



# Maintaining an Engaging Remote Learning Environment: A study of instructors' tactics and students' perspectives during the pandemic

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## **Abstract**

During the first year of the pandemic, instructors, inexperienced in online class delivery and platforms, were forced to conduct emergency online classes. Boosting and sustaining the student engagement remains a priority for instructors in the wake of the pandemic. In this study conducted during the first year of the pandemic, instructors and students were surveyed to determine the most effective pedagogical and delivery online instruction methods to maintain an engaging online classroom. The experiences of 15 surveyed instructors, who experienced remote teaching for the first-time, and the experiences of 519 students were used to understand the troubles facing student engagement in online classrooms. Adjusting the online classroom dynamics and allowing for more time for online-class activities resulted in increased student engagement from ~67% to ~75%.

## **1. Introduction**

Early in the year 2020, most schools around the world adopted remote-learning to face the COVID-19 pandemic [1, 2]. Instructors and students had to deal with remote learning platforms, which for many of them was a first-time experience. In the engineering school where this study was made, and during the spring, summer, and fall of 2020, most instructors adopted the pedagogical methods and material delivery techniques closest to their normal, pre-pandemic classroom [1, 3, 4]. By adopting these techniques, the instructors thought that the students would experience minimal changes as they were diverted to an online classroom environment. However, the interactions in the virtual classroom were not as smooth as planned.

The main problem that arose, during that first pandemic year of 2020, was the lack of interaction and inclusivity in the emergency online classes [5]. In this article, we explore the issues, reasons, and remedies to achieve a more interactive and inclusive virtual classroom. Fifteen instructors, in the department of Electrical and Computer Engineering of the school that hosted this study, were asked to provide feedback on their teaching experience during the year 2020.

In this article, a study of different attempts of pedagogical and delivery methods; aiming to maximize the students' interactions in a remote classroom, in 15 online courses from spring 2020 to spring 2021. For all the methods used in this study, less class-time was devoted for classical lecturing, and more time was allotted to the students-instructor interactions in the main room, and student-student interactions in the breakout rooms. The latter mainly to include all students in classroom activities and peer discussions. While several methods have been devised to engage students in a remote classroom and promote inclusivity [6-8], the methods proposed in this work are more suited to in-experienced instructors. The outcome of this study was measured by the students' performance on tests throughout the courses. Also, the students' perception was judged by their responses to end-of-semester surveys. The authors will reflect on the applied online teaching methods and how they affected the dynamics of their courses.

## **2. An Account of the Problem**

Online learning has been established for decades as an alternative method of obtaining education. It has enabled those who seek education, in abnormal circumstances, to learn and obtain degrees to better their lives [9, 10]. E-learning has certainly helped when the pandemic struck, assembly was banned, and everyone was forced to stay at home. While people in other professions have suffered greatly during the first year of the pandemic, it is not entirely unrealistic to deduce that E-learning have helped most educators maintain their jobs. While e-learning have been developed for decades [9-12], in most non-online schools, instructors had very little to no exposure to online teachings platforms and delivery methods. They had to develop electronic course materials and learn how to run virtual classrooms online. The number one complaint that we got surveying 15 faculty members was about the instructor-student interaction and that “it just doesn’t feel the same” like having students in class. The student engagement in an online classroom became the biggest challenge to instructors.

Students too had to adapt to the new environment. Aside from attending a class with a healthy student body, most students were used to studying in groups. The isolation and the new solitary-style of work took a toll on students’ mental and psychological health. Instructors have recorded a number of students with mental and psychological grievances, comparably greater than their experience from pre-pandemic days. However, students’ main complaint remained that they do not feel included in the online classroom compared to the physical classroom. Often there are disruptions in their new learning environment like family or roommates carry out daily activities distracting the students. While maintaining students’ engagement have also been a popular subject for educational studies; only a few of which focused on sustaining students’ interactions in a remote learning environment [13].

## **3. Online Teaching and Delivery Techniques**

### **3.1 Online Pedagogical Techniques**

Different pedagogical methods exist in e-learning [14]. Traditional lecturing commonly offered in online classes where an instructor introduces the students to the materials. While flipped pedagogy is one where the pre-recorded lectures and materials are viewed by the students before class, and keeping the online class meeting for discussions, and Q&A [15]. In the latter, the students encounter the course’s materials for the first time before class, and come prepared to class, as a method of active learning, as opposed to the passive traditional learning method.

### **3.2 Online Delivery Methods**

The course materials in an online course can be delivered in many ways [16-19]. The instructor and students may convene in a synchronous lecture setting, where the lecturing and classroom activities are live. An asynchronous lecture will be recorded by the instructor a-priori for the students to view during lecture hours or at other times [20]. A common hybrid method has the lecturer and students recording a live class and making the recording available for students.

## 4. Gauging Student-Engagement and Interactions in Emergency Online Classrooms

During the first year of the pandemic, instructors, and students from over 15 courses spanning three semesters, were surveyed to underline the most effective pedagogical and delivery method in maintain student engagement in an online classroom. Human subjects' approval (PRO18060710) was secured for these various forms of assessment.

### 4.1. Instructors' Perspectives

The faculty survey aimed to gather instructors' perspectives on the motivation and challenges of the teaching methods they adapted since the university switched to online mode in March 2020. The survey was similar to the one presented in [21]. It was the consensus of the surveyed instructors that exclusive asynchronous lectures would weaken communication and connection with students. Thus, none of the instructors adopted an exclusive asynchronous lecturing. Instead, they decided to adopt synchronous meetings irrespective of their pedagogical approach of teaching, either with traditional lecturing or flipped instructions. Table 1 summarizes the number of instructors adopted different pedagogical and class meeting methods.

Two-thirds of the instructors either preferred or were involved in a full online setup, while the remaining one-third chose to teach in a hybrid mode where they delivered in-person class meetings from campus, when then hybrid mode became available by fall of 2020. Those who opted for online meetings indicated that it was more convenient and safer to teach online. On the other hand, "feeling connected" was the main motive for being in-person in a hybrid setup. In both approaches, the frequently reported problem was class participation and students' interactions with the instructors. Also, in hybrid classes, the coordination between student teams, partly attending online and partly attending in-person, was complex and time-consuming.

Nine of the surveyed faculty favored traditional lecturing, while the other six adopted flipped instructions, either partial or full flipping. Traditional lecturing enabled instructors to address student questions as they arise during the synchronous lecture instead of a potential struggle that may happen if students work on the material before the class time with a flipped style. In instructors' opinion, this teaching approach keeps students motivated and on track with their learning and understanding. On the other hand, the instructors who adopted flipped style of instructions indicated that flipping enabled an efficient delivery of the course content and they were able to tailor the class-time to students' needs and have more class discussions to gauge their understanding of the course topics. In their opinion, the class discussions fostered an inclusive and active environment in which each student had the chance to ask questions and enrich the class discussions without the fear of exposing their misunderstanding of the taught concepts.

Irrespective of the class delivery method and the teaching pedagogy, student engagement was the most-frequently stated challenge. Table 2 shows the challenges that the faculty experienced while teaching remote and hybrid classes. It is clear that the majority of the surveyed instructors struggled to get everyone in their classes to interact with them and engage during the lecture time. However, all instructors reported that the use of active learning techniques in their classes helped enhancing the class dynamics and maintained an engaging environment for all students. Active learning also helped with the reduced attention span of students. The active learning practices used in this study included interactive questions via polls, or Top Hat; ask questions and randomly pick students to answer them; minute papers; and breakout rooms for group discussions. Surveys, like a mid-term survey, were conducted during the semester to gauge how students perceive class activities. From

the instructor and students' responses to the surveys, active learning in online classes seems to be beneficial in remote classes too.

Several responses of instructors the surveys revealed that the instructor-student interactions were often compromised by external distractions. The instructors also dealt with the challenge of creating an inclusive environment for all students in their classes. Instructors reported that there were only a few students that were used to the new class environment. Those students normally dominated the responses, while much of the classroom laid low, un-included in the discussions and the verbal classroom activities. This can be due to lack of courage to answer questions in the new environment or can be due to lack of attention spent during class. The instructors also complained that due to limitations on internet bandwidths, most students did not switch on their web-cameras live, which made the task of grasping their attention and gaging the level of their understanding of the course contents, incredibly tedious. One instructor commented: "It often feels like I am talking to myself."

Table 1. Number of instructors using different teaching pedagogy and meeting modes

	<b>Hybrid Synchronous Meetings</b>	<b>Online Synchronous Meetings</b>
<b>Traditional Lecturing</b>	2	7
<b>Flipped Instruction</b>	3	3

Table 2. A summary of challenges discussed on teaching remote and hybrid classes

<b>Student Engagement and Interactivity</b>	13
<b>Reduced Attention Span</b>	4
<b>Reduced Class Attendance</b>	3
<b>Academic Integrity and Conducting Exams</b>	3

#### 4.1. Students' Perspective

During spring, summer, and fall of 2020, 519 students were presented with various activities and discussion, held during the online live lecture meetings. These activities included student-student activities, held in separate online breakout rooms, and instructor-students discussions and interactions held in the main meeting room. Students were asked to fill in a survey, detailed in [22], to gather their perspective on remote learning during the COVID-19 pandemic.

Question four of this survey presented multiple positive and negative factors and students were allowed to choose all the factors that affected their experience. The 519 students participating in this survey, spanned freshman, sophomore, junior, and senior levels. The survey was also conducted in numerous courses and almost covering all the major fields in the freshman year and the Electrical and Computer Engineering department, in the school hosting this study [22].

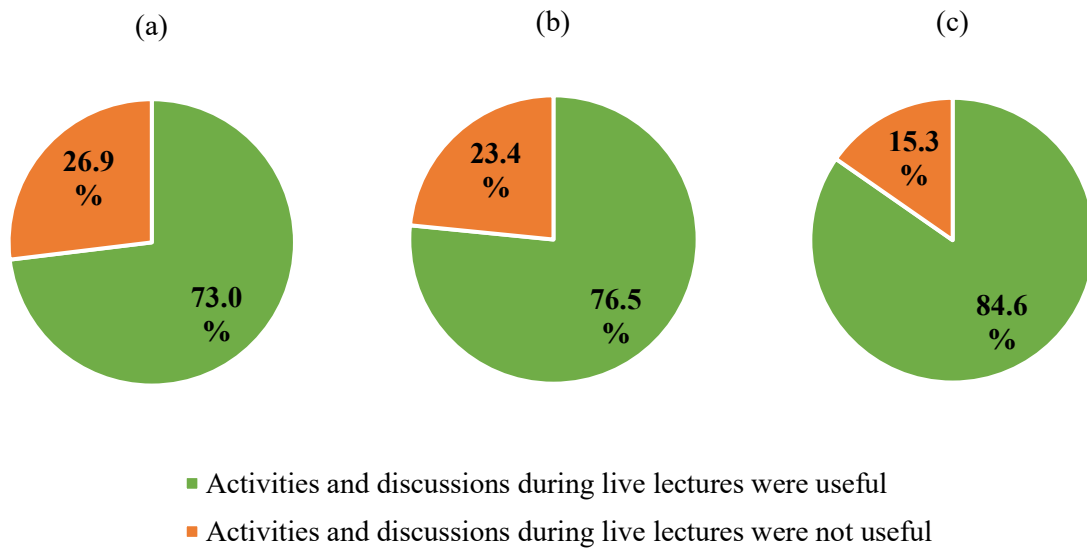


Figure 1. Students' perspective on activities and discussions during a live lecture in (a) live (synchronous) lecturing with meeting recording uploaded after, (b) live (synchronous) lecturing, with meeting recording uploaded after, and (c) Asynchronous (pre-recorded videos) lecturing, with live discussion during lecture time.

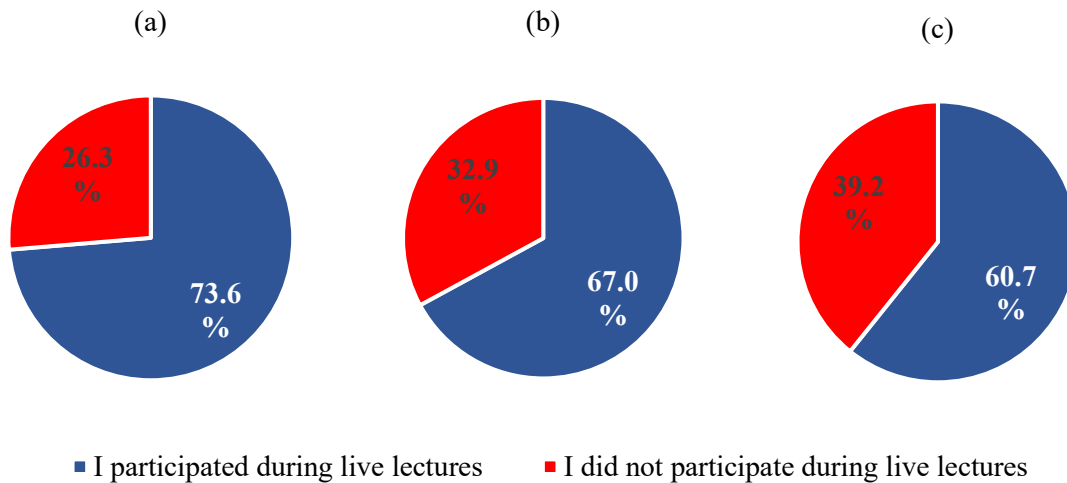


Figure 2. The distribution of students' participation in live-remote classroom activities in (a) live (synchronous) lecturing without meeting recording uploaded after, (b) live (synchronous) lecturing, with meeting recording uploaded after, and (c) Asynchronous (pre-recorded videos) lecturing, with live discussion during lecture time.

Figures 1 and 2 depict the results of question four of the survey. In figure 1, the percentages for the students who have participated and those who have not participated in live lectures' activities and discussions are shown for three different online class delivery styles: (a) live (synchronous) lecturing without meeting recording uploaded after, (b) live (synchronous) lecturing, with meeting recording uploaded after, and (c) Asynchronous (pre-recorded videos) lecturing, with live

discussion during lecture time. Similarly, the distribution of student participation in live lectures is shown in figure 2. As can be deduced from the charts, the majority of the students have participated in live online lectures and have found the activities and discussions useful, for all three styles of class delivery. On the other hand, some students reported that these activities were useless and that they didn't participate in the live lectures. However, the number of students who participated in the live online lectures and have found the activities useful is at least twice of those who have not. According to the surveyed students, the activities and discussions of asynchronous lectures were the most useful, while the synchronous- unrecorded lectures induced the highest participation in class.

In last question of the survey, the students were allowed to provide written feedback of their remote classes experience. Through which it became clear from multiple responses that dividing students into groups and sending each group to a breakout room to carry out classroom activities have boosted the student engagement. In one course where this method was implemented, the students' participation during live lectures have jumped from ~67% to ~75%. One student commented on this practice: "I liked the breakout rooms! I did wish we got to do more problems in breakout rooms, but I understand we were short on time." Another student compares this inclusion and engagement activity to other online classrooms: "I think one of the biggest drawbacks of online classes is the lack of interaction between peers. If you don't know anyone going into the class, there is no one you can ask for help without having to go straight to the instructor. The breakout groups in this class did a good job helping with this."

#### **4. Conclusion and Future Work**

In this work, when COVID-19 was projected to spike in the fall of 2020, and with several spikes to follow, and with uncertainties about when the vaccines will establish immunity against the mutating virus, uncertainties arose to when normal life can be resumed. Instructors and students here find themselves in need to normalize the learning environment and become accustomed to remote learning.

The instructors in this study were only used to the traditional teaching methods inside of physical classrooms but were forced to utilize remote learning platforms and methods to face the pandemic. Since the instructors were not trained initially and had very little time and opportunity to learn about online-teaching methods, there were a big room for improvising the online lectures' pedagogical and delivery methods. Establishing an engaging environment that is inclusive for all students in an online classroom, especially for students who were not used to the online classes, proved to be a difficult endeavor. The analysis of the survey results shows that 13 out of 15 instructors surveyed reported that the number one challenge they have faced in the new online classroom was related to student engagement and interactivity. Furthermore, the tasks of grasping the students' attention and gaging the level of their understanding of the course contents, were incredibly tedious.

This experience was new for the students at the school of this study as well. They also, have reported multiple challenges of their own in dealing with the remote classroom environment [14]. A majority of the students who participated in this survey study have found the engagement activities during the live remote lectures beneficial and have participated in those activities. The inclusion of the remaining un-included group remains an arduous mission. When three online lecture delivery methods were compared, the activities and discussions of asynchronous lectures were considered to be the most useful. This may be due to the fact that students attending the class

meetings have reviewed the lecture recording and are more prepared for the discussions and class time activities. The results in figure 2 also revealed that not recording the synchronous lectures stimulate higher participation during online meetings. This can be explained as the students may tend to lose their concentration or procrastinate knowing that the class meetings are being recorded.

Student-to-student interaction can be boosted by the utilization of breakout rooms, where student groups can break the ice and have personal discussions that boosts engagement and sense of inclusivity. Instructor-to-student interaction can be improved by maintaining classroom activities during live sessions. The live meetings are crucial to maintain this interaction, even if asynchronous pedagogy is used. In the latter case, the instructor is advised to meet with the students to discuss the lessons and insist that the students attend and not just view the recorded lectures outside of class time. Assigning different tasks to different students, or student groups, can help with including more students in the classroom activities, and increase the sense of worthiness of the personal effort.

In online classrooms, when less class-time was devoted for classical lecturing, and more time was allotted to the students-instructor interactions in the main room, and student-student interactions in the breakout rooms, the students' participation and engagement was boosted from ~67% to ~75%. The authors advise allocating a greater portion of an online classroom to class activities and exercises like Q&A, and instructor- student and student- peer discussions. In the future work, the authors will advise the optimal division of course-time between classical lecturing and interactive activities. The effect of making the online class personable to students on inclusivity will be further explored.

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