A comparative analysis of student learning experience in face-to-face vs. fully-online

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ABSTRACT

CONTEXT

The last several years have witnessed both gradual and dramatic changes in the nature of learning and teaching delivery. In particular, online learning continues to gain momentum as it capitalises on evolving technology and provides the flexibility of place or distance. Whilst online and face to face learning share many fundamental aspects for both student and educator, there are significant differences which require carefully considered pedagogical design and approaches. For instance, with appropriate learning design, online learning provides new opportunity for learners to develop independence in their learning. Overcoming the challenges of designing and delivering learning activities for an online learning environment require planned and pedagogically sound intervention. The Melbourne Polytechnic Blended Learning Model (MPBLM) was developed to provide a quality learning experience for students across vocational and higher education programs where any form or degree of online learning delivery was included. The MPBLM sets standards for the curriculum design of a learner-centred approach to learning consistent with the Melbourne Polytechnic vision of developing the capabilities of students for industry readiness and to thrive in a rapidly changing world.

PURPOSE OR GOAL

Educational institutions need to understand the impact of changes to education delivery, especially where this has occurred at short notice due to exceptional circumstances. Student learning achievement review ensures whether quality outcomes are maintained. If student learning has been compromised, remediation may be necessary to ensure students' longer term educational goals. If student learning has been enhanced, identified practice improvements can be used to strengthen educational delivery going forward. The objective of the study is to establish, using already available quality indicators, whether the shift from essentially face-to-face delivery to fully online, at extremely short notice and in the context of a pandemic, impacts student learning achievement.

APPROACH OR METHODOLOGY/METHODS

Learning and teaching strategies and the resulting student learning achievement will be considered for two consecutive offerings of a third-year engineering unit which was first offered in essentially a fully face-to-face mode and later as fully online, necessitated by the recent lockdown in the following year. The two offerings of the same subject are contrasted according to their approach to and ability to meeting the MPBLM standards. The student learning achievement is also compared for each offering using a number of readily available standard indicators.

ACTUAL OR ANTICIPATED OUTCOMES

The results of the study show student learning achievement could be maintained in fully online learning delivery provided appropriate strategies were applied to facilitate the short notice pivoting from fully face to face delivery.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

Our study contrasted two delivery approaches to the same subject using the standards for quality learning design provided the MPBLM. Student learning achievement for the face to face delivery and the fully online delivery were found to be comparable. The study results show student learning achievement can be maintained through a fully online learning delivery provided that appropriate strategies are used. The study provides a method for comparing subject delivery which utilises existing quality data and is therefore useful for establishing learning quality when unexpected subject delivery changes are necessary. Further research is warranted due to the limitations of the study around relative impacts of specific elements of delivery approach, the nature of the sample size and single cross-sectional data.

KEYWORDS - Blended learning model, online learning, comparative study

Introduction

The last several years have witnessed gradual and dramatic changes in the nature of learning and teaching delivery. In particular, online learning continues to gain momentum as it capitalises on evolving technology and provides the flexibility of place or distance. Whilst online and face to face learning share many fundamental aspects for both student and educator, there are significant differences which require carefully considered pedagogical design and approaches. Online learning can provide new opportunity for learners to increase interactions, communication, motivation and participation (Gedik et al., 2012) and develop particular educational leadership skills such as time management, reflective thinking and independence in their learning (Namyssova et al, 2019). Online learning is not about simply adding digital technologies to the traditional face-to-face curriculum (Vaughan et al, 2017) rather an online learning environment needs to overcome the challenges of designing and delivering learning activities on the online platform with the use of planned and pedagogically sound intervention.

The world was unprepared for the Covid-19 pandemic. In the face of major disruption, all sectors scrambled to find work arounds which meant they could continue to function as close to normally as possible. Education was no less impacted, as hitherto normal on-campus learning opportunities were moved fully online at short notice to accommodate lockdown requirements. The enabling capacity to immediately pivot to fully online delivery was welcome, however for many it was unanticipated, and so changes to students' learning experiences could understandably lead to changes in learning achievement. This paper gives consideration to understanding changes to the student learning experience arising from the move to fully online learning delivery and seeks to identify and apply a process to determine if learning achievement has been impacted by this move. The approach utilises readily available learning achievement and quality indicators, providing a model for a straightforward 'health check' of student learning which can be easily applied.

The paper is structured as follows: the next section presents some comparison of face-to-face vs. online learning approaches and impacts. This provides a theoretical basis for the two delivery approaches utilised in this study. That is followed by a description of the paper's methodology which introduces the Melbourne Polytechnic Blended Learning Model (MPBLM) as the set of standards for delivery which both delivery approaches aim to achieve and which provides a framework for comparing these. The application of the MPBLM in a subject offered to engineering students in two different delivery approaches is then presented. The paper concludes with a summary and an outline of areas for future research.

Face-to-face vs. Online Learning

Face-to-face classroom learning provided the primary method of learning and teaching over several centuries. A face-to-face instructional method provides a number of benefits not found in online learning (Xu and Jaggers, 2016). Face-to-face classroom instruction can be extremely dynamic providing real time interaction and stimulating innovative and scaffolding questions which respond directly to learner need. On the other hand, online learning provides benefits such as program choice and time efficiency (Wladis et al., 2015); the freedom to communicate with instructors, address classmates and complete assessment tasks from any internet accessible point quality education without sacrificing work time, family time and travel expense (Richardson and Swan, 20013) and flexible study hours (Lundberg et al., 2008). Combining both face-to-face and online learning, the University of Waterloo (2015) and the University of Queensland (2021) report significant success in flipped and blended learning at a number of institutions.

Despite recent reports advocating online education, researchers still question its ability to provide desired learning outcomes. Research is still conducted on the effective use of the online learning platform. Financial viability, provision of pedagogically sound online learning, achieving a quality student learning experience and desired student academic performance and the gradual transformation of students from learners to professionals are now being carefully considered when determining whether online education is a sustainable and effective substitute for face-to-face learning. In this context, the current study aims to understand whether the pandemic mandated move to fully online learning delivery maintains learning outcome achievement.

Blended Learning Model

The Melbourne Polytechnic Blended Learning Model (MPBLM) was developed to reflect the breadth of ways for applying blended learning across vocational and higher education programs and to provide a quality learning experience for students. This blended learning model is intended to retain a learner-centred approach of learning and to support the Melbourne Polytechnic vision of developing the capabilities of students for industry readiness and to thrive in a rapidly changing world.

The MP definition of blended learning is: *"Blended Learning at Melbourne Polytechnic means that you will be connected to your learning and assessment through a combination of in-person and technologically enabled experiences. Your study will be supported by teachers and resources available to you through scheduled classes and workshops held on campus and online. Blended Learning offers the best mix of the flexibility of online learning with the benefits of the personal experience of face to face learning.''*

The MP blended learning model is underpinned by a set of standards to support a quality learning experience for MP students. These standards outline a student-centred approach achieved by the provision of: (i) A safe online learning environment; (ii) Flexible access to learning materials that are current, aligned and engaging (fully developed, comprehensive, consistently presented to a high standard); (iii) Assessment tasks that are aligned and relevant; (iv) Regular and relevant communication from their teachers; (v) Opportunities to interact and collaborate with peers; (vi) Meaningful opportunities to have input into their learning (student voice); (vii) Learning experiences that (a) utilise a range of contemporary teaching and learning strategies, (b) include purposeful use of technology, (c) engage students to develop contemporary skills for life and work, (d) enable students to demonstrate higher order thinking skills; (viii) Opportunities to give and receive feedback (to & from teachers; to & from peers); (ix) Opportunities to use technologies to find, use and disseminate information; (x) Appropriate support in their learning journey, including support in the use of technology (Melbourne Polytechnic, 2020).

In practice, the MPBLM provides the flexibility of choosing appropriate synchronous (face-to-face or online real-time lecturer-led instruction) and asynchronous (self-paced) components for delivering a particular subject provided that the standard framework is maintained.

Methodological Approach

Learning and teaching strategies and the resulting student learning achievement were considered for two consecutive offerings of a fourth year engineering subject. The first of which was offered in essentially a face-to-face mode with some online components (pre-pandemic) with the second offered fully online, as necessitated by the pandemic related lockdown the following year.

The MPBLM standards are used as a framework to compare the delivery of the two offerings. The learning strategies used to address each standard are presented.

The student learning achievement was compared for each offering using a number of readily available standard indicators. Similar to other research, grade distribution and student experience questionnaire results are compared (Johnson, Aragon, Shaik, 2000), although unlike Johnson et al., no specifically designed data collection was undertaken. Grade distribution comparison indicates educational outcomes achievement. Student experience questionnaire results indicate the extent to which students believe they achieved learning that was relevant and appropriately delivered in this study, however, assessment submission rates are also compared to round out an overall indication of student learning achievement. This provides an indication of learning achievement in relation to student participation.

Differences in student learning achievement and delivery approaches are reviewed and compared to other studies in order to assess the validity of the approach. A selection of the comparative data is then discussed in relation to possible impact on student learning achievement.

Results

The results below describe two deliveries (face to face and online) of a third-year engineering technology subject against the MPBLM standards (Table1).

The subject covers issues related to traffic flow and transport planning. This subject aims to equip students with necessary knowledge and skills to survey traffic distribution and flow patterns and to develop related traffic engineering or transport planning solutions. The subject is usually delivered face to face without a laboratory component over13 weeks. Both offerings of the course covered the same topics and the same instructor facilitated both modes of delivery. Approximately thirty students undertook each class, a large majority were international students, where English was their second language.

Table 2 shows the student mark distributions for the two modes of delivery. There are some variations in the grades obtained among different categories in these two modes of delivery, however, there is very minor difference in the average mark for the face-to-face class (67.1%) and the online class (68.7%).

Table 2: Distribution of student grades for two modes of delivery

Mark range	Face-to-Face (% of Class)	Online (% of Class)
80 – 100%	8	13
70 – 79%	33	35
60 – 69%	46	30
50 – 59%	13	22

Table 1: The Blended Learning Model of selected Standards applied to two modes of delivery

MPMPBLM Standards	Face-to-face version	Fully online version
(i) A safe learning environment	Common to both: Allowing students to be openly expressive and celebrate student work in different ways.	
	Use of a list of classroom guidelines that are supposed to be followed by each participant.	*Use of a list of online protocols that are supposed to be followed by each participant.*
(ii) Flexible access to learning materials that are current, aligned and engaging	Common to both: All learning materials were approved as current and aligned. Subject guide, lecture notes, exercise sheets, some worked solutions, and references to web-based resources were available to student via the LMS.	
	Additional learning resources were available in hard copy via the library and as handouts in classroom settings.	*Additional synchronous class sessions (lectures, workshops and tutorials) were recorded and uploaded to the LMS.*
(iii) Assessment tasks that are aligned and relevant;	Relevant assessments were conducted both in-class and online submissions. All assessments were the same in each delivery excepting the exam with the following modifications.	
	Final exam - the weighting of MCQ to problem solving questions = 20:80.	*The structure of the online exam differed from the face to face version with a randomised MCQs order, so each student had a unique exam paper. Weighting of MCQ to problem solving changed to 50:50.*
(iv) Regular and relevant communication from their teachers	The main communication opportunity was provided during face-to-face class sessions and synchronous online sessions. This was supplemented by asynchronous means (such as emails).	
(v) Opportunities to interact and collaborate with peers	Common to both were in class (synchronous) whole-group discussions and small group discussions were featured and a key part of the learning approach. The face-to-face did this in the classroom, the online version used zoom whole group discussion and break-out rooms.	
(vi) Meaningful opportunities to have input into their learning (student voice)	Common to both were opportunities for students to provide input into their learning experience, during both face-to-face class sessions and synchronous online sessions and, also by asynchronous means via emails or LMS discussion forum in both delivery modes.	
(vii) Learning experiences	Common to both: Students were provided with - • explicit class learning intentions with success criteria • a well-planned lesson structure with appropriate sequencing of learning activities, • a learning process to build on and connect to existing knowledge *For online only: an asynchronous pre-introduction of selected content and a recorded synchronous lecture video for self-paced post review was made available*	
(viii) Opportunities to give and receive feedback (to & from teachers; to & from peers)	Common to both: • written feedback from the lecturer and comments from student peers • instant probing for learner understanding using thumbs up/down (online via zoom reaction tool).	
(ix) Opportunities to use technologies to find, use and disseminate information	Common to both were in-class small discussion groups to find, use and disseminate information. The face-to-face mode offered this in the classroom, the online version used zoom whole group discussion and break-out rooms.	
(x) Appropriate support in their learning journey	Common to both: students were encouraged to use library sessions to enhance their capability in the use of technology.	

Figure 1 presents the submission rates of the weekly assessment tasks for both modes of course delivery. The weekly submission rate was a few percentages higher for the MPBLM mode in comparison its face-to-face counterpart.
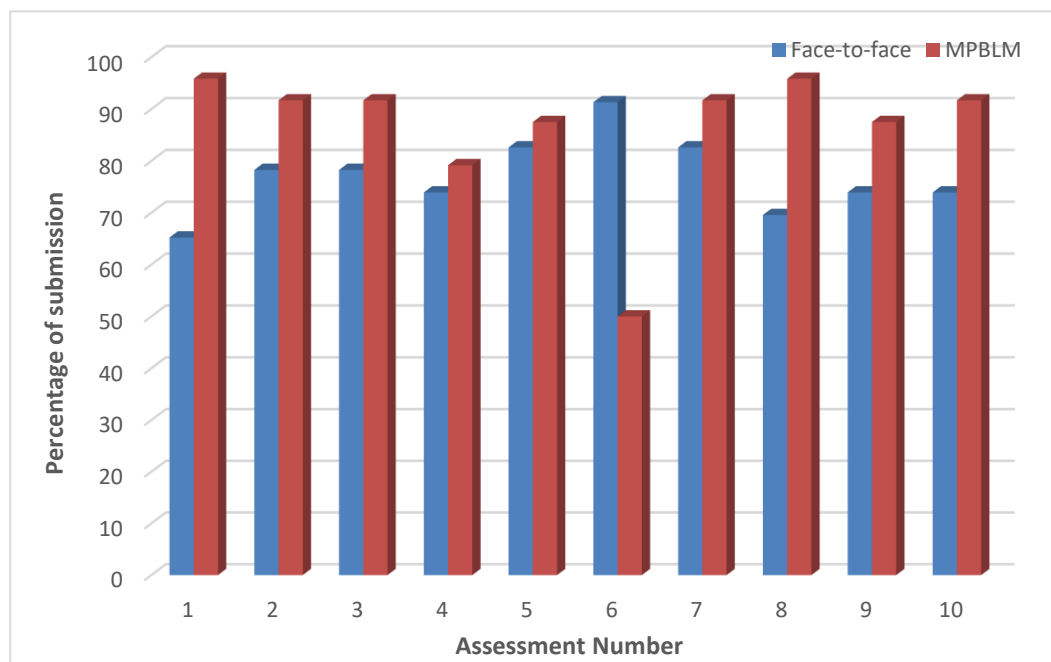
Figure 1: Submission rates of weekly assessment tasks

Table 3 shows the student opinion surveys for these two modes of delivery. The responses indicate that the online delivery has a slightly better response in comparison to face-to-face delivery, however, there is not significant difference between these two modes of delivery. The average changes from 4.28 (face-to-face) to 4.30 for online delivery.

Table 3: Subject evaluation questionnaires, each out of five

Mark range	Face-to-Face Class	Online Class
Achieve learning outcomes	4.27	4.30
Appropriate assessment	4.27	4.35
Helpful and timely feedback	4.27	4.35
Manageable workload	4.18	4.20
Appropriate learning resources	4.27	4.20
Relevance to future career	4.36	4.35
Professionally relevant skills development	4.27	4.25
Learning stimulation	4.27	4.35
Overall well taught	4.36	4.30
Overall quality of subject	4.27	4.35
Average	4.28	4.30

Discussion

Impact on Student Learning Achievement

All three of the selected measures (moderated grades, assessment submission and SEQ results) show no significant student learning achievement difference between the face-to-face and online deliveries. This finding is consistent with other studies comparing online and face-to-face delivery (Dell, Low, Wilker, 2010; Johnson, Aragon, Shaik, 2000), albeit, some different measures were used across these studies. These findings show student learning achievement was maintained and therefore suggests students were not disadvantaged by the change in delivery mode.

Comparison of Learning and Teaching Strategies

Appropriate learning design of a subject has greater impact on student learning achievement that the delivery mode, face-to-face or online (Dell et al., 2010). The learning and teaching strategies were selected and applied in this study in order to compensate for the move to online learning and to achieve best opportunity for student learning achievement suggests these appropriate choices.

Significant commonality of learning and teaching strategies across the delivery modes is shown in the MPBLM standards in Table 1. These commonalities include an asynchronous pre-introduction of selected contents, an explicit learning intentions with success criteria, a well-planned lesson structure with appropriate sequencing of learning activities, a learning process to build on and connect to existing knowledge, an encouraging learner participation environment to develop interest and curiosity, an alignment of the learning goal with the relevant assessment task and an instant probing for learner understanding with the provision of effective feedback.

Differences in learning and teaching strategies included a series of online protocols for safe learning environment, an asynchronous pre-introduction of selected content, pre-reading resources to allow substantial class time on discussion and active learning during synchronised online classes, an availability of recorded videos of online classes tin the course learning management system (Moodle) for post-review and a restructuring of examination format with changed ratio of MCQ to problem solving styled quesitons.

These differences seem to provide a mix of benefits and challenges to student learning in the online learning mode. Students will have benefitted from the increased availability of learning materials in the online mode. Recorded class sessions were available to be reviewed by students asynchronously. Capturing this discussion is especially valuable for students whose first language is not English. In contrast, students may have been disadvantaged by exam format changes. Where MCQs replaced some problem-solving questions, students may have missed out partial marks for their working. Further, designed activities for socially constructed learning may be less effective in an online environment. For instance, using breakout rooms can be more difficult for the lecturer to monitor and support group work and discussion.

Impact of Lockdown

The effect of a lockdown online delivery compared to a non-lockdown delivery is not possible to determine from the study, however, it is likely that lockdown influenced student learning achievement in addition to the shift to online. Kapasia et al. (2020) found negative impacts of lockdown on student learning associated with student wellbeing, whilst Aristovnik et al. (2020) found students suffered from uncertainty and impacts on personal circumstances, whilst students were still satisfied with their learning experiences. Thus, compensating effects may well have resulted in mediating the impact of student learning during lockdown.

The shift to online learning may also offer this student cohort additional benefits. Online learning has been shown to set students up for stronger learning achievement in subsequent subjects (Burns et al., 2013).

Limitations and Learning Going Forward

This study aimed to show a straightforward method to indicate the shift to online learning due to lockdown did not disadvantage students. The method presented uses readily available measures. Other studies (for instance Dell et al., (2010) and Thompson (2000)) comparing online to face-to-face delivery include student demographic data and additional data collection on student assessments etc. This study has not undertaken this additional data collection, and this might be seen as a limitation. Nonetheless, the study results have been consistent with these other studies. This strong alignment in outcome of this study, despite these limitations, suggests the method provides an acceptable 'health-check' of the delivery and validation of the teaching and learning 'work-arounds' implemented when pivoting learning delivery in a time of disruption.

Conclusions

The study presented the application of the MPBLM in a lecture-based face-to-face format with some online components and a fully-online version and compared student learning experiences between these two different modes of delivery. The MPBLM provides the flexibility of choosing synchronous (face-to-face or online real-time lecturer-led instruction) and asynchronous (self-paced) components to deliver a particular subject keeping the standard framework. The fully-online delivery strategies intended to, at a minimum, maintain and ideally enhance the learning engagement of engineering technology program students in the lockdown period. The study results show no significant difference in student experience between online and traditional classroom students outcomes, suggesting learner engagement can be maintained in fully-online delivery provided that appropriate strategies are used. The study suggests the application of fully-online version of the MPBLM means students were not disadvantaged by the mandated move to online learning arising from the pandemic lockdown. Significant commonality of learning and teaching strategies exit across the delivery modes.

This study presented a straightforward method, using readily available qualitative and quantitative indicators, to compare the two delivery modes. This study has not undertaken this additional data collection, and this might be seen as a limitation. Nonetheless, the study results have been consistent with these other studies. This strong alignment in outcome of this study, despite these limitations, suggests the method provides an acceptable 'health-check' of the delivery and validation of the teaching and learning 'work-arounds' implemented when pivoting learning delivery in a time of disruption. However, further research is warranted due to the limitations of the study around the nature of the sample size and single cross-sectional data.

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