



Using simple technologies to improve student engagement and success in an online applied-science course: A case study

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The first year course, Soil Properties and Processes is a core course of two of Massey University's applied science degrees. The course is offered both internally and via distance education. The course has a reputation for difficulty, and end of year pass rates for the distance offering are generally below 50%. In 2013 a new student engagement strategy was adopted to increase this pass rate. The strategy was built upon engaging students at the start of the course with a pre-course screening quiz, and then maintaining ongoing engagement using multimedia resources accessed through the university's Learning Management System (Moodle). This strategy represented a paradigm shift for a lecturer more comfortable with email and phone correspondence, but has been well received by students. The strategy has consistently engaged students throughout the first semester of 2013, and highlights how a focused, low-technology approach can improve student experience.

Keywords: distance teaching, science, engagement strategy, student experience

Introduction and Context

Massey University is a New Zealand University that offers both traditional (internal) and online (distance) education. Soil Properties and Processes is a compulsory first-year course of the Massey University Bachelor and AgriCommerce and Bachelor of AgriScience degree programmes, and integrates physics, chemistry, biology and the soil resources of New Zealand. Time is allocated equally through the course to each of these subject areas. The course is offered internally as a single-semester course (in both Semesters 1 and 2) and via distance teaching as a double semester course. The course is regarded by students as one of the toughest first year courses at Massey. Lecturers attribute this reputation to the integration of physics, chemistry, biology and pedology in a single course.

Soil Properties and Processes has a history of low pass rates. This is particularly apparent for the distance offering of the course; for three of the past four years distance pass rates have been under 50%, and significantly lower than the pass rates for the equivalent internal offering. A large proportion of students who do not pass the distance offering are DNC (did not complete) or WD (withdrawn) students. However, the failure rate for students who manage to complete the course is low.

In 2013, a new approach was implemented to better engage distance students enrolled in Soil Properties and Processes with learning. The long-term objective of the approach is to increase the completion rate to at least 70%, and the pass rate to at least 60% by converting a large number of the DNCs and WDs into completions.

Traditionally, the distance offering of Soil Properties and Processes was taught with limited student engagement where students are expected to work through a printed study guide, to submit four assignments through the year, and to attend a final exam. The new approach aims to increase retention and success by focusing primarily on early and ongoing student engagement. This presentation describes the initiatives that were adopted to improve student engagement. It presents a case study for how simple technologies used via a Learning Management System (Moodle) have been used to increase engagement in a first-year university applied science course.

International data shows that retention and completion rates of online courses are generally lower than those for similar, traditionally delivered courses (Park & Choi, 2009). Statistics from Massey University reflect this pattern. Not only are retention and completion rates linked to government funding in New Zealand (courses with pass rates lower than 50% are under threat of cancellation of government financial support), but the publication of performance league tables means that there is a tendency for this data to be associated with poor academic performance (Maathuis-Smith, Wellington, Cossham, Fields, Irvine, Welland & Innes, 2010). Thus, such courses are under close scrutiny at Massey University.

The literature identifies a number of factors that cause students to withdraw or fail to complete. Recent work by Jeffrey, Milne, Suddaby, & Higgins (2012) identifies a lack of engagement at the start of the course as having the biggest impact on the retention of online students. Additional factors influencing retention and success include a poor quality learning experience and failure to cope with the academic demand (Yorke & Bendon, 2008) and inaccurate expectations of the course (Braxton, Vesper & Hossler, 1995, Nadelson et al, 2013, Yorke & Bendon, 2008). The online/distance learning environment brings additional challenges for students, including negotiating the online environment, information overload and a de-personalised learning environment (Willging & Johnson, 2004).

Online teaching also presents challenges for teachers, including the challenges of new teaching methods (Claybon, 2008) and the development of a new set of skills such as technology and design skills, process management and distance mentoring and motivation skills (Heilman, 2008). In order to be successful, any strategies for increasing student engagement and success must also be manageable, sustainable and cost-effective for the lecturer and the organisation (Stepanyan, Littlejohn, & Margaryan, 2010). Tablet technologies such as iPads are becoming ubiquitous in higher education institutions, and an increasing body of literature attests to their positive impact on student engagement (Manuguerra & Petocz, 2011) and their ability to provide transformative learning experiences (Miller, 2012). The portability and ease of use of the iPad was also a prime consideration for a lecturer who spends a great deal of time travelling due to participation in international research projects.

Methodology

Any strategy for engagement introduced to a lecturer has to be manageable, simple and easy to implement in the face of a demanding teaching and research schedule. Two key areas were therefore chosen for focus: ensuring that the students who enrolled on the course had the scientific knowledge and skills required to understand the course content, and ensuring that students were engaged by the course and felt supported by the lecturer during their studies. An additional challenge in the initiative was presented by the lecturer's unfamiliarity with online teaching technologies. This meant that any strategies or tools needed to be easy to learn and quick to use and maintain. Three simple, quick approaches were employed which represented collaboration between a lecturer and teaching and learning consultant:

Pre-course quiz. Students enrolling into Soil Properties and Processes come from a range of education backgrounds. Some students are recent secondary school graduates, some are professionals, while others are completing the course for interest, or as part of a part-time degree, and may have received no scientific education for more than ten years. In order to better appreciate the range of background knowledge within the class in the areas of math, chemistry and biology, an 18-question quiz was developed. Although students received marks for the quiz, the grade was used only to determine whether students could gain direct access to the course, or required a lecturer consult prior to access. The grades did not form part of the formal assessment. The questions were designed such that any student with a general secondary school science education (the background knowledge we pre-suppose in the course) should be able to achieve 100%. Students were offered one attempt at the quiz. Those who achieved 60% or higher were automatically granted access to the course via Moodle's conditional release function. Those who scored less than 60% were directed to an email link, via which they could schedule a consult with the lecturer before release was granted.

Not only did the quiz provide an indication of the level of background knowledge of the course participants, it

was also a useful indicator of individual student engagement as the Moodle completion tracking function allowed the lecturer to identify those students who had not attempted the quiz ten days after the course had begun. As these students would have had no access to course content, they were identified as not engaged, and the lecturer was then able to follow up individually with these students.

Video updates. Completion of the pre-course defined students as engaged with learning at the start of the course. The challenge for the lecturer was to continue this engagement after the first three weeks. Short video clips of the lecturer in conversation with the (student) viewer have been used to meet this challenge. In each video, the lecturer provides a week-by-week progress chart, reviews what should have been achieved in the previous week, and defines what should be the learning objectives for the next week.

Educreations. Educreations is a free iPad app that allows the user to turn the iPad into an interactive whiteboard to create video tutorials containing voice narration, images, videos, drawings and animations. The video tutorials are stored online, and students access them using any type of computer or mobile device, via a link on the course Moodle page. The app was used both pro-actively, to create short lessons on topics that the lecturer had identified as traditional trouble spots for students, and reactively, to answer specific questions posed by students. Information about new video tutorials was posted to the course news forum so that all students had access.

Results and Discussion

Despite being a very simple strategy, the introduction of the pre-course quiz was remarkably effective in providing students with an understanding of the level of science knowledge required, and on the actual nature of the course. Two students voluntarily withdrew from the course without academic penalty, and with a full refund of fees as a result of this quiz.

Students who achieved more than 60% in this quiz were automatically given full access to the Moodle site using the conditional release function. Students scoring less than 60% had to request access to Moodle from the lecturer. This allowed the lecturer to engage these students in conversations about the nature of the course, and to provide guidance and academic support where required. Regular prompting was required to ensure that all students completed the quiz within the first three weeks of the course. The consequence of non-completion was the potential classification of the student as 'non-engaged' with a warning of possible cancellation of enrolment, in accordance with Massey University policy. Two enrolments were cancelled as a result of this initiative at the end of the first three weeks.

Both video updates and Educreations tutorials have been very well received by students. In the first 5 months of the course, eight Educreations tutorials and 15 video updates were loaded onto the Moodle site for the course. A class survey conducted during a three week break between the two teaching semesters showed that 80% of the class always watched the videos, with the remaining 20% of the class sometimes watching the videos. 70% of the class had watched all of the Educreations tutorials, with 10% watching some of them.

Feedback received from students has been perhaps the greatest indicator of the apparent success of the engagement strategy. A selection of comments to the question 'Please describe the positive aspects of this course that are assisting your learning', are listed here:

"When someone asks a question it is always replied to ... has been a big help. Having not only a visual method explaining a point but also the audio as well has really helped"

"Even though it is called distance learning I feel like other students and staff are not so far away, you only have to ask, and help is there."

"The video updates and educreation clips are invaluable."

"I think the interaction is doing is excellent and should be used in other [courses]. The iPad short clips are excellent and could be used as a basis of short bullet point lecture"

The lecturers' experience and perspective

The success of any engagement strategy is not only defined by the student response. The strategy and technology employed must also be sustainable from the perspective of teaching staff. In the Sciences at Massey

University very few academic staff are specialists in teaching; most have heavy research and management workloads. This description is true of the lecturer involved with the case study presented here. The strategy described in this paper therefore represented a mental and perhaps confidence challenge to the lecturer involved. Use of video and an iPad in teaching was a paradigm shift for an academic more comfortable with email and phone correspondence with distance students. The initiative was approached in early 2013 with a fair degree of trepidation. But students quickly responded, and stated their appreciation of the level of engagement they were experiencing. The pre-course quiz and video updates were seen as a useful part of the learning experience. Very early positive feedback provided encouragement that the initiative should be continued, and an iPad was bought in April to implement the Educreation phase of the strategy. This in itself was a learning experience: the lecturer involved had never before used an iPad for any application.

This case study shows that an approach to better student engagement does not need to be high-technology. No specialised software has been used to implement the described strategy. Technology used has been limited to the university's learning management system, an iPad and a laptop web camera. Although the measurement of student completion and success is ongoing at the time of writing this paper, it is clear from course analytics and student and lecturer feedback that both students and lecturers are more engaged in the course, and that students are responding positively to the increased sense of lecturer immediacy and the provision of multi-media support.

The ability of university lecturers to respond to the challenge of improving online teaching will depend on teaching staff more widely adopting currently-available and low-technology strategies that promote student engagement to improve the distance student learning experience. The immediate task for the lecturer and consultant responsible for the current initiative is to communicate the experience and effect of the strategy, and to support other staff who wish to promote and achieve similar engagement.

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