Using Web 2.0 in Large Cohort Project Management Education: Panacea or Empty Promise

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Abstract

Many higher education institutions regard the use of technology in teaching and learning as a key tool in the pursuit of efficiency savings. Simultaneously a new generation of students are arriving at university confident with technology and well versed in the many collaborative and social tools that fall under the broad umbrella of Web 2.0. These students have high expectations of academic teaching faculty.

This paper investigates whether the selective use of web 2.0 technologies can enable teaching faculty to meet the Net Generation students where they are and deliver an enhanced student learning experience. The development and evaluation of a compulsory project management course, which is taught to 270 third-year engineering undergraduates at The University of Manchester, is used as a case study. The course retains the benefits of face-to-face contact with students through weekly keynote lectures, but supplements this with the extensive use of a virtual learning environment (VLE) and key Web 2.0 applications.

The key findings are that technology is not a panacea: face-to-face contact with teaching staff remains the priority for most students. New learning technology may also lead to an increased incidence of strategic learning with students preferring the tools that are most closely aligned with the assessment process. Nevertheless, the use of Web 2.0 tools and the VLE was found to enhance the student learning experience in terms of communication and feedback. The greater challenge of using new technologies to increase collaboration in learning remained an elusive goal, with further work by the authors focused on this objective.

Keywords: Technology, Web2.0, VLE, Project Management

Introduction

Net Generation students—those born from the mid-1980s onwards (Oblinger & Oblinger, 2005)—continue to stream into higher education, where they crash headlong into teaching faculty, a significant proportion of whom have often only recently progressed from "chalk and talk" to the use of PowerPoint slides in lectures. The Net Generation, also known as Digital Natives (Prensky, 2001), Millenials (Howe & Strauss, 2000), and Homo Zappiens (Veen & Vrakking, 2006), have grown up with Web 2.0 as a way of life—utilizing online collaboration sites such as Facebook, Twitter, and various blogs, to communicate, collaborate, and organize their lives. Surveys in the United Kingdom suggest that 90% of U.K. students are regular users of social networking sites on entry to higher education (Melville, 2009). As undergraduate students, the Net Generation demands continual feedback, increased interaction with teaching faculty, and extensive collaboration in learning (Oblinger & Oblinger, 2005). How then should higher education Institutions, driven by financial and government pressures to accept ever-increasing student numbers evolve the student learning experience to meet the expectations of the Net Generation? Didactic teaching in ever-larger lecture theaters may not constitute the optimal approach. Recognizing this, many universities have seized on new technologies in teaching and learning as a source of cost and efficiency savings. Universities have invested in virtual learning environments, and encouraged and cajoled teaching faculty to use new technology, without necessarily understanding whether the use of these technologies can deliver enhanced teaching and learning.

Addressing this question, this paper investigates whether the selective use of Web 2.0 technology can enable teaching faculty to meet Net Generation students where they are and deliver an enhanced student learning experience. The particular context of this study is the delivery of project management teaching to cohorts in excess of 250 engineering students, where a proportion of students view management as uninteresting, irrelevant, and less rigorous than the more mathematical elements of their undergraduate course. This study describes the development and evaluation of a semester long, core project management course, which is taught to 270 third-year civil, mechanical, and aerospace engineering undergraduates at The University of Manchester. The course challenges engineering students to think about how companies operate, how they produce their products and services, and how they remain ahead of the competition. The course has retained the benefits of face-to-face contact with the student cohort through weekly keynote lectures, but has supplemented this with student-centered learning embedded through the extensive use of The University of Manchester's VLE. Rather than using the VLE simply to replicate elements of face-to-face teaching (Blin & Munro, 2008), for example, by posting PowerPoint lecture notes on the VLE, the authors have focused attention on the Web 2.0 tools provided by the VLE also, for example podcasting, and have also linked the VLE to a course Facebook group.

The impact of the use of Web 2.0 technology within the VLE on the student learning experience was assessed using a quantitative survey of the 2008/2009 student cohort (N=146). The aim of the research was to evaluate the extent to which the use of Web 2.0 technology can enhance the student learning experience in large cohort teaching, as well as understanding which tools were accessed most often and which were ranked as most effective by the students.

The findings of this case study are something of a patchwork. On the one hand, the surveyed cohort was overwhelmingly of the view that the faculty's use of Web 2.0 within the virtual learning environment had enhanced the student learning experience. However, the most effective tools for learning remained the face-to-face keynote lectures, the ability to download the lecture notes, and the provision of quizzes and case studies to test and embed the students learning. Key discussion points from the findings include:

- Technology is not a panacea, with the most effective learning tool for the majority of students remaining the face-to-face keynote lectures
- Technology can encourage strategic learning within the student cohort
- Use of specific Web 2.0 tools such as podcasting and the social networking site Facebook was lower than expected.
- Use of technology, however, did enhance the student learning experience

Literature Review

The Effectiveness of Learning Technology in Enhancing the Student Learning Experience

The debate over the effectiveness of using technology, such as virtual learning environments, to enhance the student learning experience in higher education institutions has been a long and protracted one, with neither advocates nor detractors, as yet, able to claim a decisive victory. Proponents of the view that technology can be used to enhance teaching and learning are convinced that using technology appropriately can both enrich the student learning experience and improve the effectiveness of student learning (Collis & Moonen, 2001; Davidson & Orsini-Jones, 2002; Laurillard, 2002; Sharpe, Benfield, Roberts, & Francis, 2006; Mason & Rennie, 2008; Matulich, Papp, & Haytko, 2008). Collis and Moonen (2001) stated that learning technology allows students to make the transition from a learning process centered on knowledge acquisition to one founded on participation. Mason and Rennie (2008) supported this view by arguing that effective learning is not just a matter of a lonely learner internalizing knowledge but of participation in a community of learning. Laurillard (2002) made the connection between use of technology and learning experience more explicit still by stating the following:

> Technology is an engaging and highly responsive medium; it can gather content according to interest; it can respond to individual needs of pace and level; it fits with the style and forms of youth culture; it can link the classroom to the workplace and in doing so allows teachers to provide much more of what only they can do for their student. (p. xvi)

Today's students require learning to be student paced with significant elements of peer-to-peer learning and engagement in the learning process. Technology, for example, using the VLE to post material in flexible formats, or creating group based wiki's of particular topics can help achieve these lofty aims (Matulich, Papp, & Haytko, 2008).

Detractors of technology counter that technology makes no significant difference (Russell, 2001) and that technology does little to improve learning (Kvavik & Caruso, 2005). Others claim that the use of new technology can lead to a strategic learning approach, whereby learners direct their learning to achieve specific course outcomes (Saunders & Klemming, 2003). The Joint Information Systems Committee Student Expectations (JISC) Study of 2007 reported that face-to-face contact with faculty was valued most highly by students, and that learning technology was viewed only as an adjunct to effective face-to-face teaching (Ipsos, 2007).

One challenge that the proponents of learning technology face is measuring the improved learning that occurs directly as a result of using leaning technology. How much of any measured improvement in performance is generated by the new tools themselves (e.g., podcasts), and how much is more a secondary effect of using technology to increase the students' engagement in the teaching and learning experience, thereby leading to improved learning. Is the relationship between the use of technology and the improved effectiveness of learning a direct causal one? Can we measure the effectiveness of learning at all? If we use students' grades as a measure of learning then there is a risk that we are only measuring the strategic learning of students to achieve the desired course outcome and not capturing the full extent of the students' learning.

This debate has given rise to a proliferation of research into the use of learning technology as a tool for learning in higher education institutions. Much of this research has been empirical, with case studies published on the effectiveness of VLEs in enhancing student learning across a range of disciplines, including accounting (Broad, Matthews, & McDonald, 2004), history (Rogers, 2004), operations management (Greasley, Bennett, & Greasley ,2004), engineering (Nortcliffe & Middleton, 2008), and foundation year studies (Turney, Robinson, Lee, & Sauer, 2009). These studies range from initial experiments with early versions of proprietary VLEs such as Blackboard (Greasley et al., 2004) to the specific use of a single aspect of learning technology such as audio feedback to engineering students

(Nortcliffe & Middleton, 2008). The findings of these empirical studies support the view that the student learning experience, but not necessarily the student's grade is enhanced by the appropriate use of learning technology. A consensus does seem to be emerging that technology can be used to achieve more constructivist pedagogical principles (Mayes, 2001; Rogers, 2004). This position, however, demands that pedagogy comes first in course and learning design. Academic staff are first required to understand the principles of constructivism (Biggs, 1999) that they wish to implement in their teaching and only then is it recommended that they reach for the appropriate technology or tool to achieve this.

One limitation in all of these empirical studies is that the average student cohort is 60 to 70 in number. However, class sizes can now, typically, measure in the hundreds. There are no peer reviewed studies of the use of a VLE to enhance the student learning experience within much larger (250 plus) cohorts. Face-to-face teaching of these large cohorts of students has always been a challenge for teaching faculty. It is very difficult to engage effectively with students in a one-to-many relationship in vast lecture theaters. Most students are unwilling to ask questions to test their understanding; feedback is very impersonal, if given at all, and learning through collaboration a logistical challenge. In addition, any minor problems concerning the delivery of material or the assessment process are magnified by the large cohort size. In direct response to these challenges, this paper describes the implementation of Web 2.0 tools within a large cohort project management course and evaluates the extent to which the use of Web 2.0 technology can enhance the student learning experience. The paper does not attempt to measure any improvement in the effectiveness of student learning via measuring student grades.

Unpacking the Jargon of Web 2.0

The expression Web 2.0 was originally coined in 2003 as a response to the rebirth of a number of novel Web-based applications following the bursting of the dot-com bubble back in 2001 (O'Reilly, 2005; Anderson, 2007). These Web 2.0 applications are Web-based rather than PC based; they provide a user friendly and interactive environment and critically they provide collaborative or participatory facilities for the users of those applications (Elliot, 2007). Web 2.0 has always been easier to describe by example than by definition with applications such as Wikipedia, Facebook, and Flickr being typically quoted examples of archetypal Web 2.0 technology. The earliest definition of Web 2.0 was provided by Shirky (2003) in *Web 2.0—The Social Web: Software That Supports Group Interaction.* In this respect the key distinctive feature of Web 2.0 is that it encourages, and indeed requires, user participation in generating, editing, and sharing content. Users of the software become "prosumers," rather than consumers (Tapscott & Williams, 2008) as they are producers of Web content as well as consumers of web services. Currently the most familiar Web 2.0 applications for today's students include blogging,

online chat services such as MSN, sharing of video and music files and social networking, including the eponymous Facebook and Myspace (Melville, 2009).

The majority of students entering U.K. universities today are familiar with and in many cases prodigious users of web 2.0 applications (Livingstone & Bober, 2005; Mason & Rennie, 2008; Oblinger & Oblinger, 2005). A recent independent committee of inquiry into the changing learner experience in the United Kingdom highlighted the "complete normalization and integration of Web 2.0 into the day-to-day lives of the current generation of young people" (Melville, 2009, p.13) For them the Web is a key life—both a social and an educational one, that teaching faculty can tap into to enhance the student learning experience.

Web 2.0 as an Extension of the Virtual Learning Environment

Over the last 10 years, VLEs have been introduced in many universities as a means of using technology to increase the effectiveness of teaching. Drivers for this have been the efficiency savings required by government of university administrators and the ever increasing numbers of students entering higher education (Mayes & Fowler, 1999). A virtual learning environment is "a software system designed to support teaching and learning" (Ho, Higson, Dey, Xiu, & Bahsoon, 2009). VLEs comprise a number of tools enabling the electronic delivery of course material, management of assessments, and staff- student or student to student communications features (McGill & Hobbs, 2008). VLEs are predominantly web-based, enabling access on and off campus. They are, however, closed systems, only accessible to registered staff and students in the host institution. This has led to the view that VLEs do not form part of the Web 2.0 revolution as they are not truly collaborative (Melville, 2009). This argument holds some merit, in that one of the benefits of Web 2.0 collaboration is that users are free to collaborate with whomever they wish, and this is not possible within the closed VLE. However, VLEs do provide a consistency of user experience; essential to teaching faculty in maintaining standards, even if this stands in contradiction to the endlessly customizable user generated tools and content available in pure Web 2.0 applications (Craig, 2007). The authors of this paper contend that although the VLE Web 2.0 tools may be inferior to their pure Web 2.0 equivalent (e.g., Wimba podcasting in Blackboard vs. FeedForAll or Audioblogger) the VLE may still be viewed as an effective mechanism for introducing Web 2.0 technology into the student learning experience. The great advantage of using the institution's VLE to dip ones toe in the water of Web 2.0 as a means to enhance the student learning experience is that the infrastructure, support, and tools are available within the institution.

Using the Web 2.0 tools within a university's virtual learning environment should allow today's Net Generation students to experience the interactivity and collaboration in learning that they crave (Mason &

Rennie, 2008). Web 2.0 tools implemented within the controlled environment of the VLE allow teaching faculty to combine the advantages of the VLE (that of a consistent user experience, institutional support, and control to the teacher) with many of the additional advantages of Web 2.0—a richer range of tools, and using the same tools that students are already familiar with (Elliot, 2007). The use of these Web 2.0 tools should, therefore, result in a win-win situation for students and teaching faculty alike.

Web 2.0 Technology: Panacea or Empty Promise in the Context of Large Cohort Project Management Education? The University Of Manchester Case Study

All undergraduate civil, mechanical, and aerospace engineering students at The University of Manchester undertake a compulsory spine of project management courses, one in each year of their four years of undergraduate studies. Each course is delivered to a single cohort comprising approximately 270 civil, mechanical, and aerospace engineers. It is the third year project management course which forms the basis of this case study. The typical age of this cohort is 21 years. The course aim is to challenge the students to think outside their engineering discipline about how companies operate, how they use projects to produce their products and services, and how they stay ahead of the competition.

In previous years, feedback on the project management spine was mixed with lack of academic challenge, large class size, and poor feedback listed as the most problematic issues. In response to this in 2009, the authors used The University of Manchester virtual learning environment, Blackboard Vista, and in particular, Web 2.0 tools such as podcasting and the social networking site Facebook to enhance the student learning experience on the course. The structure of the course on the VLE is shown in Figure 1.
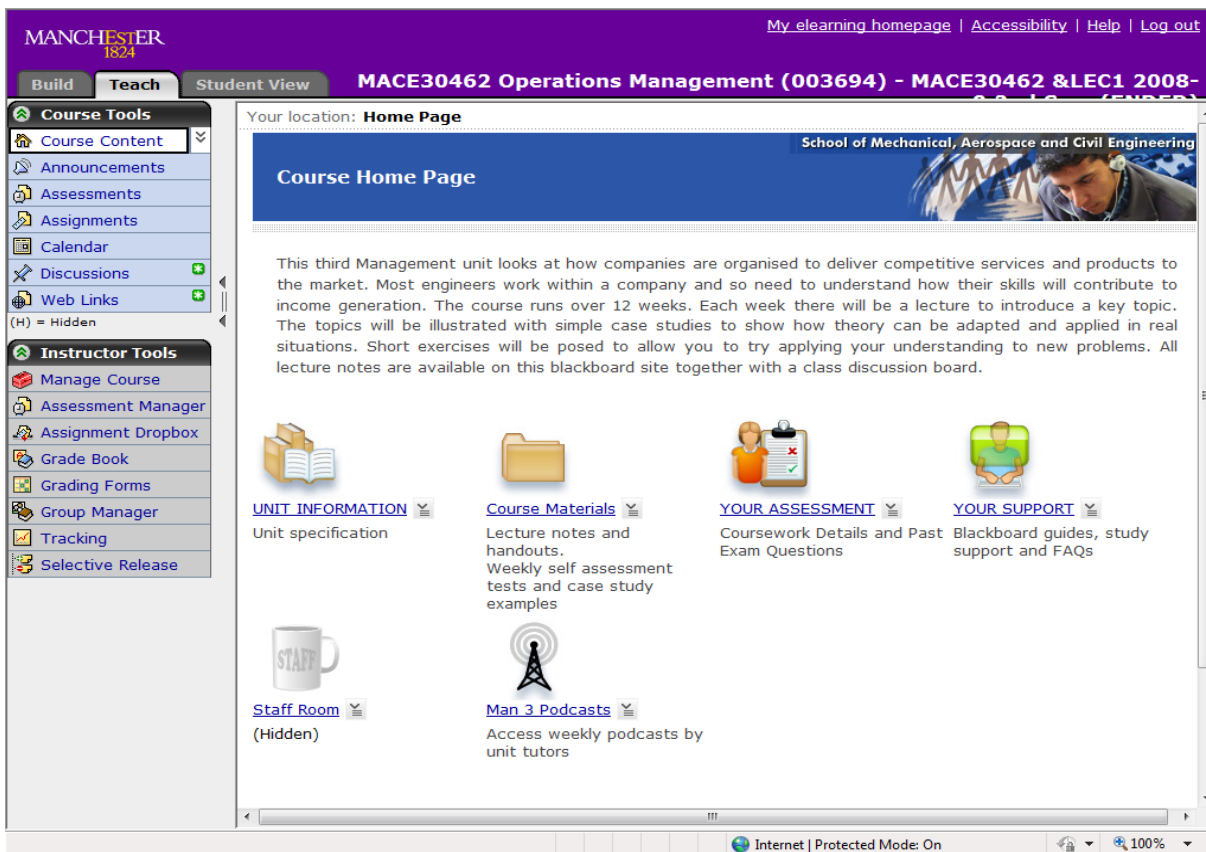
Figure 1. Screenshot of Course Unit Home page in Blackboard Vista

The key features of the course virtual learning environment are described below:

Course Materials: Here students can access and download all course materials including lecture notes and presentations. Students can also complete weekly non-assessed multiple choice quizzes on the material covered in the previous week's keynote lecture and investigate case studies from a variety of companies. There are also links to weekly directed readings from the course textbook.

Your Assessment: The VLE was used to organize the unit coursework. Students were asked to sign up on Blackboard to self-selected groups of three, which could be either single discipline or multi-disciplinary. The assessed coursework, which took the form of a group poster analysis of a project management problem allowed the students to collaborate both virtually and physically, and to draw on a range of online resources to produce the required poster. All 90 posters were displayed on the course unit Facebook group that was administered by the course lecturers. Here students could view each other's work, provide feedback, and invite friends and family to view their finished work. These posters also

provide a rich source of case-study material, and they will be available to future cohorts as exemplars of project management in the context of the company operation.

Feedback: The course lecturers recorded weekly five-minute podcasts, which were delivered via the VLE to provide direct feedback to the cohort on their performance in weekly multiple-choice quizzes. These multiple choice quizzes were designed to test the students' understanding of the face-to-face lecture material and help embed the concepts introduced in the lectures. The quizzes were automatically marked by the VLE and the authors were able to see which questions had caused the cohort difficulty. This allowed targeted rapid audio feedback to be provided to students. The podcasts were simple to record using the standard podcasting tool provided by Blackboard, and there were no technical glitches throughout the semester. A class discussion board was also provided within the VLE as a mechanism for students to discuss and resolve their own problems, or to pass questions to the course lecturers.

Key Findings on the Use of Web 2.0 Tools Within the VLE

At the end of the semester, the 2009 cohort of 270 were surveyed by questionnaire. The questions asked included how often students had accessed eight different elements of the course (including the keynote lectures and the Web 2.0 tools). Students were asked to the rank the eight main elements of the course unit in order of effectiveness as a learning tool as shown in Figure 2.

2) Please rank the following in terms of effectiveness as a learning tool:

1 being the most useful and 8 being the least useful

a) Attendance at weekly keynote lectures………………………… ❑

b) Accessing lecture notes on Blackboard………………………… ❑

c) Accessing MC quizzes and case study questions on Blackboard… ❑

d) Accessing the podcasts for feedback on quizzes………………… ❑

e) Using the class discussion board on Blackboard………………… ❑

f) Directed reading in the course textbook………………………… ❑

g) Viewing the Facebook poster presentation………………………… ❑

h) 1:1 discussion time with course lecturers…………………………… ❑

Figure 2. Excerpt from Cohort Questionnaire 2008–2009

The hypothesis that selective use of Web 2.0 tools within the VLE enhanced the student learning experience was tested through data gathered using the following questions.

3) The course tutors' use of Blackboard and other web2.0 tools enhanced my learning experience

Strongly agree ❑   agree ❑   no difference ❑   disagree ❑   strongly disagree❑

4) The course tutors' use of Blackboard and other web 2.0 technology should be replicated in other University of Manchester course units

Strongly agree ❑   agree ❑   no difference ❑   disagree ❑   strongly disagree❑

Figure 3. Survey Questions Relating to the Enhancement of the Student Learning Experience

In total, 146 questionnaires were completed, providing a response rate of 56%. Respondents' demographics can be broken down into 84% male and 16% female, with 95% of respondents being under the age of 25. Sixty-six percent of questionnaire respondents describe themselves as regular users of Web 2.0 tools and content—interestingly this figure is much lower than the 9 out of 10 of U.K. students quoted

by (Melville, 2009) as being familiar with social networking sites on arrival at university. The lower figure obtained by the questionnaire survey is probably explained by the fact that U.K. students comprise only two out three in the student cohort.

The questionnaire survey results were enlightening; respondent anonymity ensured open feedback and clear distinctions could be made between the course features that the students found to be effective tools for learning and those that were not. Blackboard usage statistics also revealed that students experimented in the early weeks of the course with all the available tools, before limiting themselves to those they found most useful. In this regard, the majority of students behaved as rational strategic learners, focusing their time and energy on the tools with the most benefit to them.

Figure 4 shows the most accessed tools on the course unit, and Figure 5 shows the respondents ranking of the effectiveness of these tools in enhancing the student's learning.
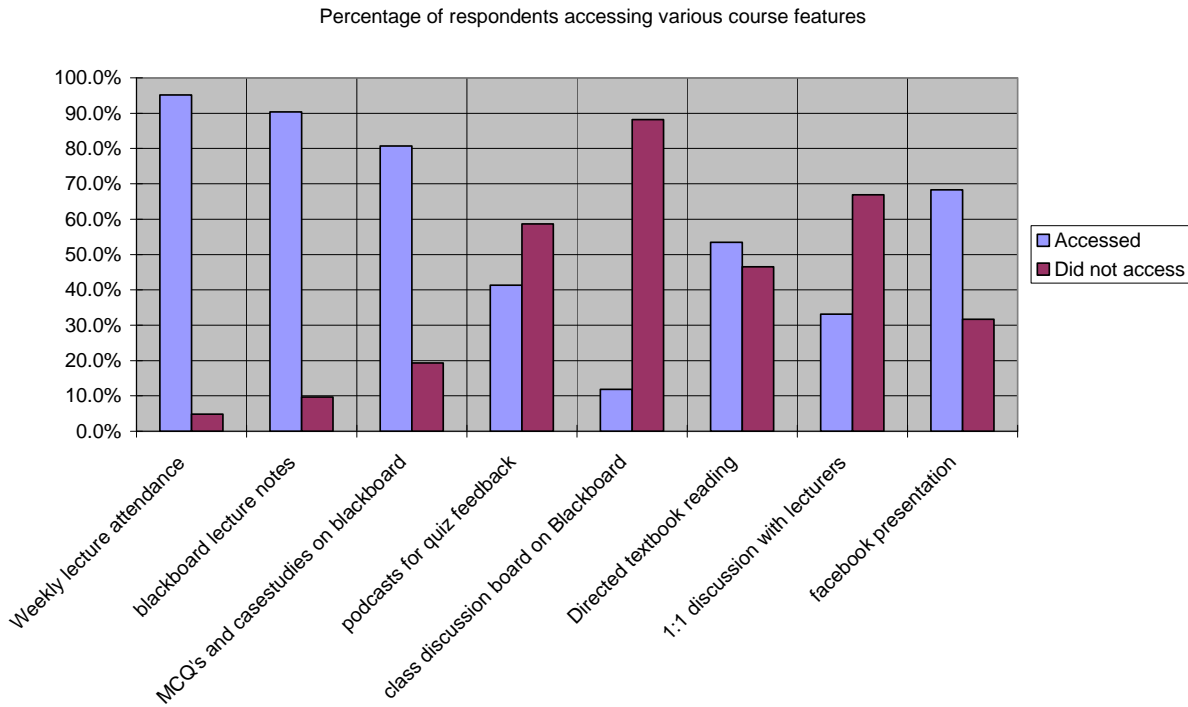

Figure 4. Percentage of Respondents Accessing Various Course Features

Student ranking of effectiveness of course delivery tools (rank 1=most effective and rank 8=least effective)
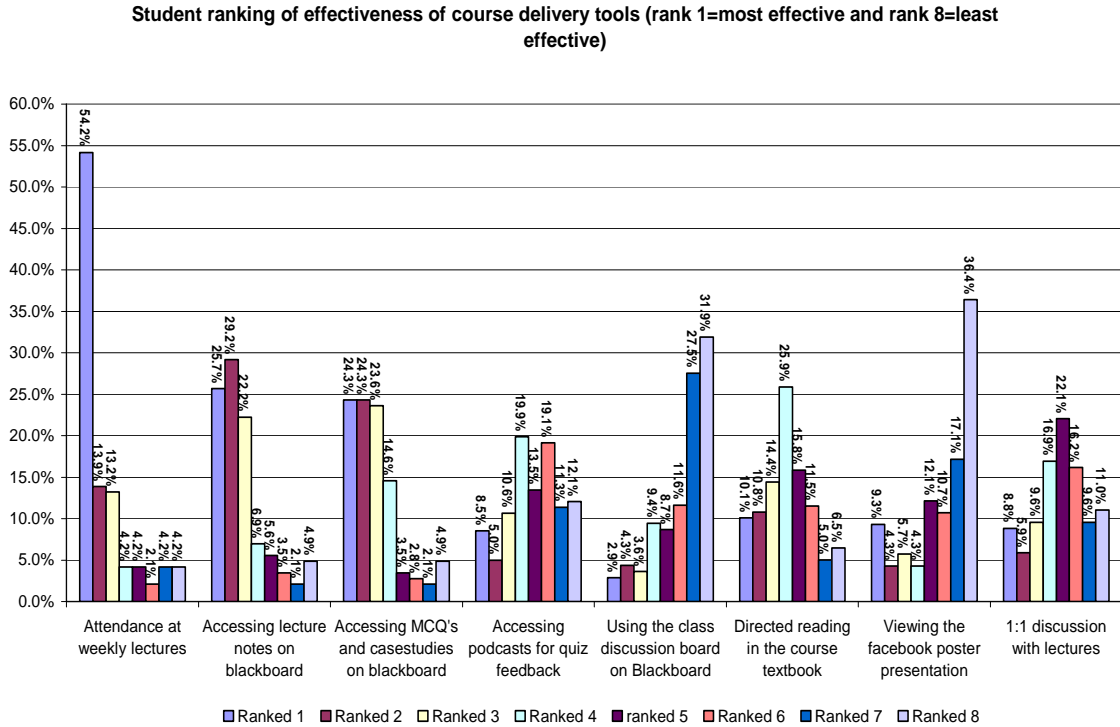

Figure 5. Respondents' Ranking of Effectiveness of Various Technology Tools

Taking a weighted average of the rankings in Figure 5 allowed the different technology tools to be ranked in terms of their effectiveness to students. This ranking is shown in Figure 6.

Learning Tool	Student ranking of effectiveness
Face-to-face weekly keynote lectures	1
Lecture notes available on VLE	2
Multiple choice quizzes and case studies	3
Directed reading in course textbook	4
1:1 discussions with teaching faculty	5
Podcasts of multiple choice quiz feedback	6
Facebook poster presentation	7
VLE class discussion board	8

Figure 6. Overall Ranking of Effectiveness of Various Technology Tools

The most effective and most accessed course unit feature remained weekly attendance at the keynote lectures, with over 90% of respondents attending some or all of the time. In addition, 54% of respondents

ranked the weekly keynote lectures as being the most effective tool for learning (Figure 5). This high ranking of the traditional face-to-face lecture demonstrates that, however large the cohort size, the delivery of keynote lectures by teaching faculty remains the cornerstone of higher education teaching. This finding is consistent with the view expressed by the JISC Student Expectations Report of 2007 which reported that face-to-face contact with lecturers was valued most highly by students (Ipsos, 2007).

The next most effective and most accessed features were the facility to download lecture notes from Blackboard and the ability to reinforce learning through multiple choice quizzes and case study analysis. This was a clear demonstration of strategic learning by the cohort, as the format of both multiple choice questions and case study analysis would be replicated in the end of semester examinations.

Less popular but still accessed by a majority of respondents were the textbook directed reading and interaction with the Facebook course group. Sixty-eight percent of respondents used Facebook to view each other's coursework; to comment on it and invite other friends to view it. However, Facebook's effectiveness as a learning tool was ranked seventh out of eight by the cohort. The additional comments section of the questionnaire also revealed that a proportion of students were not convinced of the usefulness of Facebook as a site for a virtual poster presentation. These students would have preferred to see the posters remain in the Blackboard environment. This reticence to engage with Facebook may be due to the cohort viewing Facebook as their own group space, not to be entered by teaching faculty (Locke, 2007).

Forty percent of respondents accessed the podcasts and just over 30% took the opportunity to have one-on-one discussions with the course lecturers. The effectiveness of the one-on-one discussions with lecturers and the podcasts were broadly similar in terms of effectiveness as a student learning tool being ranked fifth and sixth out of eight, respectively. The relatively low scoring of the podcasting was a surprise to the authors as, prior to the questionnaire survey results, it was believed that the podcasts were a valuable source of additional feedback to students. One explanation for this is that the majority of students were satisfied with the level of feedback provided in the automatic marking of the quizzes and did not require further explanation, leaving only a minority requiring the podcasts. Podcasting will be continued next semester but only following further discussion with the cohort over its content and format.

Only a small minority engaged with the VLE based virtual discussion board and it was ranked bottom in terms of effectiveness as a learning tool. When faced with a range of communication options, it would seem that students prefer to ask a question face-to-face to a lecturer at the end of a lecture rather than to post a question on a public virtual discussion board.

Support for the authors' hypothesis that the use of Web 2.0 tools within the VLE enhanced the student learning experience was overwhelmingly positive. Eighty-four percent of respondents agreed or strongly agreed that the use of Web 2.0 tools within the VLE had enhanced the student learning experience. Only 2.1% disagreed with this statement. Survey comments such as "Very impressed with how much material there is online to enhance and help prepare for the exam" and "I think the use of blackboard and web 2.0 tools of this course is very good and useful. Much better than the other modules we are doing" were generally very positive towards the authors' use of Web 2.0 tools within the VLE. However, the comments still show a propensity for strategic learning in that the most commonly posted comment was a request to make the multiple choice quizzes repeatable to aid in examination preparation. There were a number of negative comments posted too, for example, "technology shouldn't take away from face to face contact with lecturers" and "stick to lectures this isn't supposed to be a distance learning program." There were also a small number of respondents who described the VLE variously as "clunky" and "not user friendly" and more extremely "I think 'web 2.0 technology should be used but Blackboard is a complete nightmare to use. It's really slow, it only runs properly on IE, and requires Java plug-ins." This view confirms the one of the criticisms of VLEs, that in most cases the VLE offers an inferior Web 2.0 tool than the pure web 2.0 alternative (Craig, 2007).

The students' response to the question "Should the course lecturers use of Web 2.0 within the VLE be extended to other courses at The University of Manchester?" was emphatic too. Ninety percent of students agreed or strongly agreed that the use of Web 2.0 should be replicated in other courses, with only 1.4% disagreeing with this statement. While it may be argued that the phrasing of this question was somewhat leading, the response was still overwhelmingly positive. Additional student comments such as "If you are going to use it, it should be used school wide. Management is the only course that utilizes Blackboard to full effect." have been fed back to other teaching faculty.

Discussion

The findings of this case study are something of a patchwork. On the one hand, the surveyed cohort was overwhelmingly of the view that the faculty's use of Web 2.0 within the virtual learning environment had enhanced the student learning experience. However, the most effective tools for learning remained the face-to-face keynote lectures, the ability to download the lecture notes, and the provision of quizzes and case studies to test and embed the students learning. Nevertheless, there are a number of hypotheses and conclusions that we can draw out of the case study findings to inform current teaching practice and to identify lines of future enquiry in pursuit of the holy grail sought by university hierarchies—that of delivering cost effective and efficient, yet at the same time excellent teaching to large student numbers.

Technology is not a panacea. The survey response showed emphatically that the most effective learning tool for the majority of students remained the face-to-face keynote lectures. Technology was seen as an adjunct to the weekly face-to-face lectures and in no sense a replacement for it. This finding is in broad agreement with the earlier findings of the JISC Student Expectations Study (Ipsos, 2007). Technology should be carefully selected to meet the required pedagological outcomes of the course—in contrast to the at times scattergun approach taken by this study's authors.

Technology can encourage strategic learning. There was evidence in the questionnaire responses that the use of Web 2.0 technology within the VLE was fostering an element of strategic learning. Students focused more time on the tools, (for example, downloading lecture notes and practicing multiple choice quizzes) that were most explicitly aligned with delivering the desired course outcomes, i.e., passing the course.

Take up of specific web 2.0 tools such as podcasting and social networking site Facebook was lower than expected. The findings of the survey revealed a reticence among the student cohort to engage with the Facebook group poster site. This lends weight to the notion that students view Facebook and other social networking sites as "their" space—a private domain in which teaching faculty are generally not welcome (Locke, 2007). The authors will not be repeating the use of Facebook in the next academic year.

The relatively poor take up of the weekly feedback podcasts was also surprising to the authors, given previous work on the positive results of delivering feedback to engineering students using audio (Nortcliffe & Middleton, 2008). It may be that the podcast delivery was uninspiring, or that the one size fits all feedback did not add value to the individual students.

The use of technology did enhance the student learning experience. The evidence of this case study clearly shows that the use of web 2.0 and the VLE enhanced the student learning experience in large cohort engineering management education. This confirms the view of Sharpe et al. (2006) that "Student response is overwhelmingly positive to the provision of on-line course information to supplement traditional teaching" (p.3). This case study provides further empirical evidence that technology used appropriately within a university's virtual learning environment can overcome some of the challenges in large cohort teaching: providing improved feedback, ensuring all students have access to core course material and tools to test their understanding of course materials, and improving student interaction with teaching faculty.

Less conclusive was that technology promoted increased collaboration among the student cohort. This was probably due to inappropriate choice of Web 2.0 tool—in that the course Facebook group was not

used extensively by students for collaboration. To this end, future work will be focused on exploring more effectively the use of web 2.0 as a vehicle for promoting collaboration.

Conclusions and Future Work

The findings of this study demonstrate both the benefits and the limitations of the selected use of Web 2.0 tools within the virtual learning environment in large cohort engineering management education. Technology is not a panacea but implemented alongside traditional teaching methods, it has been shown to enhance the student learning experience.

The authors now wish to build on the learning from this case study and explore more effectively the use of Web 2.0 as a vehicle for promoting collaboration. To this end, the use of wiki's for assessed group coursework in large cohort project management education will be tested during 2009/2010. Locke (2007) classified wiki's as publishing space and hence a wiki is perceived as a public rather than a private space. We hope the use of wikis will overcome any remaining barriers to students using Web 2.0 as a collaboration tool for assessed coursework. Future work will investigate cultural barriers to the adoption of Web 2.0 in overseas-dominated post-graduate taught programs at The University of Manchester.

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