



How to support Student-focused Learning by incorporating Quiz Based Approach combined with Pre-recorded Lecture Materials

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ABSTRACT

CONTEXT

Our intention of using the pre-recorded lecture video materials by introducing associated weekly based lecture quizzes, is to encourage a more student-focused learning. The presented theoretical/practical engineering concepts have been delivered across electrical, electronic, robotics and mechanical engineering student cohorts. The emphasis is to enhance and support individual autonomous learning of each participating student. This method of lecture delivery can be used as a student self-directed guide.

PURPOSE OR GOAL

The intention is to determine whether (by using this approach) students will better engage in their learning, and (if this is the case) to influence other academics to use a similar method of lecture delivery. The leading assumption of our investigation is to examine the impact of applied video recordings and associated quiz questions, to produce a more efficient self-centred student learning experience. We would like to introduce this approach as a transitional method in developing self-sufficient and self-learning engineering graduates.

APPROACH OR METHODOLOGY/METHODS

This short quantitative/qualitative study involved simple data collection (using the Qualtrics online survey). It required students to complete a questionnaire on their perceived experience. Questions are used to determine the satisfaction of students' educational experiences in order to detect the possible topic-related educational and operational benefits. Constructs in the questionnaire are operationalised (using multi-item, 11- point Likert scales) which are not only used as an investigation instrument, but also as an assessment tool (with a common frame of reference from 0-10). The only qualitative measure item is a question related to the participants' views on how "Pre-recorded Lectures and associated Lecture Quizzes" benefited their personal/professional learning and development.

ACTUAL OR ANTICIPATED OUTCOMES

This approach has the potential to create a higher level of interaction between the academic staff and students during post-video/post-quiz lecture workshops. It creates students' ability to question presented content, and simultaneously develop their deeper understanding of possible real-life applications. It also opens possibilities of more targeted industry-based learning.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

The provided lecture quiz questions do more than just a provision of guidance to students. It allows students to be better engaged in their self-centred learning and help them to smoothly transition to fully developed and independent engineering graduates.

KEYWORDS

Lecture Quizzes, Pre-recorded Lecture Videos, Student-focused Learning

Introduction

Educational research recommends the adoption of educational technology for improvement of student outcomes and longer-term teaching efficiency Willis, Kestell, Grainger, and Missingham (2013). All these can be achieved by effectively managing the teaching and other workloads, focusing on students' engagement and by evaluating the effectiveness of combined e-learning and in-class teaching. In our study, we are focusing on the evaluation of a blended teaching approach. Some authors applied a flipped classroom approach to reduce high failure rate in their student cohorts like Gardner (2017) and O'Malley, McLaughlin, and Porcaro (2017), while others were more concern about scalability and engagement like Deslauriers, Schelew, and Wieman (2011).

In their work Jensen et al (2018) confirmed that the video lectures provide superior advantage to overall students learning over interactive tutorials or textbook-style readings (when applied through the whole semester duration), but their investigation did not use any feedback inbuilt tool to support self-centred learning. Simko et al (2019) presented the benefits of replacing the traditional lecture-based in-class format of delivery to online recordings by devoting the traditional lecture class time to workshops. They found that this approach produces higher grades, improves engagement and student satisfaction - all based on student feedback.

In our investigation, we use a similar method by incorporating a quiz-based approach combined with pre-recorded lecture materials. The major difference is the use of the lecture related quiz questions simultaneously with each pre-recorded lecture video, to allow for feedback and further enhancement of student-focused learning. This is followed by in-class workshops, tutorials, and practicals. The aim of the study is to answer the following research question: 'Would it be possible to enhance self-centred students' learning by incorporating Quiz Based Approach combined with Pre-recorded Lecture Materials?'

Our intention is to create a higher level of interaction between the academic staff and students during post-video/post-quiz lecture workshops allowing students to question presented content, and simultaneously develop deeper understanding about possible real-life engineering applications.

Background and Motivation

Student-focused learning according to Simko et al (2019) is based on a flipped learning, that allows combining online resources/assessments with in-person/in-class activities (workshops, practicals, and tutorials). Although the significant improvement in students' performance/recall of expected learning outcomes during and after such activities have previously been obtained, combining online quizzes with inbuilt pre-recorded video materials has not been properly explored. This approach requires students to access weekly available online quizzes with in-built lecture video materials. Students are also given an option to download lecture recordings for re- watching as many times as needed. The aim of this activity is to engage students in an online quiz allowing adequate time to develop a satisfactory level of understanding engineering concepts and supporting examples.

During this process, students are required to answer short fundamental quiz questions to confirm/clarify their individual level of cognitive content understanding. The quiz questions combined with video materials can be re-examined by students for a limited number of times within a provided timeframe (desirable number of days/weeks). The associated lecture slides are released at the same time with quiz/video materials to allow for additional note taking and analysis. The availability of answers instantaneously provides automated response, with permission of a specific number of quiz reattempts, allowing students to re-think carefully and apply self-correction/self-reflection, before the correct answers are obtained. Students are encouraged to use this approach in their own time and space, which supports development of self-time-management skills, an important aspect in engineering practice. To stimulate students' engagement, a maximum mark of 1% per specific lecture week is allocated. At the end of the semester, this activity

aggregates 12 % of the total semester mark, of which at least 75% must be gained to pass one of the formative topic components. In 2022 Semester 1, online quizzes were created across five different engineering topics (two mechanical and three electrical) at Flinders University (120 questions per topic – approximately 10 questions per each teaching week per topic), that were complemented by pre-recorded lecture videos to support student-focused comprehension of the lecture content. Our intention was to determine whether (by using this approach) students would be better engaged and (if this is the case) to influence other lecturers to use a similar method of lecture delivery. The leading assumption of the study was to apply video technology in an online quiz environment to provide a more efficient way in guiding students and preparing them for in-class activities by creating more time for higher level interaction.

Method

This short quantitative/qualitative study involves simple data collection (using the Qualtrics online survey tool.) It required students to complete a questionnaire on their perceived experience (using Quiz Based Approach combined with Pre-recorded Lecture Materials.) The survey was conducted across the mechanical, electrical, electronic and robotics undergraduate (alongside postgraduate) student cohort enrolled at Flinders University in the College of Science and Engineering. The survey questionnaire was distributed and scheduled in the last three weeks of the teaching semester – as a diagnostic tool to measure the level of students’ satisfaction. Questions used in the questionnaire were created to track the satisfaction of students’ educational experiences in order to determine the possible topic-related educational and operational benefits.

Constructs in the questionnaire were operationalized (using multi-item, 11- point Likert scales). They were not only used as an investigation instrument, but also as an assessment tool (with a common frame of reference from 0-10) that could be easily interpreted by students. A single item measure is used so that the informal distinctions can be made among respondents. Participants rated the level which best describes their perception of the specific measure used in the survey. The only qualitative measure item was a question related to the participants’ views on “How does Pre-recorded Practical Preparation video material benefited their personal/professional learning and development.” The questionnaire (with associated measurement items and scaling) is presented in Table1, followed by the demographic data.

Questionnaire

Instructions: Please highlight your answer on a scale of 0-10 (0=strongly disagree and 10=strongly agree, 5=neither agree nor disagree) concerning your opinion about presented statement.

Table 1: Questionnaire Measures and Scaling

Measurement item	Scale
Using lecture quiz questions helped me to check whether I fully understand lecture recorded video content	0 1 2 3 4 5 6 7 8 9 10
Using lecture quiz questions helped me to better engaged in learning of the theoretical concepts	0 1 2 3 4 5 6 7 8 9 10
Using lecture quiz questions helped me to better engaged in learning of the practical applications of presented theoretical concepts	0 1 2 3 4 5 6 7 8 9 10
Using lecture quiz questions helped me to better prepare for tutorials and practicals	0 1 2 3 4 5 6 7 8 9 10
Please provide in your own words, why you think that this kind of supporting quiz materials could benefit your personal/professional learning and development	Qualitative Data Collection

Would you like the same method of Online Lecture delivery to be implemented in other topics in your course	1 - Yes, I would like that other topics use it 2 - No, I did not find it beneficial 3 I have no preference
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Demographics

Of the 98 students enrolled across five topics, 90 are male, while only 8 are female. Of these 98, (100%) students, 31 (32%) chose to fill the survey of which 29 males and 2 females. The age of students who decided to participate ranged from 19-21 years (13), 22- 25 years (9) and 26+ years (9).

Results

The Quiz Based Approach combined with Pre-recorded Lecture Materials did more than just provide lecture content. As presented in Table 2, collected data revealed that most respondents found this approach to be a more helpful preparation tool than standard in-class lecture (especially when it comes to being better engaged in learning of the theoretical concepts) linking theory with preparation for tutorials and practicals (*standard average score was varied between 6.71 and 7.61 out of 10 scale and standard deviation was between 2.2 and 2.56*).

Table 2: Quantitative Summary of results of the student questionnaire relating to use of pre- recorded practical preparation videos

MEASUREMENT	AVG	MIN	MAX	SD
Using lecture quiz questions helped me to check whether I fully understand lecture recorded video content	7.58	2	10	2.46
Using lecture quiz questions helped me to better engaged in learning of the theoretical concepts	7.61	0	10	2.27
Using lecture quiz questions helped me to better engaged in learning of the practical applications of presented theoretical concepts	6.71	0	10	2.56
Using lecture quiz questions helped me to better prepare for tutorials and practicals	7.18	2	10	2.20

Figure 1 presents the outcome of the final survey question 'Would you like the same method of Online Lecture delivery to be implemented in other topics in your course?' It can be concluded that majority of participants - 74.2% would like that other topics adopt this mode of lecture delivery, while 16.1% have no preference and only 9.7% of students did not find it attractive. Interestingly enough, 9.7% of student who did not find it beneficial, were mostly mature age students (26+ years or older).

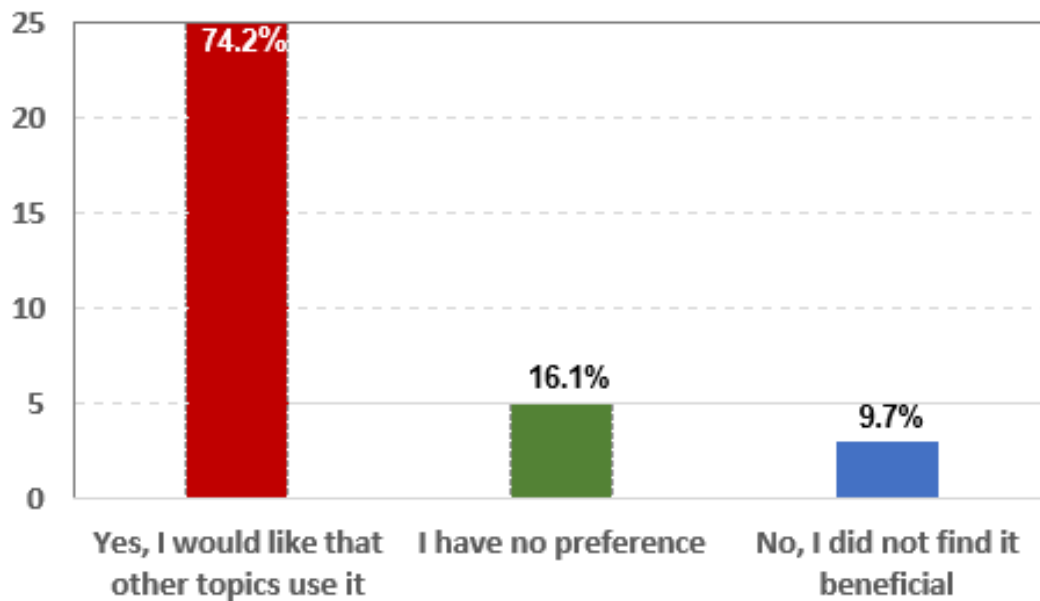


Figure 1: Answers on survey question 'Would you like the same method of Online Lecture delivery to be implemented in other topics in your course?'

The provided lecture quiz questions do more than just a provision of guidance to students. It allows students to be better engaged in their self-centred learning and help them to smoothly transition to fully developed and independent engineering graduates.

Findings/Benefits

Additionally, qualitative data responses have confirmed that the learning process started by watching the videos (followed by an exposure to the specifically targeted quiz questions) and was finalized by application of obtained knowledge during in-class activities like tutorials/practicals/workshops.

Students also identified that (by accessing pre-recorded lecture videos combined by weekly quizzes and lecture slides) they were able to achieve more individual and self-directed learning through reflection. They noticed better retention of information, identifying gaps in their learning process and were far more ready to apply new gained knowledge on other assessment pieces like assignments and practical reports. They also had more time ensured for proper and in detailed analysis of presented numerical examples. We also noticed more efficiency in use of teaching staff, as students were able to better engage, find answers on more complex questions, and achieve a higher-level of interaction. It becomes apparent the importance of re-usable learning materials for more enquire-based and timely learning. As a result, most students have been able to follow the presented lecture videos far more systematically, which prepared them to better engage in in-class and after-class activities using this student-focused approach. In the next Teaching & Learning workshop, this methodology will be discussed with other academics for adoption into their own topics

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