

MIXED-MODE TEACHING: EMERGING FROM COVID-19 TO FUTURE PRACTICE

Timothy Boye*

University of Technology Sydney

Sydney, Australia

ORCID 0000-0001-8880-6073

Tania Machet

University of Technology Sydney

Sydney, Australia

ORCID 0000-0003-1963-898X

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ABSTRACT

The COVID-19 disruption abruptly and significantly changed the way engineering and IT subjects were delivered. For our subjects, this meant a one-week turnaround from face-to-face teaching supported by an online learning management system (LMS), to a fully remote teaching model making use of the LMS and several collaboration platforms. Remote learning had to accommodate a common, quality learning experience for students in different locations, time zones and with different access to materials and technology in addition to the usual large class management tasks. The learning from this transition was invaluable in terms of effective, alternative ways to achieve our learning outcomes. We have now moved into a new phase where our students are eager and encouraged to be back on-campus, however, border closures and other concerns mean that there are students who cannot be physically on-campus. This gives us the option (and in some cases imperative) to deliver classes in mixed-mode. The challenge then is that those students who attend on-campus get the benefits of face-to-face teaching while still delivering an equally valuable experience to those not physically present. This paper reports on the experience of transitioning to mixed-mode delivery for professional practice subjects at an Australian university with a particular focus on a career management course for IT students. We believe that learning from this experience will be useful in the transition out of the COVID-19 disruption and can enhance future student experience by providing sustained flexibility and improved inclusivity and accessibility.

*Corresponding author

1 INTRODUCTION

The COVID-19 disruption to teaching and learning resulted in a significant and sudden change to the way subjects were delivered to students. In Australia, the disruption occurred near the beginning of the academic year and resulted in a large number of students being unable to enter the country and others unable to travel to attend campus. The result was a move to remote teaching in a short time frame for the first teaching session of 2020. For subsequent teaching sessions over 2020, learning activities were improved and refined in line with the experience, feedback and outcomes for teaching staff and students.

Australian universities now find themselves in the position that students based within the country are free to attend on-campus classes with only a few intermittent restrictions, while a significant number of students are still unable to return to the country. There is a strong desire from universities, students, government and other stakeholders for on-campus activities to return. This presents a challenge of how best to provide equitable, quality educational experiences to both students who are able to return to campus, and those who in the short-term cannot.

This paper reports on the experiences of transitioning from remote teaching in 2020 to a current mixed-mode of teaching for professional practice subjects in engineering and IT. The paper focuses on a case study for IT students completing a subject that prepares them for internships and draws on the experience of other subjects which are currently facing the challenges of mixed-mode delivery. The learning from these experiences can inform future teaching practice as we transition out of COVID-19 and has implications for how we may support inclusive, accessible and flexible teaching and learning past this disruption.

2 BACKGROUND

The University of Technology Sydney (UTS) has a "Model of Learning" that guides curriculum design and provides a framework for practice-oriented learning. As one of its three key points, the model focuses on integrated exposure to professional practice which includes experiences such as internships and work-integrated learning [1]. In this context, engineering and IT have a stream of core subjects focussed on professional practice and support for student internships. UTS guides teaching staff to support this learning by making use of evidence-based best practice for teaching and learning, active and personal learning and authentic assessments [2].

In March 2020, one week into the semester, when the country locked down and university campuses were closed due to COVID-19, the university paused teaching for a week to rapidly redevelop all subjects for remote delivery. In line with the university model of teaching and learning the university mandated an interactive model of learning be implemented. That is, students should be given the opportunity to interact with others, opportunities to work in teams and build knowledge together. Classes remained synchronous and were largely conducted with the use of Microsoft Teams (Teams) or Zoom. The aim was to have no decrease in synchronous teaching time.

The research suggests that remote and on-campus teaching can lead to similar levels of academic performance but that students and teacher preferences vary for the type of activity that is best conducted remote or on-campus [3]. In addition, students with different learning styles will respond differently to various modes of teaching [4]. It has been acknowledged that the success of remote teaching is dependent on "pedagogy not technology" [4]. Experience in blended learning, flipped classes, and other modes of teaching and learning that mix synchronous, asynchronous, on-campus and remote teaching highlight the importance of teaching design and the integration of the technology rather than placing a focus on the

teaching modality [3, 5, 6].

Courses in the professional practice and core streams at UTS faced challenges moving to remote teaching. They are typically large cohorts (up to 1000 students per semester), involve group projects or are focused on work placements, all of which required significant redesign with the COVID-19 disruption. A year of teaching in this mode resulted in a better understanding of how to facilitate remote, synchronous teaching including leveraging the use of collaborative tools such as Office365, Teams and Mural [7].

In late 2020, with COVID-19 locally under control, the university made the decision to start returning some classes to campus while still supporting students unable to attend campus such as offshore or vulnerable students. All subjects are required to support remote teaching while offering on-campus classes where safe and possible in line with the university's model of teaching and learning.

Some subject designers chose to have tutorial sessions that are run remotely but which include both students who are able to attend on-campus and those who cannot. In some of these sessions, locally-based students have chosen to log in from campus, physically meeting up with their project groups so that they can work in person. The result is that the teaching is done remotely and some of the students are remote and individually signed in, while others are physically together and signed in from a single device sharing the login. Our experience has been that the on-campus students enjoy this face-to-face collaboration with their teammates, however, it has an effect on the remote interactions. Activities have been designed for remote teaching where every student is individually present online and can contribute to discussions and collaborative tasks. With one representative out of four signed in for some groups who met on campus, interaction and collaboration is limited. In addition, these groups often meet in shared spaces on-campus so their communication is inhibited by the surrounding activity.

Other subjects have elected to conduct separate classes for on-campus and remote classes in this transition phase. However, this requires additional resources including developing separate activities and assessments that work best in each medium, additional staff and costs to run multiple classes, etc.

Transitioning from remote teaching to now supporting both remote and on-campus teaching, the designers of the subject Career Management for IT Professionals sought to trial mixed-mode delivery, where both on-campus and remote students are brought together at the same time and taught together in their preferred mode. The decision was made with the mind to minimise resource use while maintaining sound pedagogy.

The definitions of what makes a teaching mode “blended” is not definitive in the literature, however, they have in common that all students in the cohort receive similar instruction with components of on-campus and remote activities [8]. New conditions mean that teachers and learners are facing a scenario where the same cohort of learners may be synchronously exposed to different modes - what we will refer to as mixed-mode in this paper. Through exploring our experiences with mixed-mode delivery in one of our subjects, we hope to investigate ways in which we can bring the benefits of mixed-mode delivery to our larger subjects during this transition phase and beyond.

3 CASE STUDY

3.1 About Career Management for IT Professionals

Career Management for IT Professionals (CMITP) is a core subject for students enrolled in our combined Bachelor of Science in Information Technology and Diploma in Information Technology Professional Practice program. The program requires students to undertake subjects on

career and placement preparation, a 9-month industry placement supported by work-integrated learning coursework, and a placement reflection subject in addition to their IT degree. CMITP has a cohort of between 40-125 students per semester and runs three times per year. The aims of the subject are to support students in developing their job-seeking skills (such as job searching and interview skills), developing job-seeking artifacts (such as cover letters and resumes), as well as developing their understanding of the IT industry and the realities of work including discussion on topics such as professional communication, company culture in Australia, wellbeing in the workplace, and time and task management.

Prior to the COVID-19 disruption, CMITP was taught wholly on-campus with the entire cohort in one large collaborative space. Classes were a mix of lecture and tutorial content where students would be introduced to material and concepts and would then, alone or in groups, work on activities such as skills stocktakes or peer review of others' resumes. As with all our subjects in 2020, CMITP transitioned to fully remote teaching for the first two sessions. Teams and collaborative documentation software such as Office365 and Mural were used to maintain a connection with students and continue delivering classes synchronously.

3.2 Transition out of COVID-19 Disruption

For the final session of 2020, it was apparent that classes could return to campus. In Week 1 of the session a poll of the 125 enrolled students was taken to gauge interest in returning to campus or staying remote. Approximately 25% of students wished to return. We wanted both on-campus and remote students to get the same value from their learning experience and there was no additional budget available to offer both remote and on-campus classes separately for this subject.

Drawing on the experience of teaching remotely for two semesters as well as the experience of colleagues who have taught in mixed-mode delivery prior to COVID-19, we looked into the practicality and suitability of mixed-mode delivery. All students - whether remote or not - were in the same timetabled class, taught by the same lecturer and connected through technology. This teaching method would allow us to bring remote and on-campus students together providing a more unified experience of the subject, and would ideally not cost anything additional to implement with a cohort this size. Some of the disadvantages of remote learning in the literature are that a lack of communication with peers and teachers, limited social contact or peer-to-peer interaction and lack of timely feedback may affect the development of oral communication and teamwork skills [8, 9]. It was important for us to consider these aspects in the subject design for mixed-mode and ensure we facilitate feedback, communication and interaction with remote and on-campus students to achieve the communication and teamwork learning outcomes for our professional practice subject.

3.3 Mixed-mode communication

The learning from fully remote teaching informed our use of Teams as a platform for students to use for collaboration. This gave all students, regardless of the mode of delivery, access to each other and to the same tools and information. In the classroom, a Teams meeting was used to bring the remote students in. The lecturer made use of an external webcam and a lapel microphone to provide audio and video from the classroom to the remote students. The content slides were shared in the Teams meeting which was projected in the classroom. This setup meant everyone could hear and see the same content at the same time.

Remote students were able to ask questions in a chat or speak into their microphones which would be output to the classroom speakers. On-campus students in the room could ask questions as they normally would in a physical space and could also use the Teams chat. Similarly, on-campus students could talk to each other face-to-face or use Teams to communicate with

those not physically present.

3.4 Mixed-mode activity design

Rather than simply having on-campus students do “remote work”, the activities for CMITP were redesigned to bring back the benefits of pre-Covid-19 face-to-face teaching for on-campus students while facilitating the learning of remote students based on our learning during 2020 remote teaching.

During remote teaching, we experimented with Microsoft PowerPoint stored in Teams as a whole class collaboration tool. Other tools such as Mural (a cloud-based tool for collaboration) have been used effectively and were included in the mixed-mode design. As all our students have devices (laptops, tablets, smartphones etc), those students on-campus were able to access the same digital platforms during class as their remote counterparts could. This was particularly useful for whole-of-class activities.

Whole-of-class activities are used in CMITP in order to develop an understanding of what the class as a cohort thinks and knows about a given topic before we discuss it further. In addition, students get to be inspired and learn from the input of others. Examples of these are activities where students are given time to reflect on their own and add notes to a Mural board before discussing it as a class.

Where smaller group or paired activities took place, on-campus students would be grouped together and remote students grouped together. This allowed on-campus students to make the most of being physically present, able to use materials such as paper and sticky notes and able to discuss work without the limitations of virtual calls (such as poor audio quality). Remote students also benefited from being grouped only with other remote students as it removed some of the problems found in other classes such as background noise of other teams and audio feedback from multiple microphones and speakers. We made use of Teams functionality of breakout rooms to accommodate smaller group activities for remote students.

4 DISCUSSION

4.1 Whole-of-class activities

PowerPoint slides shared through Teams had been very effective in remote classes of 30-40 students, particularly where groups are working together rather than each student needing their own slide. This however proved ineffective for the CMITP cohort of 100 students. The students found it confusing which slide was theirs and there were numerous occurrences of editing the wrong slides, additionally, for those students with slower computers or internet speeds the file struggled to be responsive and they could not see their changes or others' in real-time.

Mural proved to be a far superior tool for this purpose. Mural was able to handle this number of students without issue. In the mixed-mode classroom, it was useful for bringing the two cohorts together in a meaningful and engaging way. As all students had access to the Mural page, all were able to add their thoughts to it with no indication as to whether they were on-campus or remote. As changes happened all students could see them on their own device and the Mural board was streamed in the Teams call and on the in-room projector so we could discuss the results as a class.

4.2 Communication and Cognitive Load

During class all students had access to text chat functionality, this turned out to be popular with remote students who tended to prefer it to speaking on the microphone. In addition, on-campus students also made use of the chat, primarily to talk with other students while the

teacher was talking. While some questions came through from on-campus students this way as well, most were verbalised.

There were differences in the management of questions and comments in the mixed-mode class that differed noticeably from both on-campus and fully remote modes of teaching. While not measured, the number of questions in the mixed-mode cohort of students appeared to the teacher to have increased compared with previous on-campus or remote-only cohorts, and more detailed comments were also made by students in the chat than previously. Students would often discuss what was happening with each other in the chat which was encouraging to note given the importance of peer-to-peer communication and collaboration.

Of significance was that, as the students now had multiple avenues to ask questions and make comments, the teacher was required to monitor these. Keeping apprised of what was happening both in the room and in the chat was an additional cognitive load and was at times disruptive as the teaching was paused to check if what is being discussed in the chat contained a question for the teacher.

There were occasions where guest lecturers were teaching in CMITP. In these cases the primary teacher was able to monitor the chat, calling out questions at appropriate times. This lowered cognitive load for both teachers and suggests that additional resources in order to monitor the different communication channels would be needed in future for a cohort of this size or larger. An alternative method is a “student champion” elected from the cohort to monitor the chat and raise any questions, but this has not been trialled in CMITP as of yet.

Finally of note is the disconnect between the method of questioning and method of teaching. That is, where students on-campus would talk, remote students could not hear them, and similarly, where students wrote questions in the chat not all on-campus students were watching the chat. In addition, when there was a lot of activity, some students were unclear about which question was being addressed. It became imperative that teaching staff repeat questions into the microphone no matter the mode the question was delivered in, to ensure all students heard the question and knew the context of what was being said. This is acknowledged good practice in face-to-face teaching of classes in large spaces or when recording classes, but usually not an issue in fully remote teaching. It is an important consideration for mixed-mode delivery so that all students benefit from the questions and answers.

4.3 Technological Issues

During class, Teams was projected to on-campus students as this meant we could share the slideshow in the meeting and all students would see the same content synchronously. Unfortunately during class midway through semester it was discovered Teams had pushed out a non-optional update which changed the presenter view to not show the slide show full screen. The slides were smaller and it was ineffective to project them in the classroom. Microsoft has since added options to use either view, but the experience illustrated how even with considered design and experience with technology, mixed-mode delivery is subject to disruptions out of the control of students and teachers.

Another technological issue that was a consequence of all students being included in the Teams meeting, was microphone feedback. During class, particularly early on when students were unfamiliar with consequences, it was not uncommon for an on-campus student to log into the meeting so they can see the chat without considering the ramifications of having their sound or microphone on. If either of these are on it causes high pitched disruptive feedback in the meeting. While students are now familiar with “muting” themselves, turning the sounds off on their devices is less intuitive and a “new problem”. A solution is to setup a meeting where the chat can be seen without joining the meeting itself (which Teams allows) as well

as providing housekeeping guidance to on-campus students around either not logging into the meeting or turning sound and microphones off.

Similarly to the microphone issue, if on-campus students log into the remote meeting the efficient use of breakout rooms is affected. Using randomised breakout rooms meant that all students logged in were placed into rooms, including any on-campus students who had logged in. Where students were required to work together there were three options: instruct on-campus students not to log into the meeting; instruct on-campus students not to join the breakout room (leaving the breakout room one person short); or manually fix the breakouts. Our preference was the option of not having on-campus students in the meeting itself as they could still access the chat and it also prevents other issues such as the audio feedback.

These technological issues all required the teacher to have flexibility and a suitable level of IT skills to manage the class. This is in line with many teaching experiences during the COVID-19 disruption and the dependence on the IT skills of educators and the importance of technology is acknowledged in the literature [8, 10, 11]. For teaching staff with developing IT skills, an additional staff member with IT skills and experience in mixed-mode delivery would be useful early on to support the transition to mixed-mode.

4.4 Remote vs In-class participation

One consequence of the transition out of the COVID-19 disruption is that any student was allowed to attend the remote meetings (regardless of whether they could attend campus or not) and as a result, not all students who could be physically present chose to attend on-campus or they chose not to do so every week. Students taking up this option illustrated the value they placed on flexibility. It may be that these students saw the remote and on-campus teaching as equally valuable, or that the remote mode suited their learning style better, and while this would be encouraging, it requires more research to understand student choices, which may not be made on the basis of improving their own learning outcomes.

5 CONCLUSION

Our experience in implementing mixed-mode delivery for a professional practice subject has demonstrated that this is a feasible solution that has the ability to support paired or small group activities, whole-class activities, class discussions and student communication with peers and teachers all of which are important for achieving the learning outcomes in professional practice subjects. In line with the research on blended teaching and learning, the successful implementation of mixed-mode delivery depends on intentional activity design in order to promote the best learning experiences regardless of the students' mode of accessing the subject and that this requires sound pedagogy as well as technical skills and institutional support to implement. Although there are requirements for additional support in order to effectively manage multiple communication streams, we found that the size of cohort has implications for the implementation of mixed-mode delivery rather than being an inhibiting factor. This paper contributes to our understanding of the implications and feasibility of delivering subjects in mixed-mode as we transition out of the COVID-19 disruption, and informs which practices may be useful in future. The ability to effectively deliver our subjects in mixed-mode improves accessibility for students with disabilities, carer duties or other life commitments which allows for greater inclusivity and diversity in our engineering and IT students.

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