Using technology innovation and blended delivery for student-centred learning in large undergraduate classes

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Abstract

Delivery methods of Higher Education classes have been scrutinised globally during the COVID-19 pandemic as academics and students were forced to shift rapidly to online delivery modes. In a post-COVID-19 scenario innovative teaching and learning approaches are required to rethink how large student cohorts can be educated online and on campus in a meaningful way, thereby reenvisioning the traditional lecture and its wider class context. This paper reports on the approach taken by the authors who restructured and redesigned an existing second-year undergraduate subject in an Australian architecture faculty. They collaborated with specialist learning designers to develop a blended mode of large-class delivery that simultaneously addresses their students' desire to engage with subject content flexibly and asynchronously, whilst benefitting from in-person interaction in the classroom. The new subject was subsequently delivered for the first time at the point of writing this paper.

Keywords: *Blended teaching; innovation; pedagogy; polling; student-centred; post COVID-19.*

1. Introduction

The delivery of classes in tertiary education has long been ripe for a major overhaul. Since the start of the millennium, education designers have been proposing new modes of teaching that take into consideration the needs of current students while making better use of new communication methods facilitated via high-end technology. Universities around the world investigated novel subject-delivery methods and implemented online classes, yet most of their efforts can best be described as half-hearted and cautious, given the existing proliferation of face-to-face learning as the predominant model of student engagement.

The cautious attitude towards online teaching changed dramatically with the sudden arrival of the COVID-19 pandemic in early 2020. The transformative character this presented to the tertiary education sector globally is well documented elsewhere (Ewing, 2021; Neuwirth et al., 2021; Singh et al., 2021 & 2022); it has had a major impact on the acceptance and quality of online, hybrid, and blended teaching approaches. As universities around the world are entering the post-pandemic era, many lessons learned emerge that point towards the need to reflect on what worked, what didn't, and what needs to be approached differently. Tertiary Education institutions are having a watershed moment when weighting off between the benefits of an on-campus experience and the flexibility inherent to flipping their classrooms.

As society changed irreversibly due to COVID-19, what is the best model for delivering content in higher education? Have University campuses lost ground as places for encounter, knowledge creation and dissemination? How does one counter isolation of students, instead focusing on the campus experience? Are there still benefits for students to attend classes in person? The research presented in this paper considers many of the above questions, as part of the author's redevelopment a large-cohort second-year undergraduate subject that interlocks as design-enabling subject with design studios taught in an architecture faculty.

2. Methodology

In the absence of existing frameworks that guide large-class subject development in higher education within the Post-COVID 19 context, the authors conducted an in-depth literature review to assess innovative learning approaches pre, during, and post COVID 19. The literature review focused on structural issues associated with designing a learner-centred subject design, as well as analysing the role of technology in facilitating blended learning modes and cognitive flexibility among students.

In order to complement the learnings from others with the lived experience and challenges faced in their home institution, the authors carried out an in-house review of the subject they took over, thereby consulting with former tutors and students on what worked well, and what needed to change. This review focused on leaving the assessment aspect of the subject

unchanged, yet focused on the opportunities of delivering the class as via a flipped-classroom model The subject counts as a 'design-enabling' subject, meaning that its purpose is to teach students skills that can be applied on other subjects, notably by intersecting with their design studio activities. For that reason, the authors conducted a series of workshops with relevant studio coordinators (among others) to fine-tune the curriculum towards their specific needs.

Due to the focused effort required to reinvent the content of the subject in a short matter of time, the authors sought and gained research funding from their home institution. It allowed them to run a series of workshops with learning-design experts, who advised on optimal pathways to introduce blended and other learning techniques, and to employ research assistants to work on the curriculum over a 3-month period. As proven elsewhere to support architectural education (Brandao et. al, 2021), the authors used the tool 'Miro' for interactive whiteboarding, brainstorming, and diagramming to advance the development of the subject.

3. Background

Researchers seem to agree that the disruptiveness of COVID-19 on the way universities deliver their teaching content is simultaneously an opportunity for a major rethink of how classes get taught in higher education. At the outset of the pandemic, Pellegrini, Uskov, and Casalino (2020, p.222) called for a radical transformation of learning approaches to make room for new skills, cultures and reference models. They predicted that young people would be unwilling to go back to their usual way of working, once they experienced the advantages of studying at home; they warned that invaluable insights offered by onsite lessons would get lost without asynchronous and carefully prepared support (p.240). The validity of the traditional lecture as the predominant instrument of knowledge transfer for large classes had previously been challenged by Garrison and Kanuka (2004), who questioned the willingness of students to commute to campus to receive a one-directional presentation that does not require them to engage with the subject content in a stimulating and challenging way. In the context of knowledge transfer, a distinction between learning from lecture material as a way for gaining knowledge, and interaction with subject matter experts who actively challenge students' thinking needs to be made. Whereas the former assists learners in building up explicit knowledge, the latter emphasizes on implicit understanding applied by learners in changing contexts. Halpern and Hakel (2003) refer to the sharing of implicit knowledge as an essential tasks of higher education to allow students to implement solutions independently.

The validity of retaining the in-person lecture format in post COVID-19 times remains in question. Ewing (2021, p.42) discusses concerns voiced by Asia-Pacific education leaders ho propose moving away from the lecture/tutorial format all together. Yet she sees prerecording a lecture and putting the video online not seen as a solution either: *We will have to do much better than simply providing an online recording… academics will need to spend*

time developing more engaging online programs with the assistance of learning designers. Singh et all. (2022) add that: *The reason for being on-campus and face-to-face should outweigh the perceived convenience of participating remotely* (p.310). Questions surrounding the future of the lecture and other on-campus learning hence point towards the level of bi (or multi) directional interaction and stimulation students experience during the lecture. Singh et al. (2021) add: *Students must feel compelled to participate in-person because the learning is incredibly dynamic, interactive, or uses equipment or immersive experiences that cannot be accessed remotely* (ibid).

Based on existing literature, learning designers will find it hard to identify a clear pathway forward in their configuration of student-centred learning approaches that best fit their subject. On one hand, research seems to suggest that knowledge-retention rates are higher when individually placed learners draw on online resources (Li & Lalani, 2020). Yet other research points towards the benefits of an on-campus experience that fosters students' sense of belonging (Neuwirth et. al, 2021, Singh et. al. 2021), that provides opportunities for peer-to-peer instruction (Carmichael & MacEachen, 2017), better interaction between faculty and students (Alshahrani & Ally, 2016), and the establishment of 'cognitive presence' where meaning is constructed through sustained discourse (Garrison et al., 1999).

4. Case Study: Large-cohort design-enabling subject (LCDES)

The impetus for the authors' research emerged from recent staff changes within their home institution that required a redesign and reconfiguration of a second-year large-cohort subject that plays a strategic role within their faculty bachelor's degree. The subject is embedded within a suite of correlated subjects, and its function is to teach foundational skills that feed into a range of other subjects and design studios within the degree. Enrolment numbers for this subject range between 300 and 350 students per semester, and changes to the curriculum required a complete redesign of the subject contents.

The redesign was required for two main reasons. Firstly, a perceived mismatch between the learning outcomes of the subject, which focuses on training students to better perform in a design studio setting, and the needs of correlated subjects. Secondly, based on the desire of the authors to re-evaluate the lecture and tutorial format (and associated learning material) that had been developed during the COVID-19 pandemic, where the subjects was delivered online only. Coordinators of the correlated design studios highlighted the need for change, as the LCDES did not fulfill its design-enabling function, instead running as a design studio that competed with their class. This sentiment was shared by students who lamented the extensive workload associated to overlapping submission deadlines between these subjects.

In recognition of lessons learned during COVID-19 (and beyond) the authors aimed to develop a new delivery mode for the LSDES to address the above issues. They were awarded

internal funding from within their home institution to allow for a consolidated 3-month period for the subject redesign. Supported by a group of teaching-design specialists within their home institution and drawing on available literature, the authors conceived a guidance strategy to address several aspects of the subject redevelopment:

- A flexible, learner-centred teaching setup using a semi-flipped classroom.
- A combination of weekly asynchronous and synchronous student activities.
- A dynamic delivery mode that combines individual and asynchronous pre-class learning material (covering knowledge accumulation: what is…?), large-class interactive lectures (explaining the purpose of this learning activity: why are you studying…?), and small-group tutorial classes (coaching and directing students at applying knowledge for the development of assignments: how do I …?).
- A fundamental rethink of the traditional lecture format into a highly interactive and engaging event that includes in-class polls, group discussions, and co-teaching.
- Targeted use of information and communication technology (Learning Management System/videos/in-class polling/etc.) to support the above learning activities.
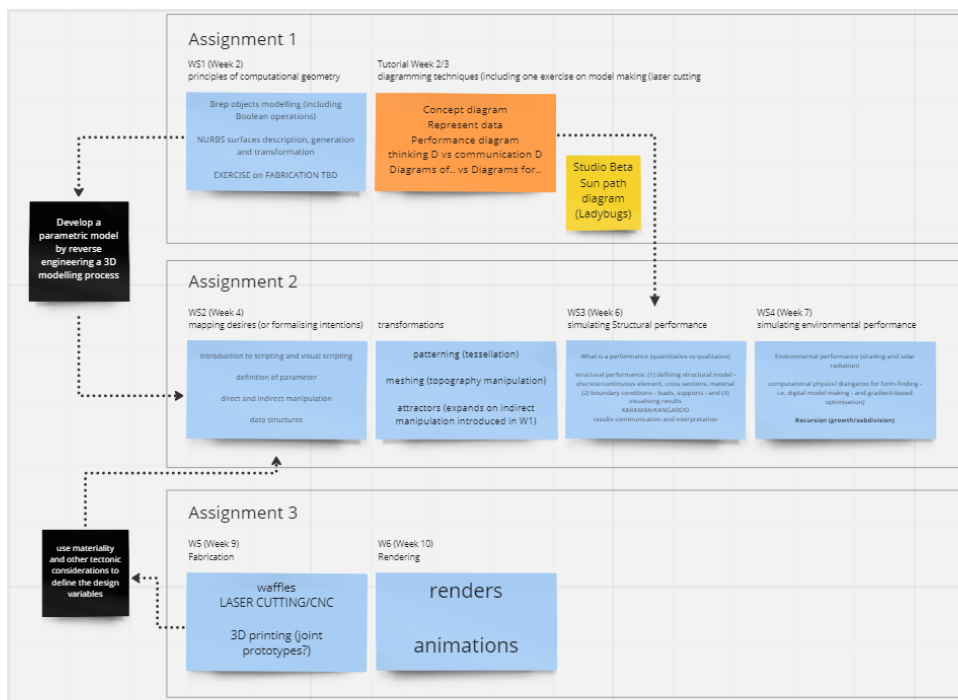

Figure 1: Diagram illustrating the interaction between lecture, tutorial and workshop activities.

The starting point for advancing the strategy in greater detail was developing new learning outcomes and associated, assessment tasks. Four learning outcomes were defined, with three key tasks aligned to them (see Figure 1).

Figure 2: Miro board developed to structure lecture, tutorial and workshop activities, in association with assignment guidelines and deliverables.

The authors subsequently mapped out all inherent learning requirements for the twelve-week teaching period (see Figure 2). These were divided into *what* students need to learn, *why* it is relevant to learn such material, and *how* they can achieved certain tasks via dedicated processes and techniques. These three focui break down as follows: *What* is captured as a set of four weekly ten-minute presentations that are pre-recorded. The associated videos are placed on the LMS and students are asked to engage with the material before each class as the semester progresses. Each video contains a question/provocation that serves as starting point for further conversation during the weekly Monday morning lecture. There, the subject matter experts curate a highly dynamic discussion to contextualise the *why* behind the learning material. The lecturer facilitates discourse, invites opinions from students in the room and responds to ad-hoc feedback from the large cohort. In order to make this work, real-time polling (via Poll Everywhere) is used to gather input from the students and foster deep understanding among learners (Stover et al., 2015). Benefits of on-campus interaction are tapped into by grouping students in pairs and asking them to discuss their views before responding to the real-time poll. The weekly Monday lecture is followed by a two-hour tutorial class later that day and a second tutorial class on Thursday. Drawing on the pre-lecture content and the in-lecture experience (and associated polling output), tutors work with groups of up to sixteen students to explain in greater detail *how* they can engage with the processes and techniques in preparation for their assignment. Groups of four students are formed and the tutor will engage with one group at any point in time whilst other groups discuss their progress with their peers.

5. Discussion

Preliminary observations from the setup of the LCDES highlight that the bespoke nature of the subject to be developed required a unique response to design a matching pedagogy that includes different modes of content delivery. Neither the pre-2020 face-to-face delivery, nor the online delivery approach taken during COVID-19 offered a feasible pathway in setting up the learning environment for students. The decisive 'back to campus' move by the author's home institution required an immediate response to develop the differentiated and student-centred learning blended teaching approach.

The authors were fortunate to receive support and in-house funding by the University of Melbourne *FlexAP Academic support team* to redesign the subject from scratch between the 3-month semester break. Mapping out all individual learning outcomes and associated subject content and subdividing it into designated sets of information communicated via different media, represents a highly labour-intensive effort. The authors redeveloped all three assignments from scratch, which translated in detailed mapping of before class and in-class activities by educators and students. When configuring those, a previous student (who had since become a tutor in the subject) proved to be pivotal as a sounding board to weave-in a student's perspective, thereby fostering the student-centric teaching approach desired by the authors. The redesign for the LCDES had additional consequences outside the pedagogy and modes of delivery: Class tutors needed to be given an opportunity to become familiar with the (discussion and polling) outcomes emerging from the lecture to prepare for their tutorials later that week. At the start of semester tutors needed to get introduced to the logic behind the blended learning strategy and learn how to adjust their pedagogy accordingly.

Due to the complexity of class setup, a focus on timetabling tutorials and associated classroom spaces proved to be essential. Learning designers needed to consider the often predefined and restricted staff and room availability and work within those constraints.

6. Conclusions

This paper proposes a way to develop an interface and interlock (pre-)lecture, tutorial, and workshop activities in a large-cohort undergraduate architecture subject by means of blended delivery modes and technology tested and used before and during COVID-19. The subject restructuring specifically addresses the risk of a lack of student engagement with traditional lectures, in particular if there is a disconnect with assignment preparation and activities during tutorials and workshops The availability of technology, including applications that strengthen learning both online, as well as in-class plays an essential part in designing the best possible environment in higher education classes.

Moving forward, the authors aim to include future feedback from students to support the developed interactive lecture format (with pre-recorded material and in-class polling) to gauge the feasibility of transforming traditional lectures within undergraduate subjects. Learner-centric blended delivery of classes and supporting material seems to be a useful approach to develop a more dynamic and engaging academic environment for students.

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