



## **Components of eLearning and Progression: Radical Innovation in Built Environment Teaching**

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### **ABSTRACT**

Bricks and mortar are common building materials and without them the building would fail to fulfil its purpose. Alternative building materials have become more acceptable and desirable for modern residents. The use of alternative materials in construction is analogous to eLearning as a radical innovation in the education process. In this paper, the design and effective delivery of eLearning in Built Environment programmes (distance learning) is examined. Its purpose is to enhance student progression while decreasing attrition. The basic design components of an eLearning environment are presented and evaluated through findings from a mixed-method study. We find that students who take up components of eLearning are more aligned with their progression goals than those who do not. An area for further study has been identified as the portability of content on mobile devices.

*Keywords:* Built environment, eLearning, radical innovation, progression, eLearning components

### **INTRODUCTION**

Radical innovation in the educational arena is critical to the long-term sustainability of related institutions (McDermott & O'Connor, 2002). However, support for such radical developments are often stifled, pushed aside by lower risk conventional approaches (Dougherty & Hardy, 1996). This paper examines eLearning as a radical innovation, as revolutionary as Phillips' introduction of distance learning in the 1720s.

On March 20, 1728 when Caleb Phillips from Boston advertised in the local news that he would mail weekly shorthand

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lessons to students in the countryside, no one realised that it would be start of the distance education revolution. It would take another 275 years or so before distance education would further evolve, this time from real to virtual. Starting slowly, it was not until the late 1970s that interest in these specific aspects of education started gaining momentum (Holmberg, 1995; Bower & Hardy, 2004). Understanding why students chose alternative options to didactic teaching modes became very relevant to higher education providers trying to maximise student success, provide a beneficial student experience, and especially, to understand why they stay and pass, or leave and fail (Bean, 1990; Tinto, 1995; 2005). The benefit to institutions is also reflected in their own success, prestige and funding. Technology, flexibility and accessibility have become increasingly important, and it is evident that educators and institutions need to keep abreast of technology and that new knowledge and abilities within the institution are required (O'Neill, Singh, & O'Donoghue, 2004; Tyler-Smith, 2006; Kukulska-Hulme, 2009).

Technological changes inevitably produce changes in other components of education (Ally & Samaka, 2013). Exchanging face-to-face interaction for eLearning not only allows flexibility for individuals but also widens the market for higher education. ELearning allows different utilisation of some basic components such as time, cost and space. It provides alternative utilisation of time

previously considered "dead time" e.g. time spent on a train while commuting to work. ELearning also utilises different components in the architecture of the programme, such as podcasts and video conferencing tools, to satisfy the requirements of an effective teaching programme. Some basic components are used differently while others are themselves different; together, these constitute the radical innovation that eLearning provides to ensure the suitability of the programme construction for industry and society.

Not all disciplines are able to incorporate all new components of eLearning. Some disciplines require students to complete face-to-face practicums or attend residential schools to satisfy academic learning outcomes and professional accreditation requirements. Aligning the cohort, subject content, technology and delivery is vital in order to establish a successful eLearning programme (González, 2010). Understanding what students want is important in facilitating an eLearning market penetration. Subject content and resource materials provide support to an isolated learner (Sarah, Carol, Tony, & Adam, 2007; Croft, Dalton, & Grant, 2010). Equally important is to determine how student progression is affected by utilising eLearning affordances for radical innovation in Built Environment (BE) teaching.

Traditionally, student progression has been assessed by measuring academic attainment, defined as the achievement of the minimum pass rate specified by the

academic institution, attainment of the minimum number of units of credit for a defined period and in some cases, passing any compulsory barrier units of study, field or clinical work or practicum (Robinson, 2004). Progression rate is defined as the percentage of effective full time student load (EFTSL) passed compared with the EFTSL assessed (McInnis, Hartley, Polesel, & Teese, 2000). Universities struggle, and have been struggling to arrest student attrition for the last 40 years (Godfrey, Aubrey, & King, 2011; Willcoxson, Cotter, & Joy, 2011; Pienaar, O'Brien, & Dekkers, 2012). With the increase of eLearning in universities, the problem is more complex. In 2010, 81% of the almost 1 million students were studying face-to-face, 12% were engaged in distance education with the remaining 7% engaging in a blended model (ABS, 2012). At Central Queensland University (CQU), 57% of students were enrolled in distance education in 2014. With the shift in the student cohort towards distance education, attention has to be given to maintaining acceptable levels of student retention while satisfying industry expectations (Love, Haynes, & Irani, 2001; Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011).

All students in the BE programme at CQU are enrolled in the distance education mode. The BE programme here and in most of the 29 other Australian universities which offer the same programme have a high attrition rate (over 50% in the first year at CQU). As a consequence, many institutions have incorporated

mechanisms to curb attrition, including higher tertiary entry requirements, having bridging subjects, and subjects designed specifically to alleviate the feeling of disconnect particularly experienced by distance education students (Ariadurai & Manohanthan, 2009; Pienaar et al., 2012).

The BE programme brings together a variety of established applied disciplines and professions including engineering, design, town planning, building surveying and legislation, quantity surveying and construction management (Frank, 2005; Zillante, 2007). Traditionally, research in the Built Environment discipline, like other applied science disciplines, was problem-focused with pragmatism as its underlying knowledge paradigm (du Toit & Mouton, 2013).

This paper discusses the design of eLearning subjects in the BE discipline, their utility and perceived impact on the progression by students and their career. In so doing, it shows the effectiveness of the radical innovation of eLearning in the teaching of the Built Environment programme.

## **THE BUILT ENVIRONMENT (BE) AT CQUNI**

Five academic programmes across three disciplines make up the BE suite of degrees at CQU. Both bachelor and associate degrees for Building Design and Building Surveying and Certification and a bachelor for Construction Management are offered here. All programmes are delivered solely in distance education

mode and are fully accredited by three professional organisations i.e. Australian Institute of Building, Australian Institute of Building Surveying and the Building Designers Association of Australia. The BE programme at CQU has about 550 active students.

Commencing in the late 1990s, the programmes were designed for distance education with major inputs from industry partners and employers. Students were provided with hard copy reference materials for study within a given time frame of one term. Lecturers were available to help students through telephone or email and students relied heavily on employer support for study progression. Students were required to complete between 100 and 120 days of industry employment before graduating. Assessments were submitted via the postal system, assessed by the lecturer and returned to students, again by post. This was a slow, costly and troublesome method as many assessments never arrived (or were never sent) which resulted in intensive and frustrating rework for both students and academics.

### **ELEARNING IN BE – THE RADICAL INNOVATION**

With the introduction of the learning management system (LMS) at CQU in the early 2000s, the programmes were presented in an electronic format, initially to Blackboard, and then to Moodle in 2010. Moodle is a free open-source LMS which can be customised to produce modular web-based subjects. It is used in

many Australian universities and overseas. Each subject in the programme has an individual Moodle presence (site) and all programme materials are distributed through the Moodle LMS. By 2012, all resource materials, contacts and student engagement activities were centralised on Moodle where students could access and download reference materials. Students now have to print their own resource materials which initially created a set back to the new initiative of onscreen reading. From 2012, subjects had to be fully online with assessment submissions, marking, and forum activities as well as downloading resource material. Since the introduction of Moodle, there have been five fundamental upgrades of the system and the University is currently running Moodle release 2.7. The LMS provides the foundation, the base slab, for the construction of an alternative solution to BE education.

The radical innovation introduced new components into the architecture of the Moodle LMS site that were better suited to the particular cohort of students. With 95% of students employed and devoid of free time for face-to-face activities, it became necessary to expand options to remove isolation from the cohort. Asynchronous podcasts were introduced as a pilot programme for the university and expanded to include synchronous webinar sessions. Initially the BE programme at Central Queensland University (BE@CQUni) utilised WebEx as a webinar platform, but in 2012, this was replaced by Blackboard Collaborate (BBCollaborate)

(integrated into Moodle). The decision to introduce BBCCollaborate university-wide was given impetus by the identification of key features required by the BE@CQUni team for online delivery. Students can access online recordings at any time and have reported that “no lecturer can be as patient as a recording”.

The BE programme developed a simple layout that is user friendly and accessible, now adopted university wide. The simple design limits cognitive load for students as all Moodle websites have a similar look and feel.

As can be seen from Figure 1, all BE@CQUni Moodle LMS sites would include four main sections.

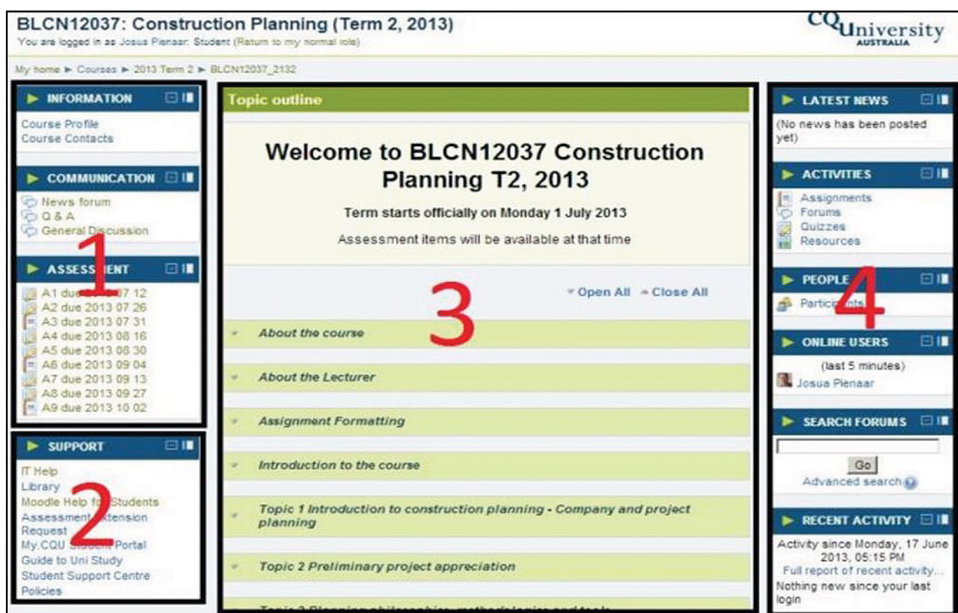


Figure 1. BE@CQUni Moodle LMS Design

### Subject Navigation and Information – Section 1

Navigation is located at the left of the interface. All subject activities and assessments will appear in the navigation pane (Fig. 2). The three most important pieces of preterm information are displayed first, namely the subject profile, subject communication methods and assessment

tasks. Students can also access their assignment tasks from here which are sorted chronologically by due date. Students can also use the various forums such as Q & A to interact with staff or General Discussion for chats not requiring lecturer input. The News Forum is used by lecturers to distribute subject wide information to all students enrolled in that subject.



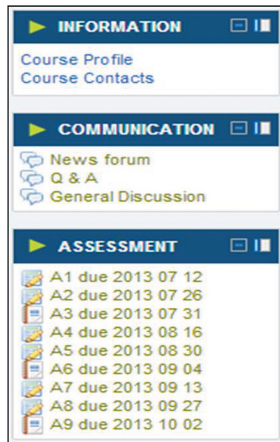


Figure 2. Navigating Moodle

### Scaffolding System –Section 2

Scaffolding is the term widely used to describe effective learning support (Vygotsky, 1997). The support system (Fig. 3) is located at the left of the interface, directly below the assessment tasks. A list of varied support systems including IT help, library help and student support centre is provided. In addition to the scaffolding system, the lecturers should also clearly state when they will be available for assistance.

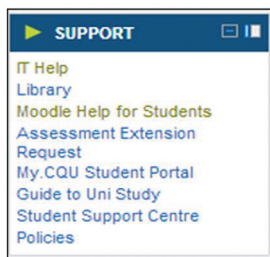


Figure 3. Scaffolding

### Collapsed Topics – Section 3

The collapsed topics are located in the middle of the interface and a sample design

is shown in Figure 4. Only core elements of each topic, such as textbook, additional readings and workbook, are presented in the collapsed topic of each week. This is to ensure that the core elements are seamlessly joined thus avoiding any extraneous load. To further reduce student confusion, in 2012 the BE@CQUni concluded that all subjects should be uniform in design. By ensuring the layout of each LMS site is the same throughout all subjects of the program, students know where to find the relevant information quickly and easily. Ease of use, logic and common-sense are all factors that dictate the current layout of the LMS. Like a modular building, the consistency of the Moodle layout means that each subject has a prefabricated design so that students can easily find their way from one (learning) space to another.

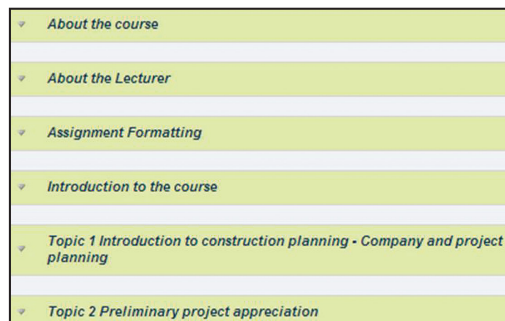


Figure 4. Collapsed topics

### Interaction with Other Students – Section 4

The online users can be seen at the right of the interface. The lecturer will not always be available to answer questions or clarify ambiguities. Showing the online

users (Fig. 5) can enhance the interaction among students by sharing ideas and answering questions. This facility also supports various other activities such as the Collaborate sessions that the subject might require students to complete or participate. Enhancing the virtual campus environment aims to reduce the feeling of “remoteness” for distance education students.

As of term 1 2012, all BE@CQUni subjects also have an individual BBCollaborate “Tea Room” (Fig. 5). The tea room allows students to interact with each other, independent of the lecturer, and control the online webinar meeting room. Using this facility, students report that they can easily facilitate discussions and seek clarifications in the absence of the lecturer.

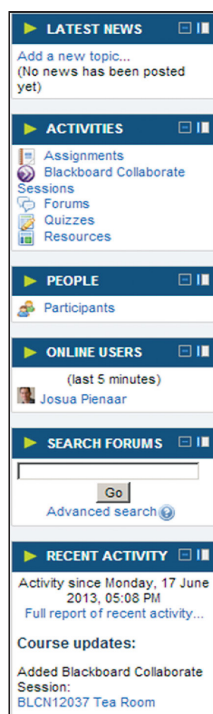


Figure 5. Student interaction

## STUDY OVERVIEW AND DISCUSSION

Evaluation of these design elements in terms of their utility to foster student progression was investigated as part of a larger sequential mixed methods study (Abowitz & Toole, 2010; du Toit & Mouton, 2013). This approach consisted of an archival analysis of student progression, followed by an online survey with descriptive trend data analysis of factors impacting student progression. The findings identified student demographic and subject performance data as well as their use of the various components of the Moodle LMS site.

In stage one, the study evaluated student and enrolment data spanning a period of 10 years for the BE discipline at CQU. Data was based on 1,547 individual student enrolment and performance records across the three disciplines and five programmes. Data by programme were extracted from the student administration system before being analysed using the Statistical Package for the Social Sciences (SPSS version 20) software. Data included 74 variables covering enrolment and demographic information as well as individual subject performance. The analysis was aimed at determining trends in performance and to identify factors influencing student progression. Female students represented 22% of the population. Students under age 24 accounted for 40% of the total student population registered for the BE course while those between 25 and 44 years-old accounted for 50%.

In stage two, an online survey was developed based on student enrolment data and performance data analysis as well as a detailed literature review. The survey targeted students in any CQU Built Environment discipline between April and May 2013 as well those enrolled during the preceding six months, but not necessarily active in the current term. The survey posed 31 questions with 142 answers. The majority of questions (28) were developed with a seven point Likert scale response with the remainder for qualitative text input. The survey was tested and improved using focus groups before it was finalised. A total of 295 students completed the survey resulting in a response rate of 22%. Responses were coded before analysis using SPSS 20. Trends were identified and cross-correlated with previous results to identify factors impacting student progression. This constituted a reasonably representative sample of the population with female students representing 24% of the sample, students under 24, 52% and those between 25 and 44 years old, 40%.

Progression has been considered from the broader individual and societal perspectives of the students' study, qualification, career and their professional organisations. The different components of the LMS constitute the alternative solution or radical innovation in BE teaching. They are now examined briefly in terms of their contribution to students' study, qualification, career and professional progression.

### **Internet and Connectivity**

Reliable and fast internet and broadband connectivity are essential in assessing all the components of eLearning. If the LMS is the slab, then this is the power. It is not surprising then that this rated highly amongst all students across all types of progression. Those students who had better connectivity and utilised electronic communications more regularly were better aligned with their progression goals.

### **Online Resources**

Online resources were not accessed frequently. The percentage of students rarely or never accessing online resources for the progression types were: subject progression 22%; qualification progression 39%; career progression 17%; and professional progression 77%. Of the students accessing resources in excess of five times per day, 31% did so for subject progression, 27% for career progression, 30% for qualification progression but only 8% for professional progression.

### **Email**

Considering that email is one of the primary means of communication from the University, the students' level of access was disappointing. The percentage of students rarely or never accessing email for the progression types were: subject progression 53%; qualification progression 58%; career progression 40%; and professional progression 84%. Email was used more than five times per day by



18% of students for subject progression, 16% for qualification progression, 31% for career progression and 7% for professional progression. Students that utilised emails the most were those who were most on target in all progression types.

### **Forums, Blogs and Wikis**

Forums, blogs and wikis allow students to communicate with each other and with the lecturer and support staff. Important notices are posted in the forums. A large proportion (78%) of the students did not make extensive use of online forums, educational blogs or wiki spaces for subject progression (never or less than once a week). This was true for all other aspects of progression, qualification (81%), career (89%) and professional progression (93%). Students who accessed these online study tools regularly (several times per day) reported a higher alignment with all progression goals. However, the relatively low usage may also be due to the fact that while forums have become mainstream, this is not the case with blogs and wikis.

### **Audio-Visual Aids and Podcasts**

Audio-visual aids and podcasts are believed to reduce cognitive load and provide a more interactive environment, thereby increasing student engagement (DeTure, 2004; Jones, 2010). Only 3% of students reported that they accessed online audio-visual resources or podcasts more than five times per day for subject progression, with 83% stating that they accessed them

less than once a week. For qualification progression, only 2% of students reported that they accessed online audio visual aids and podcasts more than five times per day while 98% indicated that they accessed them less than once a week. The percentage of students accessing these more than five times per day for career progression was 3% with 91% connecting less than once a week. Results were similar for students accessing for professional progression; 95% of students never or rarely utilised audio-visual or other podcasts. Students who utilised audio visual aids and other podcasts more than once a day were much more on target with their subject progression targets than those who did not.

### **Teamwork and Networking**

Teamwork is considered an important outcome of any degree. Aspects of teamwork are easily under-emphasised and difficult to enhance in a distance education environment. Less than half (47% and 48% respectively) of the participant students, rarely or only 'once in a while' worked in a team as part of their subject or qualification progression. Students appeared to view teamwork as more important for their career progression with 72% of students utilising teamwork often. On the other hand, it was not considered essential for professional progression and 61% of students rarely or never worked in teams for this purpose.

Students engaged in face-to-face or blended study modes did not have the same level of regular networking as did distance students, the majority of

whom were employed. Distance students, though, reported networking with work and professional colleagues as less useful compared with students studying in other modes. This may be that employed distance students take this activity for granted.

### **Skype and Video Conferencing Tools**

Given that most BE subjects at CQU offer video conference lectures regularly, it is surprising that 85% of students did not use Skype or other face-to-face virtual meeting tools for their subject progression. The 15% of students that utilised Skype or other virtual tools for their subject progression reported a higher level of alignment with subject progression goals than other students. Similarly, these tools were not utilised for qualification progression with 91% of students stating they did not use or rarely used Skype or other face-to-face virtual meeting for their qualification progression. Students who used online virtual meeting and communication tools were more on target with their qualification progression goals. Career and professional progressions were similar with 92% and 97% of students respectively stating they rarely used Skype (or other face-to-face virtual meeting rooms).

### **Mobile Devices**

The survey did not specifically ask about mobile devices, but it is evident from student fora and feedback that this is an emerging area of importance. Powerful personal mobile phones are now almost

ubiquitous. Much of the development of the LMS and its components has been predicated on the use of PCs and/or laptops rather than small hand-held learning devices. Mobile devices allow nifty ‘snack’ use of dead time rather than the indigestible large chunks of video lectures or online resources. In the same way as flight bookings and check-in have changed, so eLearning systems will need to continue to adapt to changing technology, the cohort and the needs of industry. Whether this mobile revolution will constitute a radical innovation remains to be seen and will be a subject of future research.

### **CONCLUSION**

Students who had access to better internet connectivity and utilised electronic communication more regularly were better aligned with their professional progression goals compared with those who did not have regular access or good connectivity.

The study concludes, as did Carroll, Ng and Birch (2009), that there is not a singular factor that influences retention and progression, but that these factors have varied impact depending on the combination of the factors.

This study, like previous studies, highlights that there is not a single structure for an effective construction of a successful eLearning environment (Carroll et al., 2009; Godfrey et al., 2011; Ahmed, Kloot, & Collier-Reed, 2015). From the outset, it is key to have a firm understanding of the discipline area and the requirements it has for its graduates. Detailed knowledge of

industry requirements and circumstances will have further impact if they can be successfully converted from or into an eLearning environment. The cohort adds further complexity and traditional students are more aligned with face-to-face delivery while mature students are better suited to the eLearning environment. Computer literacy and competency appear now to be a thing of the past and mature aged students in this study were more focused on completing their programmes and achieving their goals than their younger counterparts. This familiarity of students with online technology implies that the alternative solution in some respects is being normalised.

However, in order to manage radical innovation, institutions themselves need to change and to create 'truly new abilities and knowledge within the firm' (McDermott & O'Connor, 2002, p. 429). To move from an incrementalist to an innovative culture, three things are required: technical specialists, innovation champions and a coordinated process to link the outcome and the organisational structure (Ettlie, Bridges, & O'keefe, 1984). Staff resistance can become the biggest stumbling block for an online environment. An institutional strategy is therefore, required to develop technical specialists and to link the structures and processes to the desired outcome, for example, by staff development or transfers.

This paper has presented the development of eLearning in the Built Environment discipline as a radical

innovation. In this innovation, basic components, such as time and space, were used differently, and alternative solutions to traditional lectures and learning materials were introduced including podcasts and video-conferencing. This radical innovation required a foundation of an effective LMS powered by internet connectivity. Students who used the components of the system more frequently were generally more aligned with their progression goals. At CQU, the BE team has been the innovation champion but there is more work to be done at the institutional level to align staff, structures and processes to the new paradigm. In general terms, it appears that take-up of the components of the eLearning system assists individual student progression and enables innovative institutions to succeed and thrive.

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