Effective use of Zoom technology and instructional videos to improve engagement and success of distance students in Engineering

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CONTEXT Distance engineering education is a familiar and well-accepted mode of study in Australia, especially for regional areas, due to improvements in technology and convenience of learning opportunities. Many students choose distance mode over face-to-face because of flexibility around work and family commitments. But still, there are a lot of challenges to maintain student engagement and to make learning by distance as effective as on-campus studies. Moreover, most of the distance students choose to study and want to engage with academics outside standard working hours which challenges work-life balance. Online support tools such as Zoom allow students and academics to connect through virtual tutorials from any convenient location, which is an effective use of technology to improve student engagement and their success rate while minimising the inconvenience of after-hours commitments for academics.

PURPOSE The aim is to study the effectiveness of using Zoom technology to offer evening tutorial sessions to improve the success of students studying foundation engineering units by distance mode at a regional university, while maintaining a manageable workload for academics.

APPROACH A course Moodle site gives information about the learning behaviors of students. For example, data can be collected on how many students watched a lecture or the most frequently watched parts of lectures. In this study, student engagement with the course was measured by closely observing the number and types of posts to the Q&A Forum on the Moodle site for the years 2016 and 2017 and the number of students attending Zoom virtual tutorials when introduced in 2017.

RESULTS Data collected from the Moodle site over the 2016 and 2017 course offerings showed levels of engagement were maintained with the learning resources (Q&A Forum in 2016 and additionally the Zoom virtual tutorials in 2017). Also, a similar response rate was recorded for the course evaluation questionnaire but satisfaction scores improved in many areas. The introduction of Zoom virtual tutorials resulted in higher student satisfaction and a reduction in instructor workload of approximately 25%.

CONCLUSIONS By offering online Zoom tutoring sessions, the number of questions and answers posted on the Moodle has reduced significantly and reduced the workload of academics. This has been achieved without reducing the engagement levels of students or altering the grade distribution.

KEYWORDS Online teaching support, Zoom virtual tutorial; student satisfaction.

Introduction

Distance education originated to fulfill the demand for education by those who would not be able to participate in face to face courses. It is suitable for those courses which do not require physical attendance during the learning process. Distance education incorporates a variety of ways to enable students to progress along the pathway of their studies. CQUniversity (CQU) offers two pathways in its engineering degrees. One is with Co-op experience (the dual award program Bachelor of Engineering/ Diploma of Professional Practice (Engineering)) and another is the distance education program (Jorgensen & Howard, 2005a). CQU employs new technologies to provide state of the art education to enrolled students. At this moment, CQUniversity is also well regarded in Australia as the nation's most inclusive and engaged university due to offering distance education and as well as having campuses in many regional areas. Approximately 27% of the enrolled CQU engineering students take their courses as a distance mode due to the flexibility of technology (Mandal, 2015).

Emerging technologies allow instructors and students as well as student-student connection in a real-time and or time delayed alliance. Several techniques were used to deliver the distance program for a period of time (Cohen & Ellis, 2001). First generation distance education basically depends on print based education (Kaufman, 1989; Nipper, 1989). Whereas second generation distance study evolved to print and broadcasting system (Peters, 2002). Third generation distance education heavily dependent on web-based tools, such as web conferencing which enables student – teacher more equitable communication (Bates, 2005). Software companies are creating user-friendly tools that are incorporated in learning and teaching in an educational institution. The latest addition is called "Zoom", full details of this application are available online: https://www.zoom.us

From Term 1 2017, CQU enabled "Zoom" as the virtual live classroom for distance students' educational purposes. Zoom is a web based tool which enables collaboration between individuals and groups through video conferencing, video and audio calling, instant and persistent messaging, and file sharing. Zoom was adopted primarily as a replacement Virtual Live Classroom (VLC), but offers a range collaboration opportunities – within and beyond CQU.

Background

Implementation of technologies for distance studies is dependent on individual comfort levels, monetary resources and visionary leadership (Beldarrain, 2006). The educational institution must be aware of the influence and outcome of the technologies that have been used for facilitating learning pathways. It's also equally important to train the educators to familiarise them with a new technology including its possible flaws during the process. To adopt a new technology, CQU follows the seven principles of good learning and teaching practice provided by (Chickering & Gamson, 1987). Irrespective of delivery method, technology should:

- Encourage contact between students and faculty.
- Develop reciprocity and cooperation among students.
- Use active learning techniques.
- Give prompt feedback.
- Emphasise time on task.

- Communicate high expectations.
- Respect diverse talents and ways of learning.

CQU encourages all academic staff to undertake these approaches for achieving better learning outcomes. The online distance pedagogical journey can be integrated by using emerging technologies such as “Zoom” by applying these seven principles.

Now distance learners are interested in connecting with peers and receiving prompt feedback from their instructors and want to study interactively. This is more applicable to those specialised subjects which need to be explained step by step, for example tutoring about mastering software applications.

Course History

This paper illustrates the gain in learning effectiveness using “Zoom” technology for the particular specialised subject called “Drafting for Engineer’s” which is offered in distance mode as part of an Associate Degree in Engineering. Two consecutive year’s data has been analysed to determine correlations between using the new technology “Zoom” and effects on student satisfaction and feedback. In addition, the numbers of relevant technical questions asked through the Moodle site have been considered in this study to assess the qualitative relevancy of the “Zoom” tool.

Table 1: Summary of the number of students enrolled, student satisfaction scores and a number of questions posted on the Moodle Q&A Forum for two consecutive years.

Drafting for Engineers (ENAG11009)						
Item / Year	Enrolled Students	Responses	Response Rate	Overall satisfaction score out of 5	Number of Questions asked through Moodle site	Types of resources
2016 Term 1	45	18	40%	3.2	279	Recorded video and Q&A forum
2017 Term 1	34	18	53%	4.5	129	Recorded video plus first time used “Zoom” as an interactive tool for live tutorial

Student Satisfaction Scoring System and its Application

The teaching and learning environment is greatly influenced by a student evaluation and feedback process (Sayem & Rasul, 2015). Frequent student evaluation and adding their feedback into course improvement will make the learning process more informative and interactive. CQU uses a five-scale rating system to evaluate course performance. The

corporate target of average satisfaction of a course is 4.0 out of 5.0. In addition, at least 50% or more student feedback has been considered acceptable in the evaluation process. Finally, CQU also has an attrition target of less than 30% failures in a particular course. Updated resources along with innovative learning and teaching methods incorporated with the latest technology have been used to fulfill the CQU corporate targets. The key points of the changes are to: 1) Improve the student learning process, 2) Increase positive satisfaction in the student learning journey, and 3) Reduce the student dropout rate. The following section summarises the different strategies that have been considered to meet the corporate requirements.

Teaching Interventions

Table 2 summarise the various teaching interventions that are responding to student feedback for the years 2016 and 2017.

Table 2: Summary of the various teaching interventions responding to student feedback for the years 2016 and 2017.

2016 HT 1 : Drafting for Engineers (ENAG11009)			
Student feedback	Source	Recommendation	Action taken
Online tutorials were of benefit to students	Have your say survey	Increase the number of Online tutorials to enable students to ask questions and be shown the answer	Casual staff conducted fourteen, two hour online tutorials during the term
Too many folio exercises	Have your say survey	Review the Pass/Fail requirement of the folio exercises and possibly allow students to choose how many folio activities they do; however specific help on Assignment tasks will not be given as the assignments are meant to be done solely by each student without help from staff or other students	The number or folio activities were reviewed and reduced slightly in line with the hours students are expected to spend on a 6CP unit
Course videos were good and showed step by step instructions	Have your say survey	Review the current online videos and add more where needed	Completely reviewed all videos prior to the term and employed casual staff to add/fix over ten, 30min videos
Assessment items were returned late	Have your say survey	Staff will monitor and ensure the timely return of feedback to students for future offerings	Coordinator helped teaching staff with marking

Table 3: Learning resource score and forum discussion statistics for 2016 and 2017

	2016 Term 1	**2017 Term 1**
Enrolled students	45	34
Course evaluations	18	18
Student engagement	36% participation in Q&A forum	35% participation in Zoom virtual tutorials
Types of learning resources	Q&A Forum and 2 one-hour online tutorial sessions	Q&A Forum and 14 one-hour Zoom virtual tutorials
HD grades (%)	70%	75%
Student satisfaction of learning resources as a numerical scale from 1 (low) to 5 (high)	3.1	4.0
Q&A Forum posts per student	1.9	1.0
Instructor time to deliver learning resources	Number of Q&A Forum replies (148) multiplied by nominal time to reply (10 minutes) plus 2 hours of online tutorial session. 26 hours	Number of Q&A Forum replies (38) multiplied by nominal time to reply (10 minutes) plus 14 hours of online tutorial session. 20 hours

Results and Discussion

Quality assurance of learning and teaching processes is very important for any educational institution to sustain its progress. For academics, it's also important to deliver high-quality learning methods (Dekkers, Howard, Adams, & Martin, 2014). Modern technology has provided vital assistance to achieve the required standard of quality of learning tools. From Table 1, student satisfaction rates indicate that tutorial sessions with "Zoom" technology have influenced the achievement of a higher satisfaction score (4.5). Student feedback in the year 2017 said that Online "Zoom" tutorial sessions provided good interactive help. Another important key parameter is the number of questions posted in the Q&A Forum over 2016 and 2017. In 2016, the same course was offered without "Zoom" and the number of questions asked per student was 1.9, whereas this was approximately half in 2017. In 2017, due to tutorial sessions being offered by "Zoom the instructor workload reduced by approximately 25%. The introduction of Zoom also resulted in a marginal increase in the percentage of HD grades awarded. As assessments were not significantly changed over this period, this is anecdotal evidence that Zoom tutorials may also allow students to obtain deeper learning.

In addition, at the time of "Zoom" tutorial sessions, students showed their interest about the "Zoom" collaborative tool for providing effective impacts to achieve the goals of the course. Therefore, we can consider that there has been a positive impact of "Zoom" technology in the learning process. Further analysis can be done to determine the impact of "Zoom" by organising a one to one survey based on a questionnaire on the students' "Zoom" experience. The author will recommend this for the next stage of the learning development.

Instructor Observation

The author observes from solicited and unsolicited feedback about the “Zoom” collaborative tool that it creates better student satisfaction. Students enjoy tutorial sessions and asked for extra sessions due to the effectiveness of “Zoom” technology. In particular, for the “Drafting for Engineers” course, “Zoom” was especially helpful to allow students to see live command of various tools and their applications through the course teacher. Course teachers also enjoy seeing the benefits of the “Zoom” tool, especially for distance courses. Overall, students and course teachers were both happy to use “Zoom” collaborative for the first time in their “Drafting for Engineers” course.

Conclusion

The implications of introducing Zoom virtual tutorials was examined with respect to student satisfaction, student engagement and instructor workload in a core drafting course within the Associate Degree in Engineering at CQUniversity. It was found that by using “Zoom”, the learning process is more interactive, which creates positive student satisfaction and better experiences in their learning journey. The innovative approach of “Zoom” enhances positive learning outcomes for diverse groups of students as well as encouraging higher education in remote areas while potentially reducing workloads for instructors.

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