

Impact of using Moodle as an educational management tool to enhance learning for on campus and external mode electrical students at USQ

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Abstract: *The Electrical and Electronic Discipline within the Faculty of Engineering at University of Southern Queensland (USQ) is predominately a distance education provider. While the discipline provides flexible electrical programs for school leavers it also extensively provides upgrading programs to local and international industry based electrical technicians to become professional engineers. To meet the educational needs of students from such diverse backgrounds and to provide an internationalised curriculum creates unique challenges for electrical academics. The quality and timeliness of responses to technical queries, from students studying in China, India, Malaysia, or in remote mining towns in Australia, needs to be the same as for on-campus students. To achieve this aim, academics at USQ use learning management system software such as Modular Object-Oriented Dynamic Learning Environment (Moodle) as a tool to enhance learning in both external and on-campus delivery modes.*

This paper outlines the preliminary results of how improvements have been achieved using Moodle to enhance learning in Electrical Technology, a first year course. Data obtained so far indicate that greater effort is required by staff to improve student participation on the Moodle discussion forum. Interesting results presented in this paper also show that placing course materials, lectures, assignment marking schemes and solutions on the study desk in Moodle has led to a drastic reduction in attendance for on-campus lectures and tutorials. This trend suggests that the future role of engineering academics is likely to change from the “classical lecturing” to one of “facilitating learning” using learning management software such as Moodle.

Introduction

In 2009 USQ had about twenty five thousand student enrolments of which 75% studied in the distances mode. External enrolment in courses offered by the Electrical and Electronics Discipline also reached 75%. The discipline offers courses at Associate Degree (AD-2 years), Bachelor of Technology (BTech-3 years) and Bachelor of Engineering (BEng-4 years) levels in the following majors:-

- Computer systems engineering major
- Electrical and electronic engineering major
- Instrumentation and control engineering major
- Power engineering major
- Software engineering major

The benefit of the 3 tier programs is to give students the flexibility of entry and exit at any of the 3 levels depending on their prior qualifications and experience. All the programmes are accredited by the Institution of Engineers Australia.

To accommodate requests from the electrical industries, non electrical courses such as *Introduction to Global Positioning System* (Surveying) and *Construction Engineering* (Civil), had to be added as electives in its electrical and power majors. Incorporating the needs of the power industry by providing flexible programmes has led to the growth in external enrolments shown in Figure 1.

The focus of this paper is the first level course Electrical Technology (ELE1801) studied by students enrolled in all the electrical and mechanical majors. The teaching and learning quality of ELE1801 significantly impacts student learning in subsequent electrical courses and student retention similar to the dynamics course researched by Fang (2009). The composition of on-campus and external students making up the enrolment in this course from 2004 to 2009 is shown in Figure 1. The increase in external numbers from 69 to 183 during this period has been good for the Faculty as it more than compensated for the decline in on-campus enrolments. However, this increase in external numbers has also been accompanied by a high failure rate and a high percentage of students not completing the course. This in turn has affected the retention rate of engineering students in the electrical program. This paper presents the results of using Moodle, a *learning management system* (LMS), to enhance learning and hence reduce the failure rate in ELE1801.

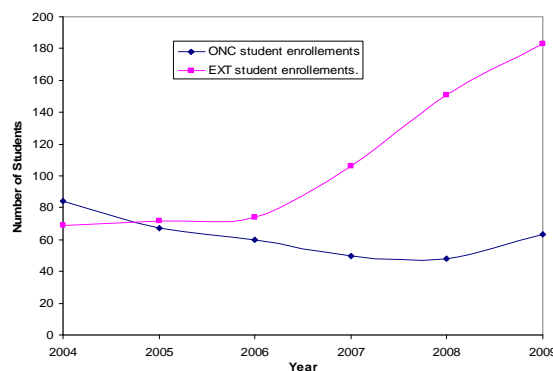


Figure 1: Student enrolments for external (EXT) and on-campus (ONC) modes

External and on-campus student learning support

Two hours of lecture and one hour of tutorial per week are scheduled for the on-campus students. They are also required to attend 12 hours of compulsory practical activities directly related to ELE1801 content. In addition to the scheduled lectures and tutorials, 4 hours per week is allocated as student consultation time to give students with special learning needs the opportunity to seek support directly from ELE1801 academic staff.

External students are provided with study materials which include a Study Book, a Workbook with worked examples and formative tests and an Introductory Book that includes study schedules and summative assignments. Whilst these study materials are provided free to external students, on-campus students have a choice to purchase them. Emails for tutorial support or queries from students are received by academics via USQ Assist in Student services. USQ has a policy that academic staff must respond to these emails within 48 hours. Students are also required to attend 12 hours of compulsory practical activities directly related to ELE1801 content. However, these activities are part of the 40 hours residential school external students are scheduled to attend each year. Unlike on-campus students the scheduling of the 12 hours practical exercises does not coincide with when ELE1801 is offered.

In 2005, WebCT was introduced as a LMS to provide an online proprietary virtual learning environment for greater interaction between on-campus and external students and teaching staff in ELE1801. The benefits of creating greater interaction between full-time and part-time undergraduate students have been researched by Davies *et al* (2008). Their work describes how interaction between the two groups of students support and enhance fulltime student experience. WebCT allowed teachers and students to interact via the course discussion board, mail system and live chats. It also allowed teachers to add extra course documents to facilitate learning. However, WebCT had problems using standard browser navigation tools and did not include an individual student activity report. WebCT was replaced by Moodle in 2008.

Moodle

Moodle has been designed to promote social constructionist pedagogy. It is an ‘open source software’ that allows users to modify and change codes to meet their specific needs. Students can actively use it to gain new knowledge by interacting with their learning environment and not rely on their teacher as the only information source for the course. Andrews and Daly (2008) concluded from their study that many elements of constructivism such as, social negotiation and knowledge building will make Moodle a useful tool to support collaborative teaching and learning across four partner universities in Australia.

One of the strengths of Moodle is that it provided individual student activity report. A copy of the 2008 activity report of an external student is shown in Figure 2. This external student did not view any of the lecture material, assignment marking schemes, detailed assignment solutions and other important course material on his study desk in Moodle. It seems that he was only interested in the information about the final examination. This information was viewed on the 8th of November and the examination was on the 12th of November. Hence, one of the benefits of activity report is that it provides useful information about students’ learning styles. Coffield *et al* (2004), commenting on teaching styles and its implications on pedagogy, state that “A knowledge of learning styles can be used to increase self-awareness of students and tutors about their strengths and weakness”.

ELE1801_2008_2: Activity report (outline)

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ELE1801_2008_2: Activity report (outline)

Page 2

The screenshot displays a Moodle interface for a student activity report. At the top, it identifies the course as 'ELE1801_2008_2: Activity report (outline)' and shows the user is logged in as 'Ron Sharma'. The course title 'Electrical Technology' is prominently displayed. The navigation menu includes options for 'Profile', 'Forum posts', 'Blog', 'Notes', 'Activity reports', 'Outline report', 'Complete report', 'Today's logs', 'All logs', 'Statistics', and 'Grade'. The main content area is organized into two columns of weekly activity reports, labeled 'Week 0' through 'Week 15'. Each week entry lists specific activities, such as 'Transformer Lecture', 'Three phase lecture', 'Assignment 2 marking scheme', 'Assignment 1 solutions', 'Induction Machine', 'Assignment 1 marking', 'Assignment 2 extension to Wed 15/10/2008', 'Students MUST NOT proffer their assignment work', 'Formula sheet for the exam', and 'Assignment 2 solutions'. For several weeks, the report includes view counts and dates, such as 'Saturday, 8 November 2008, 12:01 PM (202 days 1 hour)'. The student's activity is minimal, with only a few views recorded for the exam-related information in weeks 12 and 15.

Figure: 2 Student Activity report

Teaching staff were able to estimate the use of WebCT from student participation on the course discussion forum and the mail system. However, the student activity report provided much more accurate Moodle usage data to allow staff to contact and encourage those students who had not used the LMS in the first three weeks to do so. As a result, the percentage of students who did not use

Moodle dropped from 48% in 2008 to 38% in 2009. However, it should be pointed out that of the 62% who used the recourses on Moodle, less than 15% used its discussion forum. Both external and on-campus students preferred to form their own little study groups. External students did use the LMS to establish contacts with other students within their work location to form small study groups. A typical example of such a request from an external student: *Is anybody in this course interested in joining in on an online study group this term? I have organised a WIMBA session at 6:30pm Wednesday. Alternatively, if you are in Brisbane we could organise a face to face group. I live in Ferry Grove.*

On-campus attendance as a result of using LMS

The first noticeable change since the introduction of LMS in 2005 was the decline in lecture and tutorial attendance. Lecture attendance fell from more than 70% in 2004 (no LMS) to less than 30% in 2009. There are several studies that have investigated the impact of using electronic media on lecture attendance. Brotherton et al (2004) found that 30% of students surveyed agreed that *eClass encourages students to skip class*. In the study carried out by Harley et al, 25% of the students reported replacing lectures by webcasts. However, Traphagan et al reported that there was a link between the types of resource provided electronically and lecture attendance. They found that the *availability of additional course materials online, such as Power Point slides and lecture notes, had a greater negative impact on classroom attendance than webcasting*. In ELE1801, as shown in Figure 2, a lot of additional information is provided on Moodle.

The attendance to non-attendance ratio (30/70) can also be explained using the outcomes of recent studies related to instructional methods carried out by Pashler et al (2008). Their review of different teaching styles concludes that *“the instructional method that proves most effective for students with one learning style is not the most effective method for students with a different learning style”*. The lectures and course material available from Moodle and interactions in small groups was an effective learning style for about 70% of the students. The remaining students preferred attending face to face lectures. They also found learning from the hard copy of the course study materials and by directly emailing the teaching staff to answer technical questions more effective. To learn in an interactive environment was not an effective learning method for this group of students.

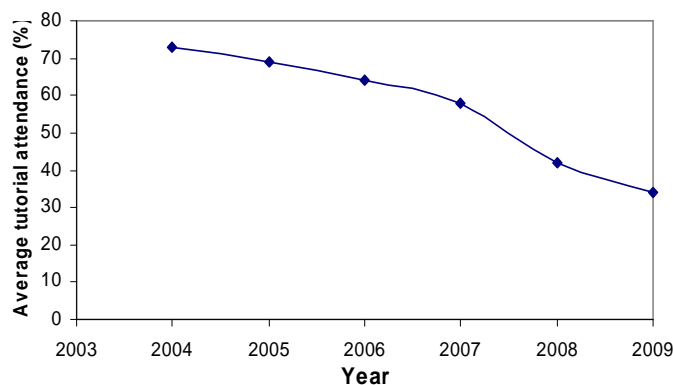


Figure 3: Average tutorial attendance

Figure 3 shows a similar decline in numbers (73 % to 34%) for the average tutorial attendance for the same period. However, a breakdown of weekly tutorial attendance shown in Figure 4 indicates that attendance rate is almost half that at the end of the semester. One of the reasons for this was that some of these students took a few weeks to become familiar with the Moodle. Once they found the additional resources on Moodle useful and learning by interacting with other students effective they did not see the need to attend tutorials. Hence the gradual fall in attendance.

Student assessment for the course comprised of 2 assignments each worth 20% and an examination worth 60%. All marked external assignments are returned to students via post while on-campus students collected their assignments from the engineering administration office.

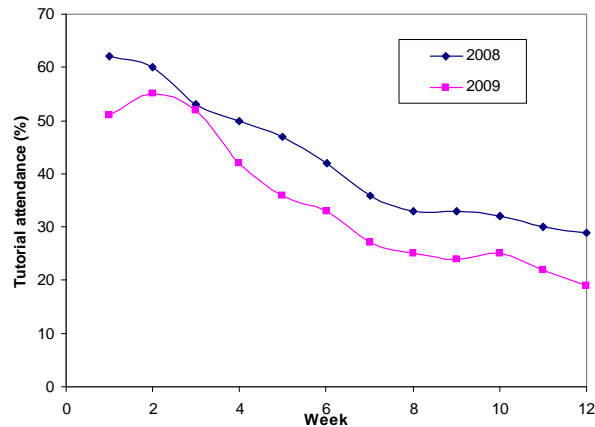


Figure 4: Weekly breakdown of tutorial attendance

Figure 5 shows in 2004, prior to the use of LMS, only 14% of the on-campus students did not collect their marked assignments. From 2005, assignment marking schemes and solutions were made available on the LMS a week after the assignment due date. As a result, the number of uncollected marked assignment rose to 53% in 2008. Students were able to mark their copy of the assignments (all students are required to keep a copy of their assignments) using the marking scheme and the solutions. When asked why they did not collect their assignment, a student replied “*I already know how I did and the questions where I made mistakes so there is no point in taking my assignments home*”. Uncollected assignments were an indication that those using the material on Moodle found it useful and effective.

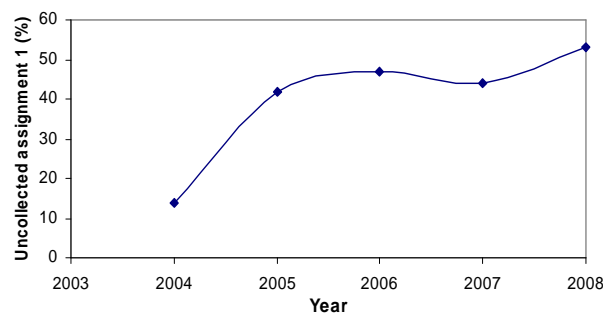


Figure 5: On-campus uncollected marked assignments

Overall Results

At USQ, a student who fails to complete ELE1801 receives one of the following grades, FLW (Failed-late withdrawal), FNC (Failed- did not complete), FNP (Failed-did not participate) and FNS (Failed-Did not sit). Some of the reasons for incomplete grades include employment commitments, poor time management, poor results in pre-requisite courses and medical issues. In many cases students did very well in their first assignment but did not complete the course. Two reasons provided by students for not completing ELE1801 are given below.

Example 1: Student received 95% in assignment 1 and provided this note from his employer for not completing the course: *Due to unforeseen events arising at the Olympic Dam Operation, all current employees have had their rosters adjusted to align with the amended contract. For some, this will include the cancellation of all scheduled holidays, a compulsory job share role and to be on standby to fly out within 24hours.*

Example 2: student received 83% in assignment 1 and did not complete the course because: *with full time work commitments, my first child and our new house still under construction I have found it hard to continue at this time.*

These examples show that incomplete fail grades were not influenced by teaching or learning styles. Hence, the use of LMS did not influence these incomplete grades. In Figure 6, while the on-campus incompleteness rate was around 20% the external rates increased from 15% in 2006 to 28% in 2009.

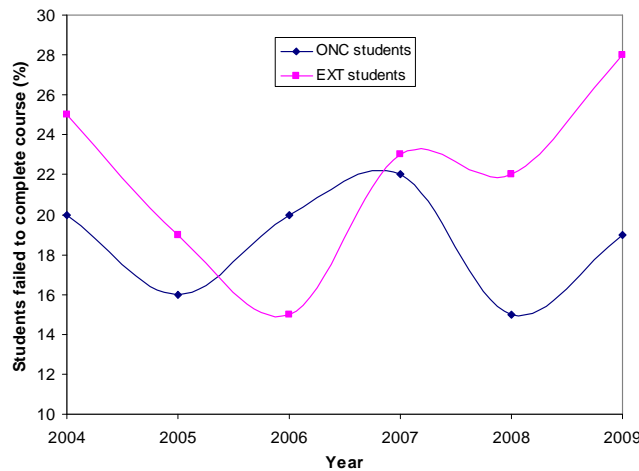


Figure 6: Rate of incompleteness of course

External students face time management challenges. Kember *et al* (2004) identified three coping mechanisms: sacrifice, support and negotiation of arrangements related to self, family, work and social life. It is difficult for fulltime employed young adults to compromise work commitments (particularly during economic boom periods) and to put restrictions on social life. As a result in 2008 19% of the students who failed the course had similar activity report to that shown in Figure 2. That is, they looked at Moodle 5 or less days before the examination and did not follow the recommended study schedule for the course.

The failure rate shown in Figure 7 does not include incompleteness figures. Students in this category attempted all summative assessments and failed to obtain 50% of the marks for the course. They were all awarded "F" grades. The changes in teaching methods and learning styles by using LMS have had some positive influence on this grade. Figures from 2006 to 2009 show a fall in the number of "F" grades from 35% to 22% for on-campus and 35% to 26% for external. In addition to the decline in failure rate, the credit and distinction grades awarded increased by 5% and 7% respectively.

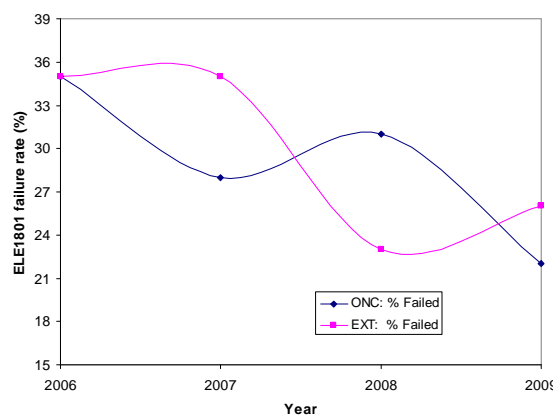


Figure 7: Failure rate in ELE1801

Of the 48% of the students who did not use Moodle in 2008, 67% failed ELE1801. Of 33% of the students who did not use Moodle and passed the course, four received overall marks above 85% (HD grade). Therefore this result confirms that the learning methods effective for one group was not effective for another group and therefore supports the research findings of Pashler *et al* (2008).

Discussions

The use of Moodle provided a forum for teaching staff and students to interact. It allowed flexibility to facilitate learning and teaching. While there has been reduction in failure rates, these are preliminary results as the project is ongoing. For all the benefits of using LMS to be realised, the use of Moodle has to be increased from 62% (2009) to 100%. To help achieve this aim, from 2010 assignments questions and instructions will only be available from Moodle. This approach introduced in another electrical course ELE3803 in 2010 seems to be working. About 25% of students enrolled in ELE3803 who contacted academic staff via email for assignment questions were asked to download them from Moodle. The activity reports of these students show that in the process of downloading their assignment questions they have viewed other important material on Moodle.

To reduce delays in returning marked assignments to overseas external students, electronic submission and marking of assignments via Moodle was introduced in 2009. Despite clear instructions being provided 14% of the students who read these instructions on Moodle elected to submit hard copies. These students used the method they were comfortable with rather than change to a new method. To ensure that they did change the following message had to be sent to them individually; "Your activity records show that you looked at the assignment details and tips for electronic submission of assignments on 17 July at 5.05 pm. However, you posted a hard copy of your assignment. If you want your assignment 1 marked please make sure that it is submitted electronically today." After this message, most of these students submitted their 2nd assignment electronically. However, electronic submission and marking of assignments had little influence on the final results was because assignment marking schemes and the detailed solutions were posted on Moodle.

Finally, as the use of LMS increases and the lecture attendance declines, the traditional face to face lectures will no longer be available. Instead, at the start of a semester there will be only one or two lectures to explain how to use all the lecture and tutorial support material on the LMS.

References

- Andrews, T., Daly, C., (2008) Using Moodle, an open source learning management system, to support a national teaching and learning collaboration. *Proceedings of 2008 AaeE Conference*, Yeppoon, Australia.
- Brotherton, J., & Abowd, G. (2004). Lessons learned from eclass: Assessing automated capture and access in the classroom, *ACM Transactions on Computer-Human Interaction*, 11(2), 121–155.
- Coffield, F., Moseley, D., Hall, E., Ecclestone, K. (2004) Learning Styles and Pedagogy in Post-16 Learning: A Systematic and Critical Review. *Learning and Skills Research Centre*. Available from <http://www.hull.ac.uk/php/edskas/learning%20styles.pdf> [accessed 21 January 2010]
- Davies, T. J., Davies J. W., (2008) Using part-time students to improve the student experience", *Engineering Education: Journal of the Higher Education Academy Engineering Subject Centre*
- Fang, N. (2009) Electronic Classroom Response System for an Engineering Dynamics Course: Student Satisfaction and Learning Outcomes *Int. Journal of Engineering Education*, Vol. 25, No. 5, pp. 1059-1067.
- Harley, D., Henke, J., Lawrence, S., McMartin, F., Maher, M., Gawlik, M., (2003). Costs, culture, and complexity: An analysis of technology enhancements in a large lecture course at UC Berkeley. *University of California, Berkeley, Centre for Studies in Higher Education*. <http://repositories.cdlib.org/cshe/CSHE3-03> [accessed 16 March 2010]
- Kember, D., Leung, D. Y. P., (2004) Relationship between the employment of coping mechanisms and a sense of belonging for part-time students, *Educational Psychology*, 24 (3), 345-357.
- Pashler, H., McDaniel, M., Rohrer, D., Bjork, R., (2008) Learning Styles: Concepts and Evidence, *Journal of the Association for Psychological Science*, Vol. 9, No. 3, pp 105-119.
- Traphagan, T, Kucsera, J.V., Kishi, K., (2009) Impact of class lecture webcasting on attendance and learning, *Journal of Educational Technology Research and Development*, Vol. 58, No. 19 to 37.