Overview

This study emphasises the need for detailed planning, long lead-times and considerable resources to undertake a major curriculum change toward a flipped classroom model—especially with a cohort of over one thousand students. Carl and his team designed and ‘set in motion’ a flipped classroom model to immerse students in authentic learning using large group problem-based learning (PBL) sessions. Students are expected to take ownership of their learning and arrive at the PBL sessions prepared: ready to work with peers on their engineering solutions.

Case study summary

Benefits

• Using active learning pedagogies, such as problem-based learning, supports skills required in engineering, such as teamwork, critical thinking and project management.

• **Khan Academy** style videos designed in small chunks and placed online allow students the flexibility to learn and revise complex concepts at their own convenience.

• The emphasis on students owning their own learning helps prepare them for the demands of professional life.

• Once the curriculum is designed, developed and implemented, it only needs to be reviewed for the next iteration of the course—the same amount of effort is not required again.

Issues to consider

• Substantial time and resources are required to redesign a curriculum (about 3-6 months beforehand) and develop the online component.
• Building relationships with the other academic staff (about 40 teaching staff) is important to ensure the success of the project.

• Regular communication with students is important, especially at the start of semester, so that they understand what is expected of them and can communicate any concerns or problems.

• Weekly meetings with the teaching team are necessary to stay on top of issues that a large number of students can raise about the course.

Reasons for adopting the flipped classroom

Before the change to the flipped classroom model, an evaluation of the engineering program at The University of Queensland (UQ) by a professional body revealed that graduates were not equipped with the requisite skills for professional practice, as the curriculum lacked authentic contexts. The other ongoing issue was the need to engage and retain a large cohort of students throughout a complex, high workload program and provide each with equal opportunities to succeed.

Planning

It was important to think of how the project was going to work in terms of pedagogy and to maximise opportunities for active learning. It was a large team effort—fuelled partly by a grant from the office of the UQ Deputy Vice-Chancellor (Academic)—to design and deliver the program, with extensive planning in the form of a design project to work out how to ‘pull students through the curriculum’. A lot of time was invested in developing relationships with the teaching team to concept map the course requirements. The online component also took substantial planning, design and technical expertise, with the video-based learning segments embedded by the team at the Centre for Educational Innovation and Technology (CEIT) in Blackboard using Drupal software.

Flipping the class

In the face-to-face sessions, students were immersed in problem-based learning activities to build teamwork, communication and project management skills.

Engagement strategies included:

• Avoiding transferring content by creating the lectures around a narrative of how engineers make decisions, utilise tools, and use mathematical and computational models and engineering materials to create an artifact or object, the performance of which students can then predict.

• Frequent communication with students in the first six weeks on Blackboard forums, mainly to lure them away from social media such as Facebook to join the course discussions.
• Creating a forum in Blackboard called ‘Things that make you want to scream’, to hear about and tackle students’ issues.

• Weekly meetings with project leaders and tutors (about 40) to communicate and tackle problems that students were having during the course.

• Expectations for students to come to class prepared or risk falling behind their peers; this was a large part of the narrative.

• Assigning heavy weighting to a peer assessment component, to emphasise the need for teamwork and time management skills.

Online component

• Video-based learning with the Salman Khan (of the Khan Academy) approach to break up the fundamentals of engineering into chunks of knowledge and concepts

• Blackboard used to host core learning materials, such as Khan-style videos, Skype video and podcasts.

• Communication with students through Blackboard forums.

• Weekly online quizzes after students had worked through the material.

Conclusion

Carl Reidsema believes that using the flipped classroom model was the only way to achieve the aims of increasing the authenticity in the curriculum and to create opportunities for learner engagement. Placing core content online and setting expectations for learners to be prepared frees up time for active learning in the classroom. Considerable effort was expended to change and implement the curriculum, but future course iterations will only require review and ‘tweaking’. Carl claims that he does not teach the course, he designed it and, with the help of his team, set it in motion.

Useful links

Case studies of Educational Excellence, Australian National University: a range of problem based learning case studies from a variety of disciplines such as law, science, education and business.

What is Problem Based Learning?: Overview of characteristics of PBL at University of California.

Monash University: PBL is now being adopted in leading business schools in Europe. Monash University offers undergraduate business degrees where all core units are undertaken using a PBL approach.

For further information, see the TEDI Flipped Classroom website.
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