

Flipped Learning in a Civil Engineering management course

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BACKGROUND

Flipped Learning is an alternative to the traditional lecture based approach to teaching. The course content is provided well before the class time so that the student can become familiar with it before they come to class. The class time is then dedicated to carrying out exercises and activities that are designed to enable the students to understand and apply the content. This "flips" the traditional approach where the course content is delivered in lectures and the students review and apply the content in homework exercises.

The main motivations behind using the flipped learning approach are to improve student performance and engagement. It is suggested that the flipped learning approach enables students to learn the course content better as they work at their own pace and have the ability to stop and revisit any content that they do not understand. Motivation is improved as the content can be presented in a more engaging manner using multimedia and breaking the presentation into more digestible chunks of content.

Engineering management is one of the less attractive papers for engineering students. It covers fields such as law, management and finance that are new to many students. As a result, student motivation and performance on this course could be improved with a more effective and engaging approach to presenting the course content. Flipped learning may be one way of achieving this.

This paper provides the preliminary results of a trial using the flipped learning approach to teach engineering management to an NZDE (Technician) class.

PURPOSE

The overall aim of the research is to determine the advantages and disadvantages of using the flipped learning approach and to identify any improvements that could be made to the design of flipped classrooms.

The key research question will be "How useful is the Flipped Learning approach in achieving better outcomes in a civil engineering technician management course?"

Secondary questions related to this main question are:

- Do students score better in tests and exams?
- Do students show a better understanding and application of the course content?
- Does the approach help ESOL students to achieve better results?
- Do students prefer the flipped classroom approach?
- How can the design of the flipped classroom be improved?

DESIGN/METHOD

An existing course, ENGG DE 6101 - Engineering Management, was modified to allow it to be presented using the flipped learning approach. This course teaches the basics of managing engineering projects to the NZDE (engineering technician) students. Slidecasts, quizzes and other resources had already been developed for this course which enabled the flipped classroom approach to be implemented in Semester 2 2012.

The general format of the trial class started with the posting of slidecasts and quizzes to Moodle a week before the class session was scheduled. The slidecasts consisted of narrated PowerPoint point slides using the content presented in previous years' classes using a traditional lecture-based approach. Each topic was accompanied by an online quiz that was worth 1% of the total course mark and closed 30 minutes before the class time.

There were two 1.5 hour sessions of class contact time allocated each week in a 13 week semester. A variety of activities were undertaken during this time including a site visit to a construction site at Unitec, presentations by practising engineers, class discussions, solving actual engineering problems, reviews of engineering documents and other activities designed to orientate student learning to the application of the course content.

The effectiveness of the flipped learning approach will be assessed in two ways. Firstly the actual results of the class will be assessed by comparison with previous year's results where the same content was taught using traditional lecture-based approaches. This was done by comparing several specific questions in a mid-semester test and will be further developed by comparing results of the end of year exam. Secondly student engagement and motivation will be assessed using the responses to a questionnaire to be given to the students at the end of the semester.

INTERIM FINDINGS

Initial student responses to the flipped learning approach started surprisingly early. Students approached the tutor after that first class session saying how much they preferred the approach. In addition other tutors mentioned that students had asked why the approach was not being used in their classes. The tutor also noticed that there was increased response and discussion in the class sessions than there had been in previous years' cohorts.

The course is presently approaching the half way mark. The mid-semester test was recently held. The results of the trial cohort are very similar to previous year's results. The test shows no improvement but no decrease in performance.

FURTHER RESEARCH

The study will conclude in October 2012 with an end of year exam. Several questions in the exam will be drafted so as to allow comparison with previous year's results. The results from the trial class will be compared with those of previous years to determine if there is any improvement in student performance and understanding of the topics being examined.

The class will also be asked to fill in an anonymous questionnaire designed to determine student views on the flipped learning approach.

CONCLUSIONS & CHALLENGES

The implementation of the flipped learning approach has provided some valuable lessons on course design and implementation. In particular, the planning of the class activities needs more work to allow the students to be more involved in understanding and applying the course content.

KEYWORDS

Flipped learning