pen, Internet and telecommunication networks, and other peripheral devices, such as speakers, microphone, camera, multimedia etc., including PowerPoint slides containing texts, graphics, figures, images, audio and video files through any online platform, such as Zoom, WebEx, Google Meet, Google Hangout, YouTube etc. This is carried out when teachers and students are not present on campus physically, i.e. this is a distance mode of learning residing at home or at any other remote place. Therefore, when classes are conducted online, it is possible to maintain social distancing as the teachers and students do not have to come into physical contact with each other. As such, the university administration decided to transfer to web-based education considering the health safety issues of their students as well as the teaching and non-teaching staff. However, there should be some definite criteria to facilitate such a transition.

The importance of online education is being given high priority in several disciplines like nursing, medical, engineering, language etc. Educators have emphasised the reflective process (Rojas-Bahamon, Aguilar-Cruz & Arbelaez-Campillo, 2020). Curricular amalgamation as a tactic to reinforce the educational procedure in public academic institutions during the COVID-19 times was revisited also through the work-integrated learning process (Carmody, Duffy, Brown & Fabbro, 2020). The issues of adaptability, flexibility and resilience to online education have been stressed as well (Hodges & Martin, 2020). Other issues, like collaboration, interaction, organisation, communication, technology integration, learning style disparity, critical thinking and feedback system, have also been emphasised (Sekulich, 2020).

The relationship between teachers and their students is being progressively facilitated by modern educational technologies. The augmented usage of modern technologies has consequences for educational levels. But this is observed mostly in the arena of higher education. Thus, students need to spend their time online rather than on the campus physically. This provides students with a kind of flexibility in utilising their time and efforts. Teachers can also get flexibility in their teaching by using these modern educational technologies. The concept of ‘flipped classrooms’ has emerged due to these modern technologies. As such, an increasing number of programmes are being offered by

different academic institutions online. Data analytics, data mining, artificial intelligence, artificial neural network, machine and deep learning etc. are substantially influencing the adaptability, flexibility and customisation of online programmes through these modern educational technologies. If these trends continue to grow, then the role of teachers and their relationship with students needs to be adjusted accordingly. Besides, we have to ensure the quality of education, i.e. we have to emphasise predominantly on student learning outcomes (Lodge, Kennedy & Lockyer, 2020).

This paper aims to reflect on the processes and practices of online education adopted by the Electrical and Electronic Engineering Programme (EEE) Department of SEU by detailing all the policies enacted for the online classes and assessment policies of the student outcomes. The paper also reports on the data and results based on the questionnaire that was given to the students to collect their feedback about the online education system. Statistical data analyses were conducted to get the necessary information on it and to improve this system further. The paper also highlights and advocates the importance of online educational activities during the pandemic as well as after the pandemic.

Nomenclature

EEE	Electrical and Electronic Engineering Programme
PBL	Project-Based Learning
SEU	Southeast University
WHO	World Health Organisation

2. Literature review

The United Nations Educational, Scientific and Cultural Organisation's Director-General, Audrey Azoulay, said in a recent statement that, 'While temporary school closures as a result of health and other crises are not new, unfortunately, the global scale and speed of the current educational disruption is unparalleled and, if prolonged, could threaten the right to education' (Coronavirus Update, 2020). From her statement, it is clear that approximately 400 million students from several countries are currently not attending their classes due to the lockdown as a result of the COVID-19 pandemic. Therefore, to ensure continuity of education and students' learning, some guidelines and policies need to be developed to recognise and accredit this new form of online education which is not like the conventional on-campus/face-to-face education system. Nevertheless, since online education has started and if it is not recognised, then the degrees awarded to the students will be a challenge. Therefore, such initiatives of online education must be recognised by everyone and the governments should come forward to find a proper solution to the online-based educational initiatives. The solution should include the use of an online platform to conduct classes online, the change in the curriculum design, teaching delivery method, assessment of online course learning outcomes and other educational activities within a recognised virtual platform.

At present, online schools and open universities, where all educational activities are conducted through the online platform, exist in many countries, like Azerbaijan, Georgia, Iraq, Nigeria, UK, Ukraine, Morocco etc. (Doghonadze, Aliyev, Halawachy, Knodel & Adedoyin, 2020; Housseine & Rabha, 2020). The fact is that distance/online/mobile/e-learning has a lot of advantages and is already in practice with great success and has become popular among faculty members and students as well. As such, this is a proven fact and does not require any additional shreds of evidence. The issue has been deliberated in many research papers already (e.g. Dumford & Miller, 2018; Gossenheimer, Bem, Carneiro & de Castro, 2017; Naidu, 2019; Sadeghi, 2019; Santana de Oliveira, Torres Penedo & Pereira,

2018). Many education researchers have identified its feasibility and utilisation. Now they want that the online education system be adopted for the duration of the COVID-19 epidemic as a boon to continue the teaching–learning practices of institutions where the conventional or face-to-face education system was practiced before the pandemic. They think that online education has numerous benefits. This method has a unique feature that online education can take place without any need for educators and learners coming to the campus physically and they can continue it from any geographic location without any interruption, only if the network permits. Thus, educational institutions, especially the private ones, can collect their revenue to meet their several types of expenses, like giving salaries and bonuses, paying utility bills and rent, purchasing necessary equipment and logistics, maintaining the properties, etc.

However, trusting online education as an alternative solution to continue education and learning of the students may be desperately positive. If the countries are very conservative to accept online education, then this experiment may provide a false inference that the online mode of the teaching–learning system is an ineffective model. Finally, this will lead to the deduction that conventional methods of teaching–learning are very good. To escape this possibility, it is essential to focus on a few actions for the even and active execution of the online education system in a country like Bangladesh.

In one study, South Korean college students' experiences were analysed by collecting responses of 393 students when they had to switch to remote teaching due to the COVID-2019 pandemic. They used flexible and in-depth qualitative thematic analysis to investigate the similarity and relationship between the theme words and their associations. They tried to find out the students' satisfaction and dissatisfaction due to remote teaching and improvement areas through an online survey. From their study, they found out that students are participating in online classes from their homes using their laptops. The students mentioned a few positive features of remote teaching, such as suitable learning environments, smooth communications and effective use of their time. However, they mentioned some disadvantages of online classes like network instability, unilateral interactions and problems of maintaining continuous concentration in front of laptop etc. Therefore, they suggested a few areas where the educators can bring about improvements. Some of these issues were to stabilise the network, record and share the lecture classes and interact actively with the students. The conclusion from this study is to bring about an effective learning environment with proper interactions among the students and the teachers and the utilisation of appropriate technology. The authors finally suggested that an improved and effective remote teaching system should be designed by upholding the academic environment and achieving similar learning outcomes for the students as per the current way of on-campus classroom teaching, so that in the future if any crisis like this pandemic occurs, then the educator can quickly switch over to the online mode of teaching and learning practices (Eun, Shim & Lee, 2020).

Another research paper shared the experiences of acclimatising online teaching to a course on Biochemical Engineering of the Biotechnology programme at Francisco de Vitoria University, Madrid, Spain. The authors designed an arrangement of collaborative online teaching–learning activities with the lively engagement of the students of that course instead of conducting the traditional on-campus midterm examination due to the pandemic. Such activities included engineering skills, transversal competencies and higher order thinking skills. After that, the analysis was made based on the teaching–learning experiences of the teachers' observations, academic performances of the students and survey results obtained from the students. An improved impact on student performance and class participation even by the repeaters was observed after the adoption of various methodologies and techniques of the online system of education during the pandemic period (Ripoll, Godino-Ojer & Calzada, 2020).

Some other researchers found that enthusiasm, motivation, warm and friendly behaviours and the positive roles played by the faculty members are the most significant factors to create a proper environment to motivate students towards online education. They also found that these factors increase the motivation of students towards online courses. These determining factors were obtained

through an opinion survey from the students on the ways of increasing their motivation towards online-based teaching–learning. The findings show that learning–teaching process, deliverability, relevance of course materials, well-planned and well-organised meetings in the class, actively involving students, use of various instructional techniques, use of real-life scenarios, concrete, clear and practical examples, collaborative approach, communication with students, independence and freedom of learning, measurements and evaluation process, instructors’ competencies and flexibility, participants’ attention, online learning atmosphere, infrastructure facilities and time management by faculty members affect motivation towards online education. Out of all these factors, the three most important factors are online learning setting, technical set-up and measurement and evaluation process to encourage the learners throughout their educations online (Selvi, 2010).

Another researcher analysed the existing problems in teaching while designing the ‘digital circuits and system design’ course online and he suggested rethinking imparting knowledge and skills efficiently online by applying a heuristic approach for this course. In practice, complex design problems are solved in four sequential steps, such as raising questions, enlightening thinking, bifurcating solutions and comparative analysis. However, to solve the complex design problems in this approach, the teachers need to have an intention, design skills and behaviour and should be improved to adopt online teaching. The study of this research demonstrated that heuristic teaching could achieve a good impact and additional elevation of teaching performance online (Zhao, 2020).

In another study in Indonesia, the researchers concluded from their results that blended learning and project-based learning are fairly significant in developing creative thinking skills of the biology course teachers before entering into their service, and these are more effective teaching–learning techniques online than the traditional on-campus mode of education (Yustina et al., 2020).

A few researchers studied the factors of predicting students’ use of a mobile learning management system (m-LMS). They fixed on certain factors that backed the technology reception manner by the students. In this research, factors that estimate the use of the m-LMS by the university students in the online mode were determined. The researchers found that students used it with their gratification. Through this research, they predicted that students are reluctant to access LMS on a computer but they are interested to use it on their mobile. That is, once the students are habituated with the mobile interface of the online LMS for their courses, they are supposed to continue to use that system even if they get the opportunity to access it on a personal computer or a laptop. However, these results are pertinent to infer that the students opt to adopt mobile technology when they get the chance to access their online resources through multiple technologies. However, it is apparent that their digital literacy skills are not insignificant (Joo, Kim & Kim, 2016).

In another finding, it was shown that students’ intentions and their actual usage of mobile technology impact how the faculty and institutions promote the usefulness to accept and embrace technology. This is very much pertinent to the students whose income levels are very low and digital literacy skills and access to it are very insignificant. For most of the students, mobile-based technology is the solitary way by which they can take part in online courses offered by their institutions of higher learning during the COVID-19 epidemic (Antee, 2020).

In another paper, the authors discussed the challenges of using learning management systems, web conferencing and open source software that may be implemented to alleviate the problems of teaching and learning information technology and other computing courses. They also discussed approximately all other challenges that have ascended in the online mode of teaching and learning processes. The authors recommended some strategies mitigating these challenges, especially in the teaching delivery of the technical courses, like courses on IT and computer science disciplines. Since there is less possibility of getting direct interactions with the instructors and peers, the students are in an endangered situation to have their mastery of the subject matter. In addition to that, because the students and the faculty members are isolated, preparing, motivating and engaging them properly for online teaching–learning are also very perplexing jobs. The findings of this research also show that the students find it very difficult to master the concept of their courses of such disciplines when delivered

online, and this causes the student dropout rate to rise. The instructors also experienced a lot of difficulties in delivering the course contents, managing projects and group works, as well as assessing and evaluating students' works. This paper talked only a bit about such contests faced by the students and instructors. As per their recommendation, many such challenges can at least be mitigated to some extent by the use of the LMS and various open source and free license software. LMS may be used as the primary repository for uploading the lecture slides, notes, audios and videos, as well as links to external sites and resources. Open source and free license software can complement the materials given through the LMS to provide students hands-on training to grasp the concepts of their computing and IT-related courses (Rahimi & Martin, 2020).

In another paper, the authors shared key points to consider when migrating from face-to-face to online courses. In that case, they faced additional challenges of rapid time, stress, unknown expectations and an uncertainty of how the material would be received and integrated, and if the course would ever be offered in this format again. In an attempt to address a broad approach to teaching and learning online, they used the framework of ELEVATE, which stands for empathy, learning outcomes, erudite, value, assessment, technology and emotion (Shi & Hargis, 2020).

The main strong point of virtual teaching includes a variety of accessible online resources. It is possible to design very interactive platforms for delivering subject matter by providing online teaching on how to interact with their patients residing at their homes located at very remote places from their hospitals or clinics. Virtual teaching with medical experts has enabled medical students to be up-to-date with the newest signs of progress in this field and to retrieve knowledge forgotten due to the postponement of their classes and internship work during the pandemic. Besides, peer mentoring was suggested for medical apprentices to raise their knowledge level and provide all kinds of psychological supports. The author also found out the flaws of virtual teaching that comprise technical challenges, privacy issues, decreased student engagement, loss of assessments and evaluations, degraded mental states of students, inequalities of teaching services in medical education, etc. (Wilcha, 2020).

3. Preparation for online class

The countrywide lockdown started on 18 March 2020 in Bangladesh (WHO1, 2020). At the initial stage, the Bangladeshi government declared that the lockdown will be until 31 March 2020. But gradually everyone could realise that this lockdown would continue for an indefinite period. Therefore, SEU decided to go for online education. We figured out the following issues before going into the operation of online classes during the pandemic period:

- Taking necessary steps and preparing for online classes by enacting good and robust policies for the EEE Department.
- Training the faculty members.
- Motivating the students of the EEE department to participate in online classes.
- Utilising available resources for online classes.
- Converting ongoing class monitoring for online mode.
- Preparing guidelines for the online assessment and evaluation of students.
- Creating an assessment plan for assessing and evaluating course outcomes and hence programme outcomes for the students under the OBE curriculum.
- Conducting surveys among the faculty members and the students, identifying the challenging issues on online classes they have faced and then recommending improvement plans after the end of the summer 2020 semester.

Before the lockdown started, the midterm examination of the spring 2020 semester was completed based on its OBE curriculum (Bhuyan & Tamir, 2020), and the EEE Department of SEU was about to resume classes for the remaining part of that semester. At first, private universities in Bangladesh came forward to start ongoing classes. Therefore, the Honourable Vice-Chancellor of SEU, Dhaka, Bangladesh, convened an emergency meeting during the lockdown on 22 March 2020, and we took a

unanimous decision to switch to the online mode of classes from 29 March 2020, considering the pandemic situation and lockdown to complete the remaining parts of the spring 2020 semester. But after 3 weeks of classes, we had to stop it on 8 April 2020 because, the University Grants Commission (UGC) Bangladesh, the state regulatory body of the public and private universities in Bangladesh, ordered to stop online classes. Later, due to continuous pressure from various educationists of the country, the UGC was compelled to hold meetings with the vice-chancellors of various universities, minister and deputy minister of the education ministry, government officials etc. The UGC lifted this embargo with a condition that universities should follow uniform guidelines to conduct online classes (UGC, 2020). The common objective was to continue the higher education of students, otherwise they would have derailed from their studies and learning. Then, the UGC prepared and circulated the guidelines among all public and private universities in Bangladesh. Each university was given the necessary freedom to adopt the online mode of teaching–learning through which a valid framework could be ensured with consistency among the various departments of the university in terms of the student learning outcome attainment. But after getting the UGC guidelines (UGC, 2020), SEU started preparing and providing training to the faculty members accordingly. Therefore, there were certain decisions and policies to be taken at the department level as well. After that, we restarted online classes on 6 May 2020. Then, we continued the semester till 15 June 2020 including the classes and final examinations, as well as grade submission. However, we could finish only the theory courses successfully. No laboratory courses could be completed. Therefore, the decision was to assign an ‘Incomplete’ grade to the students for the laboratory courses.

According to the decision taken by the university management, the EEE Department’s academic committee convened several online meetings from 11 April to 14 May 2020 and discussed several issues regarding the online classes. All the faculty members were then given a brief introduction to the online class conduction processes and policies. The department level important policies are as follows:

1. SEU decided to go with option II of the UGC guidelines (Memorandum No: UGC/Bay: B:/69(01)/2018/2214, Date: 08 May 2020 AD (Memorandum No: UGC/Bay: B:/69(01)/2018/2214, Date: 08 May 2020) (UGC, 2020); therefore, the EEE Department also went with option II of those guidelines for the final examination of the spring 2020 semester considering the pandemic situation of the country. The classes will be conducted online via Google Meet, Zoom etc. The assessment will also be conducted online.
2. Since the midterm examinations were already held before the pandemic, these examination marks will be counted as usual. Therefore, 30% and 40% of the total marks will be from the midterm and final examinations, respectively, as per the previous university policy (SEU-EEE, 2020). But for the final examination, there will be no definite examination at the end of this semester. There will be a kind of continuous assessment of student learning outcomes of various courses through the multiple assignments submitted by them. However, online viva voce should also be conducted for each student individually. The ratio of marks for the assignments and the online viva voce is 50:50, i.e. assignments will have 20 marks and viva voce will also have 20 marks.
3. It is mandatory to use Google Classroom for collecting assignments/presentation slides so that the records are preserved there. Faculty members should create the Google Classroom account for their assigned courses using the university email address.
4. All assignments submitted by the students must be handwritten by the students themselves and even the cover page must also be handwritten and must be uploaded to Google Classroom via their student email account provided by SEU based on their student identification number.
5. Small class tests/quizzes/viva voce/online presentation using PowerPoint slides may be taken online. These will be part of the continuous assessment. Continuous assessment comprises 25% of the total marks as per SEU’s central policy. However, the continuous assessment made before the pandemic should also be taken into consideration.
6. Attendance will have 5% marks for taking part in the online classes and appearing in other online class-related activities as well as attending on-campus classes before the pandemic.

7. The assignment should be given at least 1 week before the submission deadline. This should be announced in Google Classroom.
8. The viva voce should be taken during the final examination week mentioned in the revised academic calendar of the summer 2020 semester of SEU.
9. Lecture classes, assessments and evaluations, as well as grade submission, should be completed within the scheduled time frame provided by the university management.
10. Few points should be kept in mind while preparing the problems and questions of the assignments, as well as assessing and evaluating the same. They are as follows:
 - a. Each assignment should have full marks which should be awarded based on the student's problem-solving skills, creativity, number of problems solved correctly, number of problems attempted to solve and also on the viva voce on each assignment.
 - b. The assignments must be multiple for the final assessment. There should be at least three separate assignments for the final assessment with defined full marks for each.
 - c. In each assignment, there should be multiple questions and problems.
 - d. It is better to keep an audio/video record of the viva voce sessions.
 - e. Problem-solving methods must be demonstrated live online to the students.
 - f. For taking online quizzes, Google Form should be used and its response files should be preserved for future references.
 - g. Of the several assignments, assign a few questions on open-ended topics. Since all students' views will not be the same, marks will vary based on topic, writing quality, the number of words/pages, grammar and spelling errors etc.
 - h. There should be some critical thinking and higher order skills-related cognitive domain questions (Bhuyan, 2014; Bhuyan & Khan, 2014) to distinguish between high and low-performing students. In viva voce, such type of questions should be asked to assess and evaluate the course outcome (CO) attained (Bhuyan & Khan, 2020; Bhuyan & Tamir, 2020) by each student individually, and for this purpose, the assessment plan and questions should be set accordingly.
 - i. In the problem-based assignment, vary the number of various parameters based on the student ID number's last two or three digits. For example, the velocity data may be, $v = \text{last 2 digits of student ID number in m/s}$, or the electron mobility may be, $\mu_n = \text{last digit of student ID number} \times 200 \text{ in cm}^2/\text{V.s}$ etc., so that the students are compelled to calculate by themselves. This helps to assess and evaluate the students' outcomes confidently.
 - j. Any course assessment and evaluation-related documents (e.g. pdf or PowerPoint presentation slides, EXCEL sheets of the student responses on an online quiz etc.) must be received via Google Classroom and that should also be preserved there.
 - k. The students must be informed about the assessment and evaluation strategies in the first online class.

After taking the online classes, we surveyed the students who registered in several classes of the courses offered by the EEE department of SEU in the summer 2020 semester. We prepared 14 survey questions, out of them 2 were short questions and the remaining 12 were objective-type questions that have five options based on a Likert-type scale in which 1 means strongly disagree, 2 means disagree, 3 means neutral, 4 means agree and 5 means strongly agree. A total of 174 students responded to these questions. But due to incomplete data submission, many responses were deleted. After that, we had 148 responses for a total of 14 questions. The questions and their options are presented in Tables 1–3 in the next section with the percentage of the respondents. Besides, we calculated the mean values and standard deviation of each question where the students agreed or strongly agreed. The survey data and its analysis are explained in the next section.

4. Survey results and its analysis

The survey results of question 1 (i.e. How often did you participate in the online classes?) are presented in Table 1 from which we observe that around 65% of the students participated in the online classes. However, 5.41% of the students could not participate in the online classes at all. But there are various reasons for that, such as non-availability of Internet, financial crisis, not having the proper environment etc.

Table 1. Students' responses to question 1

Class participation type	Number of students	Number of students (in percentage)
Always	73	49.32%
Very often	23	15.54%
Time to time	40	27.03%
Only during online quiz and viva	4	2.70%
Not at all	8	5.41%
	148	100.00%

From Table 2, which is on question 2 (i.e. What type of Internet connection type do you use? How much mobile data do you need for a class of 1-hour duration per day?), we found that only 23% use broadband connection and over 71% use mobile data. However, over 5% of the students use both types of connections. The students, who used mobile data, responded that they need from 200 to 500 MB of mobile data for every 1-hour class per day.

Table 2. Students' responses to question 2

Internet connection type	Number of students	Number of students (in percentage)
Broadband line	34	22.97%
Mobile data	106	71.62%
Both	8	5.41%
	148	100.00%

Twelve objective-type questions are given in Table 3 with their mean values and standard deviation of agreeing on each question. After that, we calculated the average of the mean values of these questions and found that it was 3.78 and the average standard deviation was 1.21. However, we also calculated the standard deviation of the mean value as 0.234. We found out the z-value for the mean value of each question was 0.9224. However, from z-test analysis, we found that more than 52% of the respondents are likely to choose options 4 and 5 on the Likert scale. That is why we analysed the detailed data in Table 4.

Table 3. The mean and standard deviation of students' responses to 12 objective-type questions

Question number	Question	Mean	Standard deviation
1	Do you think that the online class is an alternative approach to the learning method instead of on-campus learning?	3.48	1.36
2	Do you think that the online class approach adopted by SEU is the right choice considering this pandemic situation?	4.18	1.07
3	Do you think that the online class approach adopted by SEU is saving your time, money, and effort?	3.56	1.28
4	Do you think that the online class approach adopted by SEU should be continued along with on-campus class during the post-pandemic era?	3.56	1.29

5	Do you think that the online class approach adopted by SEU is being taken properly by the faculty members of the department?	3.92	1.13
6	Do you think that the online class approach adopted by SEU is being taken properly by the adjunct faculty members of the department?	3.98	1.01
7	Do you think that the materials (such as slides, notes, videos etc.) provided before or after the online class by the faculty members of the department are useful and effective for learning?	4.02	1.14
8	Do you think that the online assessment process (class test, quiz or viva or assignment) adopted by the faculty members of the department are effective for learning outcome assessment?	3.89	1.17
9	Do you think that the online class gives you more opportunity to interact with the faculty members easily?	3.56	1.37
10	Do you think that the online class method is interesting and engaging?	3.36	1.45
11	Do you think that the latest technology-based online class or such other innovative methods should be utilised and encouraged by the university to its faculty members?	4.00	1.11
12	Do you think that the online class or such other methods give you the flexibility to learn from home?	3.91	1.18
Average Value		3.78	1.21

From Table 4, we observe that overall we obtained 123 + 126 + 310 + 421 + 592 = 1,572 responses for all 12 questions, and on average, more than 64% of the responses were found to be agreed upon that the online classes are favourable for them considering the pandemic situation. If we go by the question-by-question analysis, then we see that more than 50% of the responses are in favour of online classes. A major portion, around 20% of the responses, is also in the neutral position.

Table 4. Number and percentage of students agreeing on each objective-type question based on Likert scale

Question number	Number of students on each point of the Likert scale					Percentage of students on each point of the Likert scale					Percentage of students agreeing on each question
	1	2	3	4	5	1	2	3	4	5	
1	17	14	29	31	40	12.98%	10.69%	22.14%	23.66%	30.53%	54.20%
2	5	4	23	30	69	3.82%	3.05%	17.56%	22.90%	52.67%	75.57%
3	12	14	34	30	41	9.16%	10.69%	25.95%	22.90%	31.30%	54.20%
4	10	18	36	23	44	7.63%	13.74%	27.48%	17.56%	33.59%	51.15%
5	7	7	26	41	50	5.34%	5.34%	19.85%	31.30%	38.17%	69.47%
6	4	4	32	42	49	3.05%	3.05%	24.43%	32.06%	37.40%	69.47%
7	7	10	12	46	56	5.34%	7.63%	9.16%	35.11%	42.75%	77.86%
8	9	7	23	42	50	6.87%	5.34%	17.56%	32.06%	38.17%	70.23%
9	14	21	18	34	44	10.69%	16.03%	13.74%	25.95%	33.59%	59.54%
10	25	11	24	34	37	19.08%	8.40%	18.32%	25.95%	28.24%	54.20%
11	5	8	27	33	58	3.82%	6.11%	20.61%	25.19%	44.27%	69.47%
12	8	8	26	35	54	6.11%	6.11%	19.85%	26.72%	41.22%	67.94%
Total	123	126	310	421	592			19.72%		Average	64.44%

5. Advantages and disadvantages of online class

Based on students' feedback through the above-mentioned questionnaires, we have identified the following advantages and disadvantages of online mode of classes as well as the teaching and learning processes. The following advantages of the online classes were identified:

- a. In the present pandemic situation, it is quite impossible to hold on-campus classes. So online classes are the only option as it allows us to maintain social distance.
 - b. All the department chairs voted unanimously in favour of holding online classes as there was no alternative option to conduct the on-campus classes during the lockdown.
 - c. Although the students were reluctant initially to take part in the online mode of classes and their numbers were very limited in the class, gradually the number of students increased over time and now it is very encouraging.
 - d. As the students do not have to travel to the campus, waste their valuable time on the road due to traffic jams, they can save time, energy and money (both for travel cost and food cost) by attending the online classes.
 - e. The faculty members were requested to record all their classes and share the study materials with the students. As a result, students who fail to attend live classes right at the class hours, for whatever be the reason, may still access the lecture afterward.
 - f. Since recorded materials were provided, students may play it several times later on if they fail to comprehend the topic or they may review a part of the lecture that if they forget it. In an on-campus class, this is not possible to do.
 - g. The contents created for online classes remain a very good resource for future students and perhaps also for the other faculty members (as those are shared).
 - h. Faculty members and students got to learn some new technology in modern-day teaching which may benefit them in their professional careers and will also help them in similar scenarios (e.g. pandemic) in the future.
1. The following disadvantages of the online classes were identified:
- a. All the students could not be brought under Internet connectivity because a good number of students come from remote villages in the country. There is no broadband connection or mobile network towers near their homes. As a result, they were deprived of our teaching.
 - b. Another group of students could avail of the internet connection, but their connection speed is so poor that they could not receive the full benefit of online teaching.
 - c. Disruption of electricity is another problem to attend all the live classes conducted by our faculty members.
 - d. All the participants could not be attended to by the faculty members during the live online class due to time constraints.
 - e. When the students and faculty members run out of Internet balance, they may need to go outside of their homes. Of course, this may be avoided if they have debit/credit cards or any online payment option, like bKash, Q-cash, Sure-Cash etc.
 - f. Since faculty members and students are to remain seated for a long time in front of their laptops or PCs, they feel some health hazards, like backache, headache, frozen shoulder, dizziness, eyesight problems etc.
 - g. Most of the students do not have laptops or PCs, they mainly use smartphones. Therefore, they cannot see the slides clearly, and thus they cannot receive the class materials properly.
 - h. Audio and video recordings take a lot of time and effort. The faculty members do not have high-quality ready content for this sort of purpose. But the students find it convenient for them if they get a full recording of the classes conducted. Thus, they do not need to remain present at a specific time for their scheduled classes. Of course, this is beneficial for the students if they lack good internet connection and a proper environment at their home. However, all the faculty members do not have such good electronic devices and tools at their homes or at the SEU campus to prepare these contents and make them available to the students.

- i. The faculty members need to conduct at least 8–12 online classes per week. They frequently encounter several problems, such as the replacement of their mouse, keyboard, microphone, camera, speakers, batteries, UPS and servicing their laptops, computers etc. Besides, the prices of these devices and service charges went very high during the pandemic.
- j. Most of the faculty members do not have any stylus pen and pad compatible with laptop/PC. As such, they are unable to show any computation or drawings live during their class.
- k. Laboratory classes could not take place, so practical teaching–learning was hampered.
- l. Hardware-based research works are not possible.
- m. Many students are waiting for the certificates and transcripts due to their non-completion of their 1/2/3 credits laboratory courses.
- n. It is not always possible to assess the quality of each student during an online class.
- o. IT support services were not possible to provide to the students and the faculty members promptly due to manpower shortages.

6. Improvements towards online class

Based on the students' feedback, we have provided the following suggestions to enhance the excellence of teaching–learning processes-

- a. For students who do not have laptops or smartphones, the university authority may take the initiative to provide them these devices through group/corporate purchases from any reputed dealers at a discounted rate.
- b. Faculty members may be equipped with electronic gadgets, like a good quality camera, microphone, speakers, stylus pen and pad compatible for laptop/PC necessary for the online classes to mature the teaching methods of the faculty members and learning outcomes of the students in the online mode of education.
- c. To get the actual scenario, student and faculty surveys may be conducted.
- d. Faculty members should give more assignments and take online quizzes frequently to engage students in their studies.
- e. Faculty members should play a proactive role to motivate their students to participate in online classes. Besides, they should be more empathetic to their students because students are going through several types of traumatic situations, including personal and family crises, financial constraints, poor internet connectivity, health issues, fear of getting infected by the coronavirus etc.
- f. The department chairman should formulate some guidelines for his/her faculty members to maintain the uniformity of assessment across the department. However, this should be notified to the faculty members before and monitored regularly whether the faculty members are following the guidelines diligently.
- g. Since the teachers and students do not need to come in physical contact with each other, it is hard for the teachers to observe their students' attention towards the class lecture and problem-solving issue in real time. Therefore, the supervision of the learning process of the students is not possible directly. Hence, there is a huge gap between online remote education and campus-based education with a physical presence. Therefore, we suggest that the faculty members interact with them during their class apart from teaching and giving lectures. To do this, they should ask some questions to their students about the lecture topics during the real-time class period. This will also help them to assess each student individually.
- h. To improve the assessment process during the online mode of teaching, creative questions and assignments should be set by the faculty members. Besides, problem or project or case study-based assignments may be incorporated.
- i. To teach and assess the laboratory courses, both on-campus and online laboratory classes may be conducted as per the UGC guidelines circulated recently.

- j. To improve the quality of teaching, learning and assessment, frequent faculty training on these issues is also very essential.
- k. To assess the assignment, plagiarism checking software should be renewed by the university so that the uniqueness of the student assignments can be judged separately and timely.
- l. To ensure that enough online resources, like text and reference books, research articles, thesis and project reports, monographs etc., are available to the online library of SEU.
- m. The faculty members need to strengthen their supervision to maintain the regularity and punctuality of the students as in the online higher education system, the students enjoy more freedom for their learning purpose than that in the on-campus classes.
- n. Faculty members should encourage their students to study in a group to enhance collaboration among themselves and also with him/her because physical on-campus classes are restricted to the classroom presence only, and the students do not feel interested to interact with their teachers inside the class.
- o. Faculty members need to supply the highest possible amount of teaching and study materials, as well as other educational resources to their students.

7. Conclusion

This paper explains the importance of conducting online courses during the pandemic. In the online education system, the preparation of slides is one of the important tasks by the faculty members for proper teaching and learning to happen in the online classes. In the online mode, the cognitive domain of Bloom's taxonomy should be adopted (Bhuyan & Khan, 2014). To improve teaching quality, faculty members need to be trained regularly. Therefore, taking student feedback is an essential method to get a proper reflection about how to pay full attention to the students for their proper learning and to utilise the advantages of this online teaching mode practically.

In a broad spectrum, the main purpose of teaching online is to continue the education, and also the teaching-learning process of the teachers and students was successful through this newly reformed system of education. However, the department has tried its best to cultivate students' self-learning ability and improve the quality of the learning process. Reasonably, we can say that the faculty members must improve their sense of responsibility, bring about innovations in their teaching methods according to the students' accepting characteristics and learning abilities. Through the constant reform policy, they can attain the desired course learning outcomes by cultivating their knowledge, skills, ability and attitudes. However, students must complete their assigned tasks in time to make this online education system successful and beyond any question of doubt.

Another important issue that the educators and the management of academic institutions must bear in mind is that these online education initiatives are emergency measures. Above all, this method is untested, and in some cases, is not applied successfully across all educational institutions. Moreover, monitoring and evaluation tools are still not suitable enough. Finally, the initiatives of online education can only categorically be employed efficiently if the learners and the teachers have reliable access to Internet facilities and the other resources across the whole country compulsory for online transfer of knowledge to the learners. In this regard, recommendations provided in the previous section may be adopted to make it fruitful for the students.

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