Technology-Enhanced Learning and Teaching in COVID-19 Era: Challenges and Recommendations

Ali Al-Ataby
Department of Electrical Engineering and Electronics, University of Liverpool, Liverpool, UK.
Email: aliataby@liverpool.ac.uk

Abstract

Technology-enhanced learning and teaching methods have been in literature and for many years now. Many educational institutes all over the world have been using these methods to deliver their programs and degrees. Nevertheless, some institutes are not very keen on using technology in some disciplines, and deliver their programs in a traditional way for a number of reasons, especially if these have been successful and well-attended (i.e. popular) by students. In the current era, where COVID-19 pandemic has disrupted every corner of our life including higher education, technology has become a critical success factor to reduce the negative impact of this pandemic. Accordingly, it is now no longer an option to opt out from using technology in learning and teaching. This doesn't just refer to providing (dumping) contents to students digitally, but to facilitate learning and deliver engaging and highly interactive experience to compensate for lack of face-to-face interaction between the students and their teachers and also amongst the students themselves. The use of technology in education due to COVID-19 pandemic, however, has confronted by a number of challenges. In some cases, the focus was shifted to the contents (documents, videos…etc.) rather than interactivity and student engagement. Furthermore, the students were highly overwhelmed with contents in a short period of time, which has caused anxiety, dissatisfaction and performance issues. In this paper, examples of teaching methods based on the use of technology that are employed during the lockdown period are provided. Moreover, a number of subsequent challenges due to current situation are discussed, and recommendations for implementation and best practice are shared. Also a proposal for a flipped delivery model to move forward is provided and discussed. Anecdotal student feedback has shown that the used methods and techniques were really helpful and have boosted student learning and enthusiasm in this difficult time.

Keywords: Technology-enhanced learning; remote teaching; hybrid teaching; flipped learning; Virtual Learning Environment; COVID-19.

1. Introduction

In recent years, educational technology tools are predominantly integrated in every aspect of higher education. Today's students are digitally literate in a remarkable way, and are always online on social media and other communication applications (Al-Ataby, 2016). In 2010, the NUS (National Union of Students) has demanded form the universities in the UK to review their teaching methods to assess whether new

technologies are incorporated in learning and teaching or not. Moreover, NUS has carried out a survey after being commissioned by HEFCE (Higher Education Funding Council for England) to collect students' perspective about the use of technology in higher education. Among the outcomes of this survey are that the students believe undoubtedly that technology would absolutely improve their learning and teaching experience, and they want more state-of-the-art technology tools to be embedded/integrated in their learning and teaching, and they think their teachers need more training on the use of technology. Moreover, the students would like all the tools and utilities to be integrated and used from one place, which is obviously the VLE (Virtual Leaning Environment) or the electronic blackboard system (Al-Ataby, 2019). From the above discussion, it is evident that the students are happy for technological tools to be embedded and integrated in their learning, obviously in a planned and quantifiable manner.

In 2020, COVID-19 pandemic has impacted severely all aspects of our life, including education at all of its levels. As a way to mitigate the negative impact of the pandemic, many higher education institutions have decided to switch completely to online (remote) teaching delivery and virtual education in a matter of few days (if not overnight) (Daniel, 2020). This required heavy use of technology and high reliance on the available IT infrastructure. Because of this prompt switching to online delivery, there were a number of pitfalls and challenges. Students were overwhelmed with huge amount of contents (documents, videos), and lost the interactivity and social interaction element between themselves and the teachers from one side, and among themselves from the other side. Accordingly, lack of motivation and engagement has resulted, and many students have felt isolated, and just wanted to finish the academic year and progress to the next year with the least efforts as possible (Kandri, 2020). Assessments during the semester when the lockdown occurred and end-of-year examinations were also impacted by the lockdown, and it was a great challenge to run these in a fair and authentic way. Moreover, there were other problems and challenges encountered as a result of running everything in an online and virtual way.

In this paper, examples of teaching methods based on the use of technology that are employed during the lockdown period are provided. Moreover, a number of subsequent challenges due to the current situation are discussed, and recommendations for implementation and best practice are shared. Also a proposal for a flipped delivery model to move forward is provided and discussed. Anecdotal student feedback has shown that the used methods and techniques were really helpful and have boosted student learning and enthusiasm in this difficult time.

The paper is organized as follows:

- Section 2 provides a brief overview about online learning and teaching methods such as flipped, hybrid and blended learning methods.
- Section 3 summarises the case study used in this paper.
- Section 4 lists a number of challenges that were encountered during the lockdown period.
- Section 5 provides a brief discussion about the status of education after COVID-19 era.
- Section 6 provides the proposed flipped learning model.
- Section 7 provides recommendations to move forward.

- Section 8 provides concluding comments.
- Sections 9 and 10 provide acknowledgements and references.

2. Online Learning & Teaching

The term online learning was used for the first time in 1995, when the first LMS (Learning Management System) was developed (Singh and Thurman, 2019), although a number of references in literature sends it back to 1980. The terms online learning and e-learning are frequently used interchangeably in literature, and they both refer to the use of technology in delivering learning and teaching, where a course or a degree has a number of embedded online elements (Kukulska-Hulme, 2012).

There are a number of learning methods that are usually referred to when applying or implementing online learning. These are (Panopto, 2020, Alammary, 2019, Salmon, 2001):

a) Flipped learning, which refers to the learning that includes both online and face-to-face elements. In this learning, unlike traditional learning, the students learn the principles and concepts of the subject being taught themselves on their own time and pace using the provided resources (online material, videos) beforehand and attend face-to-face sessions to expand their knowledge or for class/group activities. In a flipped course, students and teachers highly utilize both online and face-to-face sessions. Such learning method is very useful for basic and introductory courses, but may also be suitable for advanced courses. End-of-term exams are usually carried out in person in this learning method.
b) Hybrid learning, which refers to the learning where online component is used to replace some face-to-face element of the course. The online components could be lecture sessions or even online discussion sessions that are not necessarily video-based, but could be textual (e.g. wiki pages or chat rooms). These online components could be carried out in a synchronous (real-time) or asynchronous way. Hybrid learning is useful for students who live far away from the campus or study part-time because they are busy with their work. Face-to-face component in the hybrid learning is useful to promote class community, social interaction and prompt and face-to-face feedback, the things that are missing in fully online course. End-of-term exams are usually carried out in person in this learning method.
c) Blended learning, which refers to the learning where face-to-face classes are usually accompanied by online resources and material, so the online component is not meant to replace the face-to-face component but rather to complement it, so the provided online resources are used as supplementary material to the face-to-face lecture sessions. Students can go through the online material at their own time and pace, as many times as they want, and they usually perform better in such learning environment. Although there are differences between the two, blended learning and hybrid learning terms are sometimes used interchangeably. End-of-term exams are usually carried out in person in this learning method.
d) Distance or remote learning, which refers to the learning that is carried out completely in an online

(virtual) way, without any face-to-face element. All course material and documents are provided on the VLE, and the lectures could be delivered in a synchronous or asynchronous way. Depending on the class size, teachers can virtually meet their students in groups or in one-to-one basis incase this is needed. End-of-term exams are usually carried out remotely as unattended open-book tests or as closed-book tests by but with online proctoring with a webcam for real-time monitoring of the student while carrying out the exam. The end-of-term exams could also be replaced by coursework components.

As can be seen from the learning types discussed above, each type has its own advantages and disadvantages. Employing one of the above types depends highly on factors such as student learning preferences, year of study, class size and also the available resources and infrastructure. Moreover, discipline/program of study could also dictate the learning style. For example, medical and engineering disciplines require hands-on work that is usually carried out in laboratories, so the physical presence and face-to-face interaction are unavoidable.

During COVID-19 pandemic, and due to lockdown measures, the majority of universities have switched to completely online delivery without any face-to-face element. End-of-year exams were carried out predominately as open-book tests. With the reduction in the lockdown measures, universities are expected to incorporate a face-to-face component, hence moving to a hybrid or flipped learning styles, taking into consideration social distancing measure (Marinoni et al, 2020).

3. Case study

In this section, an example of a course delivered during the lockdown period will be provided. The course is a third year (final year) module, with a class size of about 150 students. The cohort was very multicultural, with home (UK), EU, Chinese and Middle Eastern students. For the first seven weeks of the second semester, the module was delivered in the standard format, which is basically a blended learning, with face-to-face lectures and problem class sessions, plus additional online material such as supporting documents and videos. The last face-to-face lecture was delivered on 13th March 2020, after which a complete lockdown was imposed in the UK. Recorded videos for the remaining lectures were made available immediately to the students on the VLE. Here are some examples of the methods used in delivering the remaining material of the module during the lockdown:

3.1 Online (live) sessions

When it comes to carry out video conferencing, web conferencing, webinars and online (live) lectures to students, there are many tools available for that. Cisco Webex and Skype were among the tool that have been used for long time to carry out live meeting and lectures. However, during COVID-19 pandemic this year, two video applications have been remarkably instrumental; these are Zoom from Zoom Video Communications and MS Teams from Microsoft. The main reasons behind this are they are both very simple to use (user-friendly) and are integrated with most the available VLEs (CANVAS in particular).

Setting a meeting up by both applications is very straight forward and joining it is even simpler. They are both cross-platform (Windows, Mac OS, Android or iOS) and their free versions provide good flexibility and features, and more capabilities and features can be obtained with the licensed versions. Most of the universities have had a license for Microsoft products, so obtaining MS Teams application was like adding one more software tool to the available suite. Many universities obtained Zoom license during the lockdown period as an additional level of flexibility to the academic and professional staff. There are other options that are either free or cost-effective, such as YouTube live stream, but they are more suitable for the public domain rather than academia.

For the module used in this case study, Zoom was used as a tool to run Q&A and discussion sessions. As mentioned before, when the lockdown occurred, recorded videos for the remaining lectures were made available immediately to the students on the VLE (which is Blackboard). The students were informed that if they have any questions after watching the videos for the lectures, then they can join a timetabled live Q&A session, and the questions will be taken on first-come-first-served basis or on alphabetical order if many students turn up at the same time. Also, as another use of live sessions on Zoom, problem class sessions were carried out. It was found that this is much more useful than organizing live lectures, as many students won't be able to join for several reasons, or may not be interested to join if the session is just a lecture session where student questions can't be taken. Moreover, when it comes to lectures, students usually want to watch a recoded video at their own time and pace. This was also confirmed by anecdotal student feedback.

3.2 Virtual office hours

Besides the timetabled live sessions, students seemed to prefer drop-in sessions, where they can turn up and ask general questions about the module that are not necessarily linked to a specific lecture or topic. Weekly virtual office hours on a specific day/time of the week were provided to students using Zoom. Although the number of students joining these Zoom meetings was small, they were very useful to the involved students. These Zoom meetings are meant to be one-to-one, so the students can speak openly to the teacher if they have any problem, besides asking questions about the subject. The students are advised to book a slot in the virtual office hours before the designated day/time, yet they can still join (if possible) in case they miss to book a time slot.

3.3 Online Q&A sessions and Discussion Boards

Although online (live) sessions and virtual office hours offer a very good chance for the students to interact with their teacher in a video call format, a number of students would prefer textual interaction. This could be due to a number of reasons such as language barriers and reluctance to show faces or part of their homes in the background of the video call. Accordingly, they may prefer to send a written question online (anonymously) and get a reply immediately or after few minutes. This is very similar to sending an enquiry by an email and waiting for a reply, but in this case, both the question and the answer appear at a dedicated page in the VLE (called Q&A or Student Questions page) where the students can find the question that

they've sent along with its answer. The teacher is going to be available to answer student questions on spot (if possible) or within a short time window, depending on the availability. A link for this tool is available in the VLE, and the students need to click on that link to open the tool and send their questions anonymously. With large cohorts, and closer to the final examination day, a high number of questions are expected to come to the teacher, which obviously creates a high workload. There is another tool that is also useful in this regard, which is the discussion board, where students can also send questions (anonymous or with their name), but they expect the answers to come from their peers rather than their teacher, who can also answer the questions in case other students couldn't. The discussion boards offer a good environment for student collaboration and promote peer-assisted learning concept, and it is a feature that is available in most of the VLEs.

3.4 Simulation tools

With remote learning, simulation tools are going to be very useful to help in student understanding. The students usually struggle with subjects that are abstract theoretical concepts, and as a way to simplify these, simulation tools play a very vital role. Moreover, modules with practical lab components have lost their edge (the hands-on experience) because of the lockdown, and in this case simulation software and tools are very instrumental. Obviously, nothing replaces the practical hands-on experience gained in the laboratories while students carry out experiments, but if the learning outcomes of the practical exercise can be (partially) met with simulation tools then it could be acceptable as plan B until things return back to normal.

A large number of simulation tools exist in many disciplines, and their cost and difficulty vary. In engineering for example, there are many tools and software packages, depending on the engineering field. MATLAB (which is licensed software) is one useful tool that offers a very intuitive simulation environment (Simulink), and it has been used in this case study. It was used in the recorded videos and also in the problem class sessions to explain concepts and provide practical flavor to the information. The students were highly engaged in these sessions and used the tool to test all the examples provided in the lecture notes.

Another useful tool used in this case study was a free simulation application called GeoGebra, which is an interactive mathematical, geometrical, statistical and calculus application that is intended for mathematics, science and engineering disciplines. Every system described by mathematical equations can be simulated using this tool. The application is cross-platform and can be embedded easily in most of the available VLEs (e.g. Blackboard and CANVAS). It is a free tool, so no licensing is required. Depending on the complexity of the system or circuit to be simulated, development time and effort vary. There are a large number of models available already in the application itself that can be used by teachers and students, but for new or advanced models, one needs to create the model completely from scratch. In this case study, many GeoGebra models were created to help understanding the main concept of the module.

3.5 Online Quizzes (formative and summative)

To assess students understanding of a certain topic, tests are needed. The easiest way to do this nowadays

is to have an online test on the VLE which provides prompt feedback about understanding. These online tests could be just formative quizzes, or assigned a certain weight from the overall module mark. The tests are synchronized with the lectures and the timetabled live sessions. There are pre-session and post-session online tests, where student understanding can be assessed and gauged. The students are instructed to watch the lecture recording, then carry out the online pre-session test, then join the online session and carry out the post-session test afterwards. By doing this, the students will have full picture about their understanding, the revision they must do and the additional support they need. It was found that without a formative assessment, homework or a test, the students will become self-complacent and lose focus, so they don't revise and leave everything to till the last minute. A small number of online tests are going to be summative and assigned a weight from the module overall mark in the form of an assessed assignment or task, and the rest of the tests will be formative to provide feedback for the students about their learning.

3.6 Personalized end-of-term examination

One of the most critical challenges that have resulted due to the unexpected lockdown in the middle of the second semester of the academic year was how to carry out end-of-term examinations. Some schools in many universities have decided to cancel these examinations and consider the year as just a pass/fail year or even to pass everyone. While there may be valid reasons for these decisions, other schools decided to go on with end-of-year examinations. In this case study, open-book examinations were used, where every student was given 48 hours to submit the exam through the VLE because the students were in different time zones, and could have problems to connect to the Internet, so to accommodate these issues, two days were given for submission. There are many (known) problems with unattended open-book examinations, such as authenticity, so measures must be taken. One of the measures is to have a personalized end-of-term examination, and depending on the subject type, this can be done in different ways. The idea is to create as much variety and personalization as possible amongst the students when they do the examination to improve exam authenticity and reliability. In this case study, the module has many numerical elements, so numerical questions can be linked to the student ID, so in each question, one or more variable can be linked to the numbers in the student ID (e.g. the last digit in the ID, the last two, three…etc.). For non-numerical questions, other ways could be attempted, such as if the student ID is within certain range then the students must answer specific questions in exam paper, or answer different set of questions, and so on. These ways obviously won't guarantee 100% exam authenticity but it'll definitely help somehow.

4. Challenges

There were many challenges encountered in higher education during the lockdown period (IAU, 2020, Langella, 2020). In this section, the main ones are briefly discussed.

4.1 Infrastructure and Technology

It is obvious that any technology-enhanced learning method requires the right IT infrastructure and the platform to be implemented. Determining the required technology infrastructure that was needed during the lockdown to deliver lecturers and support the students remotely is out of the scope of this paper. Both

the universities and students must have the required IT infrastructure so that online (remote) delivery would be possible and successful. During the pandemic, a number of infrastructure issues were evident, especially with the students such as slow or unstable Internet connection. Accordingly, there must always be an alternative (plan B) provided to the students. For example, if the student can't join a live lecture because of a slow internet connection, then the lecture must be recorded and made available in the VLE for the students to watch later. Also, recorded lectures must be made downloadable so that the students can download when they are connected and watch these offline. Submitting an exam or coursework through the VLE must be backed by an alternative method (e.g. by email or through alternative website) in case the VLE is not accessible so that the students won't miss an important deadline.

4.2 Student lack of participation and engagement

An obvious downside of remote online teaching is that many students find it unlively, so after joining one or two live sessions or watching recorded lecture videos, they will soon get bored and just lose interest. Unless teachers find a way to engage the students and grab their attention back, they will be disengaged for the rest of the semester or the year.

4.3 Struggling in silence students

A good number of students join live sessions and watch all the recorded lectures and go through all the documents, yet they are not accustomed with this new way of delivery but used only to face-to-face delivery. So, although they get themselves busy with the available online resources, yet they just can't grasp the topics and information. Moreover, many students struggle because of personal issues during the lockdown period due to economical, health or psychological reasons. As mentioned in the case study above, students were offered virtual office hours, yet many of them decided to struggle in silence and not to speak out to their teachers about their problems because they are either shy, or just don't want to speak about their personal problems to a person outside their family circle.

4.4 Assessment fairness and authenticity

As mentioned in the case study above, measures were taken to personalize the end-of-term examination to improve authenticity and reliability. Although these measures are useful, they won't guarantee 100% exam authenticity, though. There will be collusion cases and academic integrity breaches when carrying out open-book examinations.

The other alternative for personalization is proctoring, which is an online invigilation, so the student is watched while he or she performs the examination at home or anywhere else. The student needs to sit in front of a PC which is equipped with one or more active cameras and relevant software and start the examination. There are three types of proctoring (Kaplan, 2020):

a) Subsequent proctoring, where an invigilator (or a proctor) can check if there was any breach later on after the student finishes the exam. The software records video shots or photos at random times for the student during the exam and send these to the examination team to go through.
b) Live proctoring, where a proctor invigilates a number of students remotely in real-time through

their cameras while they sit for the examination.

c) Automated proctoring: where computer software or an artificial intelligence (AI) tool automatically detects any breach during the examinations.

Each type of the above has its own features and limitations. There are many products available to carry out proctoring, such as Proctoru (http://www.proctoru.com) and Oxagile (https://www.oxagile.com/competence/edtech-solutions/proctoring). Even remote desktop solutions such as Teamviewer can be used for proctoring with some customization. Licensing/pricing of such products obviously differs depending on the features and capabilities, but in general it is costly.

Although proctoring offers a solution for exam authenticity, there are many associated issues and challenges. For example, for an international cohort, there is a time-zone problem when setting up a timed examination for the full cohort. Also, there will be many technical problems as far as the students are concerned such as connection and electricity loss, where proctoring process will be interrupted (this could be intentional, though). Moreover, with large cohorts, a large number of proctors are required because each proctor can manage a certain number of students at one time. For these reasons (and others), many universities have decided to opt out from proctoring.

4.5 Time-zones

When the lockdown was imposed, many international students decided to return back to their home countries. This has led to a problem when it comes to scheduling live lecture sessions and timed examinations because of the different time zones. Alternatives must be suggested to mitigate this challenge.

4.6 Accessibility needs

Another challenge that was experienced during the pandemic period and lockdown is how to support students with special needs. Revision material must be provided in different formats to support students with accessibility requirements. A number of VLEs (e.g. CANVAS) provide good accessibly check for the material that is uploaded to course pages and provide guidance on how to improve accessibility. As an important requirement, all recorded video material and live sessions must be captioned (subtitled). This can be done using the VLE itself (e.g. CANVAS studio), Microsoft Stream, Microsoft PowerPoint or even YouTube. For captioning live videos, Microsoft Teams is very powerful (built-in feature). Zoom can also do this directly or with a third-party tool. Automatic captioning is obviously very convenient but lacks accuracy sometimes, especially with when technical terms (jargon) are used a lot. The teacher needs to edit the transcript file of the lecture and correct the mistakes (manually) to have accurate subtitles, something that adds additional workload on the lecturers in case there is large number of videos to check.

5. Beyond COVID-19 Era

The effect of the pandemic and lockdown on education (and other aspects of life) will have a long term ripple effect that will substantially change the way educators used to carry out their work (Marinoni et al,

2020). After this pandemic ends, educational institutes shouldn't just restart and resume normal business but to rethink the entire learning and teaching process. After this unfolds:

a) We are going to have large number of distance learning tools,
b) Students will have developed remarkable independent learning skills,
c) Teachers will have developed outstanding skills in using technology-enhanced learning tools,
d) Students and teachers will have developed adaptation skills and will be more patient.

These gains, skills and attributes must be utilized when redesigning courses and programs in the near future (UN, 2020). Also, teachers, as well as students, must be supported more and their needs must be addressed (Reimers, 2020). Moreover, flipped and inclusive learning will be the buzz words in the near future.

6. Proposed Flipped Model

In this section, a proposal for a flipped delivery model is provided and discussed. The model is shown below in Figure 1. The proposed model is based on the concept of flipped learning model.

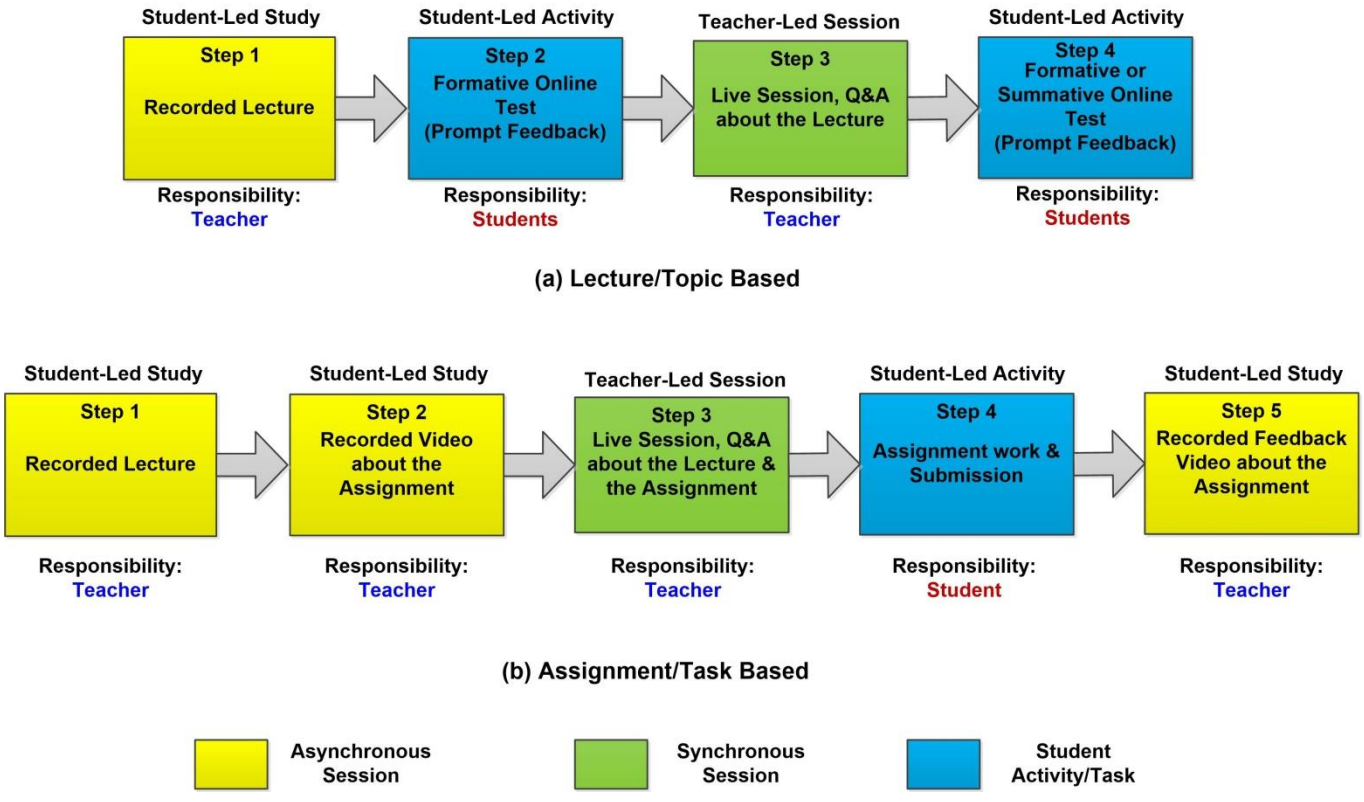

Figure 1. Proposed Flipped Teaching Model

Figure 1 (a) shows the proposed model that is based on a lecture or topic, while Figure 1 (b) shows the proposed model that is based on an assignment or task.

The lecture or topic based model (Figure 1 (a)) is a 4-step model that is designed around the lecture or the

topic taught. The model is described as follows:

a) Step 1: The teacher prepares a recorded lecture about the topic to be taught. The length of the lecture should not be long (about 20 to 30 minutes maximum). The students must watch the video of the lecture before going to Step 2.
b) Step 2: The student should carry out a formative online test to assess their understanding after watching the lecture. The test provides a prompt feedback about student understanding, and at this stage, the students will know if they have any weakness in understanding the lecture or the topic, and they will generate relevant questions about the material.
c) Step 3: The teacher carries out live Q&A session to answer students' questions and enquires. This session is timetables so that the students prepare their questions. After this session, it is hoped that most of the students understand clearly the topic discussed before.
d) Step 4: The student should carry out another online test that could be formative or summative. The test provides a prompt feedback about student understanding. The students at this stage will know if they still have any weakness in understanding. They can approach the teacher during the virtual office hours about their questions.

The assignment or task based model (Figure 1 (b)) is a 5-step model that is designed around an assignment or task to be assigned to the students. The model is described as follows:

a) Step 1: The teacher prepares a recorded lecture about the topic to be taught. The length of this lecture should not be long (about 20 to 30 minutes maximum). The students must watch the video of the lecture before going to Step 2.
b) Step 2: The teacher prepares another recorded session about the assignment/task to be assigned to the students. The length of this session should not be long (about 20 minutes maximum). The students must watch the video of this session before going to Step 3.
c) Step 3: The teacher carries out live Q&A session to answer students' questions and enquires about the lecture and the assignment/task.
d) Step 4: The student should carry out the task or assignment and submit it before its deadline.
e) Step 5: The teacher must mark the task, and after finish all marking, he/she must prepare a feedback video, which provides generic feedback about students' attempts to improve the work in future assignments and tasks.

The model above assumes that there will be no face-to-face interaction between the teacher and the students. If, however, there is a possibility for face-to-face sessions, then the synchronous sessions (green boxes) in the above model will be carried out as face-to-face rather than online (live) sessions, provided that social distancing measures are taken into considerations.

The proposed model will be applied in the academic year 2020/21, and student feedback will be collected afterward, and the results will be published in a future paper.

7. Recommendations

This section offers recommendations for educators to move forward.

7.1 Plan the delivery and always prepare

Teachers can't just turn up and teach under the current circumstances. Even well-seasoned teachers and educators found the lockdown situation very challenging when it comes to gauge their delivery and engage their students. This necessitates the need for proper planning and preparation before delivering lectures to students. The starting point is obviously the VLE page, then thinking how to make the delivery interactive by using the right tools and methods. Contents should always be made available before any live sessions, and they should be clear and easily formatted. Also, teachers must avoid surprises in online or virtual education (this should be avoided with classical delivery as well), so don't leave announcements and decisions till the last minute.

7.2 Familiarize yourself with the available tools

Teachers must be very familiar with the tools they use with online education, and must avoid trial-and-error and guessing when using these tools. Also, they need to know the extent of the tools and their capabilities and to utilize every possible feature without complicating things for the students. Teachers must choose the right device and platform that they are confident with and use tools and software that is easily available to the students as well.

7.3 Promote student discussions and participation

Student will eventually lose interest and soon suffer from lack of enthusiasm and engagement in online or virtual teaching. Teachers must find ways to bring student back on board by promoting discussion and participation. Students could be asked to prepare short presentation (recorded or live) weekly to their peers as a way to engage everyone. For live sessions, students could be asked to join earlier than the designated session time to create a social (virtual) activity such as a quiz about music, movies or general knowledge.

7.4 Maintain regular meeting times or virtual office hours

It is always a good idea to maintain regular times for live sessions and virtual office hours rather than ad hoc or random. This will help the students (and the teachers) to prepare and plan for these sessions beforehand. Automatic reminders, notifications and agenda invitations could be used to remind the students about these sessions so they don't forget to join.

7.5 Offer incentives

It is very useful to provide tasks (formative or summative) to the students and setting corresponding deadlines rather than leaving things loose. Students should also be offered incentives (bonus marks or others) if they finish tasks earlier or with high quality. Students could be named "Student of the week" or could be asked to deliver a presentation about a topic of their choice for their peers as an incentive.

7.6 Provide material in different formats

Teaching material must be provided in different formats for the students. Some students prefer to read textual information; others prefer videos and/or multimedia to learn new topics. This should be respected and facilitated for the students.

7.7 Offer inclusive learning

When designing a course, it must tick all the boxes for inclusivity. This is important for all the students in general and for students with special needs in particular.

7.8 Ask for students and colleagues continuously

Teachers must always seek feedback from the students they teach to improve delivery and teaching experience. Students must be able to communicate their feedback after each session or lecture and about their overall experience in a course. The actions taken after collecting feedback must be circulated to the students as "you said…I did" tables, so they know that their feedback is taken seriously. Feedback from colleagues must also be collected as well and best practices must be shared amongst academics.

8. Conclusions

In this paper, examples of teaching methods based on the use of technology that are employed during the lockdown period were provided. Moreover, a number of subsequent challenges due to current situation are discussed, and recommendations for implementation and best practice are shared. Also a proposal for a flipped delivery model to move forward is provided and discussed. Anecdotal student feedback has shown that the used methods and techniques were really helpful and have boosted student learning in this difficult time.

Huge experience was gained and tremendous distance learning tools were tested and developed during the pandemic period, and these must be utilized in the upcoming years. Institutes shouldn't just restart and resume normal business after this ends but to rethink delivery and teaching methods. Moreover, flipped and inclusive learning will be the buzz words in the near future.

The shock of COVID-19 pandemic on education has never been experienced before. Vulnerable students and teachers are the most disadvantaged and affected parties, so both must be supported during these difficult times.

The proposed flipped learning delivery model in this paper will be applied in the next academic year (2020/21), and student feedback will be collected afterward, and the results will be published in a future paper. Next academic year will still be challenging but it'll dictate how the upcoming years will go on.

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