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Using blended learning to enhance the experience of students in built environment related degree programs

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Abstract

Blended learning was introduced into the Construction Management programme in the School of Surveying and Construction Management at the Dublin Institute of Technology in 2016. The module has traditionally been delivered by face-to-face teaching but online delivery has been facilitated using the Virtual Learning Environment (Blackboard) which has enabled a more blended approach to academic instruction. This innovative change to module provision has also provided an opportunity to enhance the student learning experience within the School through a more flexible teaching and learning environment.

In this paper, the design, development and implementation of blended learning into a Construction Technology module is outlined and we examine the student experiences of the blended learning approach, in particular their perspectives on online delivery and the pedagogical benefits of this approach. The article highlights areas that require further research and outlines elements of the module that could be improved to enhance future provision. The paper will be of value to higher education practitioners and in particular all stakeholders in the new Technological University Dublin (TU Dublin)¹ in terms of the University vision for a digital campus; which will enable flexible, online and blended learning provision.

Keywords: Blended Learning, eLearning, Online Delivery, Learning Technologies, Construction Management Education, Higher Education, TU Dublin, Republic of Ireland

¹ <https://www.tu4dublin.ie/> (Accessed 28th September 2018)

Introduction

This paper presents the experience of implementing blended learning into a Construction Management programme in the School of Surveying and Construction Management at the Dublin Institute of Technology, Dublin. The purpose of the study is to provide a greater understanding on how the use of online teaching can be implemented in Construction related courses. It examines the student's perspective to online delivery as an alternative to face-to-face lectures and reviews the benefits of incorporating construction site visits into the module delivery. The study of Construction Management students was taken over a two-year period with two cohorts of students completing the module through a blended learning approach. The importance of face-to-face interaction with both their tutor and their fellow students was considered when designing the methods of delivery for the Construction Technology module. Blackboard was the online platform for both the uploading of course material as well as the delivery of live video content to the students. The module was developed to allow flexibility in student learning as well as integrating different methods of learning to complement the in-class lectures.

We explore the student observations of using blended learning, in particular focusing on the online elements that they interacted with most often and from where they felt they received pedagogical benefits. In the design of the module, the learning experience of the students was prioritised to ensure that the focus was not on the novelty of the new forms of delivery.

Based on two workshops with the students, we found that student's interaction with the online platform varied, but those students who engaged fully found many benefits from the blended approach. The article concludes by reflecting on the methods of the delivery that enhanced the learners experience and focuses on aspects that could be improved in the future delivery of the module.

Background / Institutional Context

The growth in information and communications technologies (ICT) has facilitated a range of innovative delivery methods to support traditional instruction methods in third level education. Blended learning has come to the fore in higher education and is growing rapidly on a global level (Donnelly & McAvinia, 2012). Similarly, in Ireland, the National Strategy for Higher Education to 2030 reinforces the need for students to be engaged through a variety of educational approaches, emphasising that higher education in the future must be characterised by flexibility and innovation:

“Institutions will have to accommodate and serve the needs of an increasingly diverse student body, many of whom will need to engage flexibly with higher education. In the years ahead, students will choose to learn in a variety of ways – full-time or part-time; on campus or off campus; classroom based, blended, online or accelerated learning” (Department of Education and Skills, 2011, p.54).

The new Technological University Dublin will be pedagogically innovative - under the ‘Re-imagining our Curriculum theme’, there will be an emphasis on teaching practices that transform student learning and programme delivery. (Technological University Dublin, 2015a). TU Dublin is committed to offering pathways to higher education through flexible learning and developing a digital campus that will facilitate remote, online and blended learning options to support the needs of an array of learners from diverse backgrounds and geographical locations.

“Our Digital Campus will enable our academic staff to engage with our students through a transformative learning environment that combines active learning in the classroom, studio, laboratory, workshop, and in our communities together with outstanding blended learning support in a student-centred manner” (Technological University Dublin, 2015b, p.2)

This project was run in collaboration with academic staff from the School of Surveying and Construction Management, Dublin Institute of Technology and library staff from the Institute

of Technology in Tallaght². Library practitioners in IT Tallaght have facilitated the development of a flexible teaching and learning environment for a diverse student body by creating a suite of online reusable learning objects (RLOs) covering core academic skills; resources which have enabled online and blended learning delivery for a range of academic programmes in IT Tallaght. The merger of Dublin Institute of Technology (DIT), IT Tallaght and IT Blanchardstown was seen by the authors as a great opportunity to build on existing best practice and to leverage and share knowledge and expertise across the new TU Dublin.

Aims and Objectives of Research

The aim was to provide a greater understanding on how the use of online teaching can be implemented in Construction-related courses. Objectives were:

- To examine the student's perspective to online delivery as an alternative to face-to-face lectures.
- To examine the value of the blended approach to student learning.
- To identify existing teaching methods and best practice when using blended learning provision.
- To identify how technologies can be utilised to supplement traditional forms of delivery.
- To analyse how blended learning can enhance the academic experience of students in built environment related degree programs.

²<https://www.it-tallaght.ie/> - sole higher education provider in South Dublin, with a significant tradition of supporting a diverse range of learners through flexible delivery modes and a range of student centred teaching and learning supports.

Literature Review

The literature review highlights the key issues that need to be considered when undertaking the design and development of a more blended approach to student learning. The review examined some of the concepts and main areas around flexible learning, online education, blended learning, pedagogy and also explored best practice examples in terms of construction related programmes and online / blended learning provision.

Blended Learning

Blended learning as defined by Bonk & Graham (2006) entails a combination of offline and online deliveries and combines instructional delivery in a traditional face-to-face context with online learning either synchronously or asynchronously. Blended learning is developing rapidly in academia and this growth is one of the modern-day trends in education, it firmly embeds at its core the teaching and learning strategy, it *'combines instructional delivery in a traditional face to face context with online learning, with synchronously or asynchronously'* (Gribbins, Hadidi, Urbaczewski, & Vician, 2007, p.741; Hubackova & Semradova, 2016; Matukhina & Zhitkova, 2015). Technology supported education takes several forms, both in its eLearning and blended learning approaches (Vladlena & Ailsa, 2015), this research focused on the blended approach. The blended learning experience combines offline and online forms of learning where the online learning usually means "over the Internet" and offline learning happens in a more traditional classroom setting.

Bentley *et al.* (2012) concluded in their study that learning is a co-operative and social endeavour with learners gaining significant benefits from being part of a cohort and interacting with staff and other students on a daily basis; with this in mind, it was essential that the design of any blended learning module would recreate this in an online environment.

Success in blended learning is very much dependent on the level to which the students are prepared to work in the virtual study environment (Hubackova & Semradova, 2016). Turner (2015) echoes this by emphasising that students placed significant importance on social interaction in the classroom; the development of the module delivery was mindful of this, at all stages of the module design.

Benefits in Pedagogy

Blended learning is very popular with the students as it brings greater flexibility for both the tutor and the student (Turner, 2015). The tutor can deliver the module through an online platform allowing them the opportunity to focus on continuously improving course material, while the student can use the method to reinforce their learning allowing them to learn outside the campus. Nazarenko (2015) sees online delivery as a method of improving the student's ICT skills, critical thinking and processing information skills. By introducing students to new technologies, we can motivate the students to work on these transferable skills. Benson & Kolsaker (2015) clearly showed that instructional videos significantly improved the competence levels of students. The videos allowed the students to access course material either in a computer lab setting or away from the college campus and gave them the opportunity to work at their own pace. Lenmann *et al.* (2016) found that when a blended approach is adopted, students worked on their own in a different manner than in the traditional out of class assignments, they found that work outside of the class became an extension of the classroom. The design of this project was very cognisant of this and adopted methods on the virtual learning environment (VLE) for the students, that allowed them to communicate with each other.

Diversity of Learning

The literature supports the need for higher education practitioners to employ an array of instructional approaches and delivery modes to meet the needs of students with diverse learning styles. (Donnelly & O'Rourke, 2007; Russell *et al.*, 2013; O'Neill *et al.*, 2005). O'Neill *et al.* (2005, p.20) point out that: 'learning style theory implies that you, as the teacher, should adopt a range of teaching strategies'. O'Neill *et al.* (2005) refers to the constructivist learning theory with its emphasis on diversity of learning and cites a range of different learning style models such as VARK (Visual, Auditory, Read-write, and Kinaesthetic). Donnelly & McAvinia (2012, p.10) indicate that 'many studies have reported that blended learning fits well with a constructivist approach'. The methods employed on the construction management module are guided by constructivist philosophies and models such as VARK; and meet the needs of different learning styles by employing visual methodologies such as video technology tools, which supplement traditional face-to-face teaching.

Assessment

Donnelly & Fitzmaurice (2005) highlight that to ensure effective module design an appropriate formative and summative assessment strategy must be employed. Similarly, Russell *et al.* (2013, p.64) point out that assessment for students must comprise both formative and summative elements in 'order to challenge existing knowledge constructs' with the principle being that students construct knowledge as well as consume it.

Best Practice in Blended Learning

The rise in the use of ICT on our daily lives has transcended into education, with students having an expectation that learning and teaching will be delivered through online platforms adopted by third level educational institutes. Rossiter (2013) illustrated that by moving from

the more traditional lectures to a student lead approach, that students responded positively and it had a beneficial effect on their learning. Rossiter (2013) also showed that providing resources with sound and animation, was a more effective learning mechanism for the students than providing it as a paper workbook. This module provided students with video lectures that are available on YouTube for the students to access. This allows the students to work at their own pace and watch the videos as many times as is required.

O'Rourke *et al.* (2015) indicated that there was anecdotal evidence that if students are given the choice, they will opt for face-to-face teaching over online delivery. When designing this module for full time students, this was taken into account and much of the focus of the module delivery looks at using the technology to supplement the face to face teaching and creating an environment of more participation and learning among the students.

The design of any delivery method tends to be more about what is available to the lecturer and what technology best suits the task in question. Benson & Kolsaker (2015) believe that a pedagogically focused academic will consider how best to integrate module material whether it be online or offline, while a traditionalist will reach for the blackboard/whiteboard, the techno centric instructor favours podcasting, synchronous online lectures and blogging. This module will allow all these different styles to come together and will focus on the strengths of the individual academics and allow those strengths to contribute to the project.

Project Overview

Traditional face-to-face lecturing will remain the most prominent form of delivery for this module; however, the growth of the use of technology in learning and teaching has encouraged the development of a blended approach. The overall aim of the module is to provide students with an understanding of the building regulations and materials within the

construction industry. The students will also be introduced to the materials used on construction sites. The module is a 5 ECTS credit module and runs over one semester in the second year of a four-year level 8 Construction Management Degree. The student is assessed through 100% continuous assessment and the students work in groups of four, with four submissions throughout the module. The assessment employed on this construction technology module made use of both formative and summative elements to assess student-learning outcomes; students working in groups were expected to submit on weeks four, six, eight and twelve. Submission of assessment material was through an online platform and feedback was given face-to-face in class. The site visits had an assessment component with the students required to create a ten minute video outlining how the new Building Regulations were being applied on each site. Although the focus of this form of assessment was mainly on the technical detail from the construction site, marks were awarded for the use of digital technologies. This allowed the students to work on their ICT skills. These transferable skills are becoming more and more important in a modern construction industry. On successful completion of this module, the student will be able to;

- Analyse the principles of design and construction in the context of industrial buildings.
- Specify and design the detailed techniques and/or materials commonly used in industrial buildings.
- Understand and evaluate common methods of improving the energy efficiency of an existing building.
- Understand the use of concrete in modern framed buildings and the importance of quality control of the product.
- Evaluate the environmental principles and practices underlying the construction of industrial buildings.

- Apply statutory and environmental requirements.
- Specify and design both the external fabric and internal finishes and components for framed structures.

The content of the module did not change significantly, however the method of delivery did. The module delivery most appropriate to the learning outcomes was applied when designing the module.

Module Structure

The delivery for the module has traditionally been through face-to-face lectures for four hours per week, two of the hours have used the traditional lecturing approach with the other two hours being used for studio and project work. The studio and project work gives the student the opportunity to clarify any gaps that they may have in their knowledge through discussions with the lecturer. The lecture tends to be more formal with less interaction from the students. The lecturer observed a lack of interaction in the lecture even after the introduction of a number of initiatives and also found that attendance was very much dependent upon the time of the week the lecture was scheduled, Friday generally having lower attendance. A blended approach was decided upon to see if it could be more effective in its delivery of the two hour traditional lecture.

The module was redesigned to incorporate technology supported learning while holding onto the studio and project work element of the module. The other delivery method was online through Blackboard, the online platform used at the Dublin Institute of Technology.

Blackboard is an online proprietary virtual learning environment that allows instructors to add discussion boards, mail systems, and live chat, along with content including documents and web pages. The latest version of the software allows for the delivery of webinars through

Blackboard Collaborate Ultra. In collaboration with the online delivery, site visits were used to help the students gain first-hand information regarding building regulations and construction techniques. The site visits were conducted over two separate mornings and were organised with the assistance of two large construction companies.

Online Delivery

Online learning has increased in popularity and is widely used across all third level institutes. Most third level institutes have adapted a web-based platform for the delivery of information to its learners. In most situations, this has involved uploading class material to the web-based platform and allowing the students to access the material online. This asynchronous method of content delivery has been utilised within the faculty for a number of years with the technology for synchronous delivery being available but yet not fully utilised. With this in mind it was decided that online delivery would be presented through asynchronous (notes, slides, videos, journals) and synchronous (live lecture, online quiz) methods.

The synchronous method utilised Blackboard Collaborate Ultra by delivering lecture material in a live online platform. The students would be expected to log on at a given time each week; the material would be delivered to the student through slides, blog and videos. The platform allows the students to interact through either text or voice. Allowing the student to interact with voice was difficult as it was hard to know who was talking at any particular time. To eliminate this problem, the lecturer decided to only allow the students to ask questions through text. Rungtusanatham *et al.* (2004) contends that successful blended learning strategy requires clear educational goals, specific and clearly articulated so that an appropriate plan can be devised to address content, delivery and learning related concerns. Cognisant of this, the tutor set out specific goals for each online class. The online delivery would be for the duration of approximately an hour and would allow interaction within that

time. The interaction was in the form of discussion style questions and also through multiple choice questions on material just covered. The lectures were recorded and were available for access after the live session. This gave the students the opportunity to revisit material that they did not understand first time around. These lectures were then broken down into shorter snippets focusing on the key goals of the lecture. The shorter snippets could be used by the student when revising that particular piece of material.

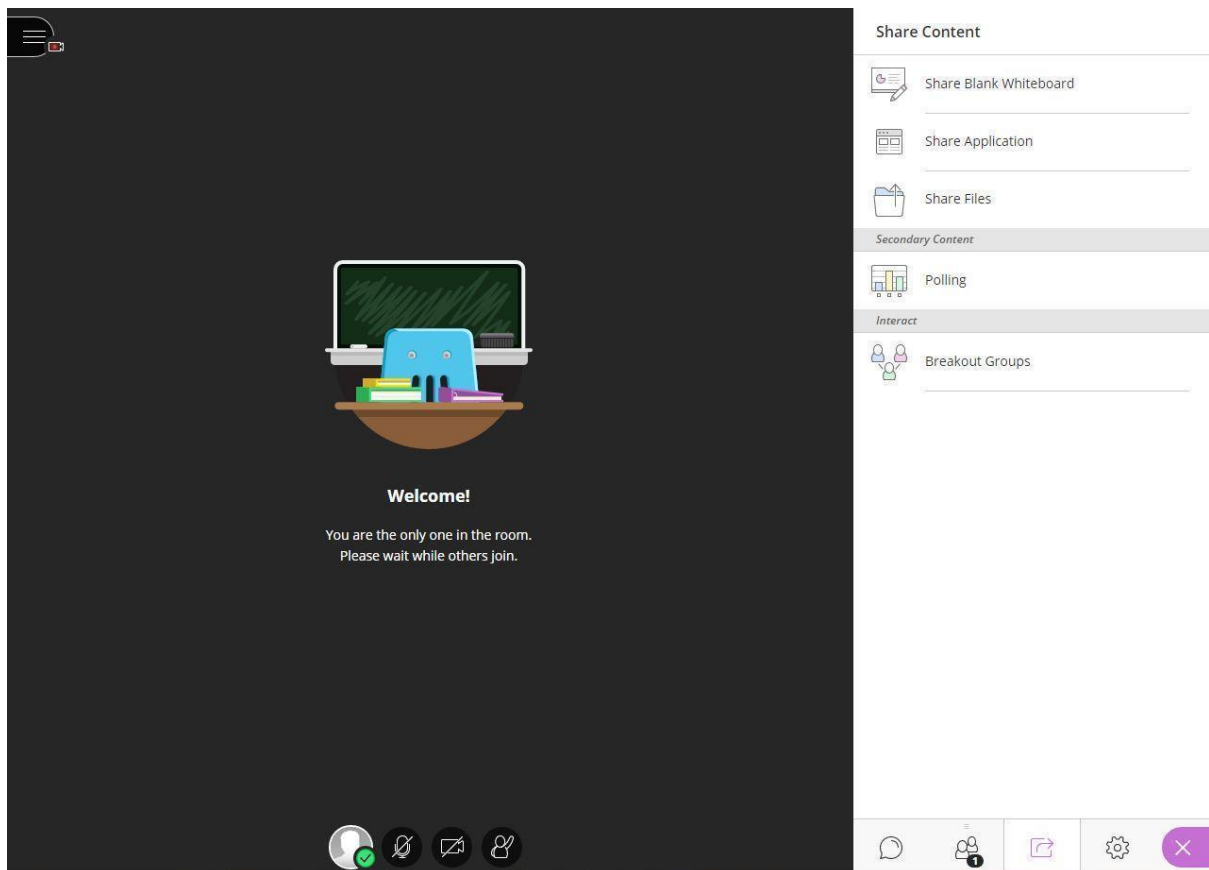


Figure 1: Blackboard Collaborate Ultra

As well as the live lectures, a series of videos were created for upload to YouTube, these videos focused on areas that students have had difficulty with in the past. The module introduces the student to the building regulations and the videos focus on a number of elements within the regulations. This module is continued in year three and the videos allow the students to consolidate information gained in the previous year. The software used for the

short YouTube clips was Screencastomatic; this is a free software that allows videos of up to 15 minutes long and instant upload to YouTube.

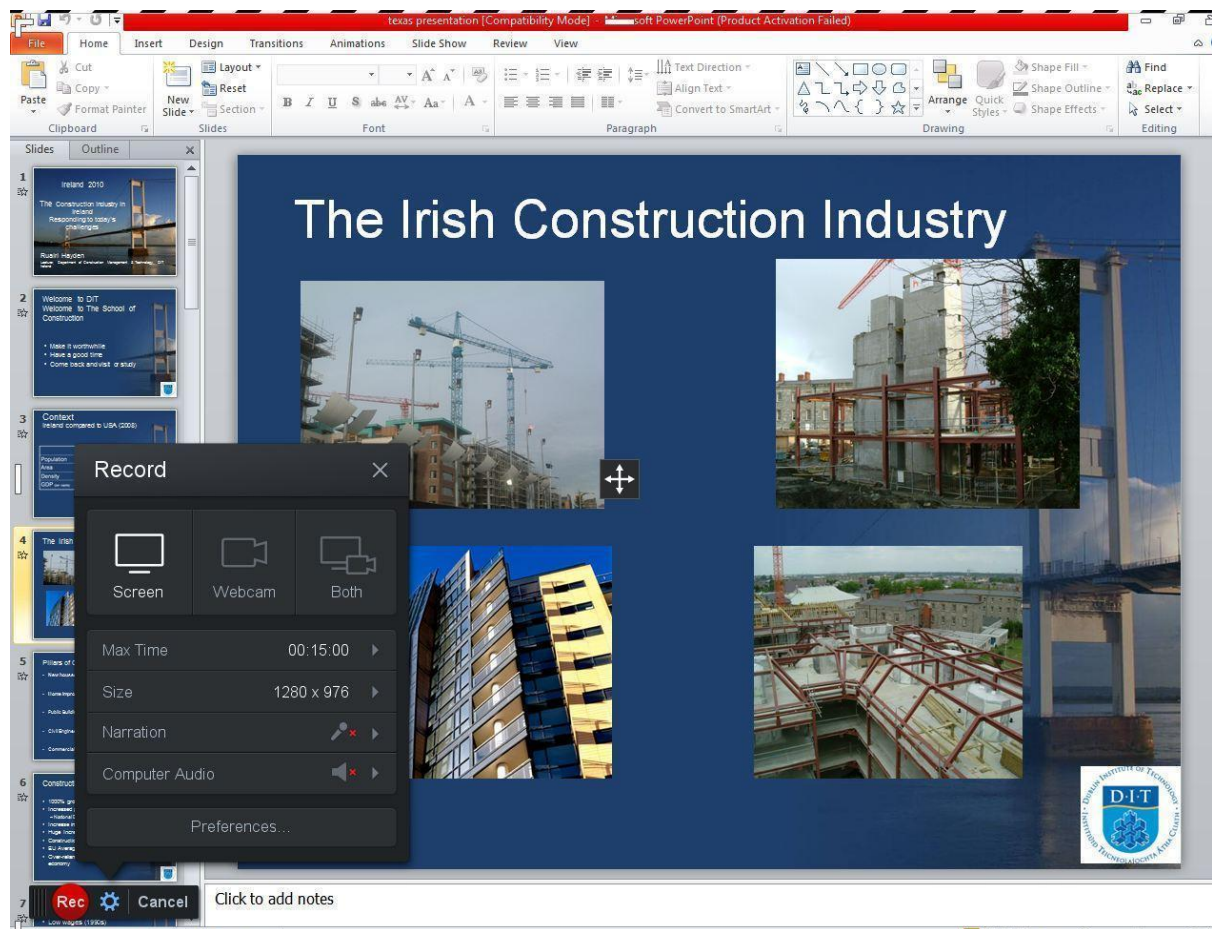


Figure 2: Screencastomatic

Site Visits

As part of the blended learning approach, construction site visits have been incorporated into the method of delivery into the module. Sen (2013) believes that industrial visits are a vital part of built environment education as it helps to bridge the gap between the classroom and the real field world. Site visits for built environment students provide an excellent shop window for the many and varied career opportunities that construction industries have to offer. A common theme arising from external examiner visits to Dublin Institute of Technology is the lack of opportunity afforded to students to visit construction sites and observe construction activities being carried out in the workplace. Sen (2013) found that the

site visit tended to reinforce the theoretical knowledge that has been acquired in the college while offering students the opportunity to experience real world situations.

The site visits were organised with two large building contractors with projects in Dublin. The focus of the site visits was to examine how the new building regulations were being implemented into the Irish Construction Industry. The building Contractors were made aware of this and they made a number of industry professionals with an in-depth knowledge of the subject area available to the students. On arrival to site, the students were introduced to the subject experts and were guided around site to show real life examples of the building regulations in practice. The students had the opportunity to ask questions and to clarify any gaps in their knowledge. The students were shown construction details that were non-compliant with the regulations and explained the process involved in reporting such non-conformance. The students were also shown how the fire regulations were adhered to and how the contractor recorded their quality assurance on site for any possible inspections. These activities have led to students observing closely the real application of the regulations and processes within the industry.

The site visits had a particular element of the assessment assigned to it and the students were expected to produce a ten-minute video detailing how the new building regulations were being implemented on each site. These videos were a selection of drawings, photographs and videos with a voiceover explaining what was in the video. The students used their phones and cameras and were encouraged to use free software such as: Blender; Davinci Resolve; HitFilm 4 Express; Windows Movie Maker.

Research Methodology

The initial stage in the research methodology involved the identification of appropriate data collection techniques. An empirical approach to the research was conducted in order to achieve the aims and objectives. Two main methods of data collection were employed - the first of these was a desk based literature review, which would provide a concise and critical evaluation of the relevant literature on the topic. The literature examined helped to identify themes, ideas, trends and understanding of the subject area.

“Literature reviews should be succinct and as far as is possible in a small study, should give a picture of the state of knowledge and of major questions in your topic area” (Bell, 2005, p.113)

With regard to boundaries, the literature review focused on retrieving academic journal articles from the last fifteen years from relevant online subscription databases such as Academic Source Complete (EBSCO Publishing), Emerald Management Xtra (Emerald Publishing), Engineering Village (Elsevier), Info4education (IHS), Institute of Civil Engineers Virtual Library (ICE Publishing) and Science Direct (Elsevier).

As there was a requirement to determine the views of construction students to blended learning provision, the second research method for the study adopted a qualitative approach, using focus group interviews to collect data. The authors considered that a qualitative approach would deliver valuable data in terms of attitudes, ideas and perceptions, with focus group interviews providing an opportunity to rigorously discuss this data. ‘The focus group has become a popular method for researchers examining the ways in which people in conjunction with one another interpret the general topics in which the researcher is interested’ (Bryman, 2015, p.501).

The focus group element of the research involved interviewing the students who took the module. The interviews adopted a semi-structured format aimed at exploring and resolving key issues by gathering rich and deep information. The focus group combined open and closed ended questions to allow the interviewer scope to examine responses in detail.

Kitzinger (1995:299) describes focus groups, as a “form of interview that capitalises on communication between research participants in order to generate data”. The idea behind the focus group method is that group processes can help people explore and clarify their views in ways that would be less easily accessible in a one to one interview.

The focus groups were facilitated by a senior librarian from the Institute of Technology Tallaght, who has substantial experience in research methodologies, teaching, eLearning and blended learning provision. Having focus groups moderated by an external practitioner can also lend a layer of objectivity to the process. There were three focus groups and each consisted of eight students. Interaction between each member of the focus group was strongly encouraged; Litosseliti (2003) views this as of the utmost importance when carrying out focus groups. Gibbs (2007) contends that focus group research is useful for revealing through interaction the beliefs, attitudes, experiences and feelings of the participants, in ways that would not be feasible using other methods such as individual interviews, observations and questionnaires. All of the interviews were recorded and transcribed. Key themes were highlighted in the transcripts and the data was categorised and coded by both members of the team. An analysis was undertaken to find similarities and differences between respondents and was completed once the focus groups concluded.

Ethics

Within the area of social research, there are a number of different ethics codes. Greener (2011, p.153) believes that ‘ethical guidelines are a good starting point for thinking about the dilemmas of conduction social research’. When completing this research, the following points set out by Blaike (2009, p.31) were closely adhered to: Voluntary Participation; Obtaining informed consent; Protecting the interest of the research participants; Researching with integrity.

Responsibility to the wider research community involves adapting a code of personal conduct which does not harm their participants and colleagues or undermine public confidence in the research process. This research was conducted based on best practice ethical guidelines such as those published by the British Educational Research Association (2018). These guidelines set out responsibilities to participants, sponsors, and the wider research community. Simons (2009) also stresses that ethics is how we behave or should behave with people with whom we interact, and that the fundamental ethical principle, no matter what methodology is adopted is to do no harm. What constitutes harm, however can be interpreted differently by different people.

Denzin & Lincoln (2000, p.192) stress that ‘subjects must agree voluntarily to participate – that is without physical or psychological coercion’. The intended participants of the group interviews were initially approached and there was a positive response to the proposed research. These ethical issues were addressed by sending all participants a letter containing a Request for Consent Form and a detailed information sheet explaining the purpose of the research, extent of the participant’s involvement, the handling and storage of data, assurances regarding confidentiality and explaining their right to withdraw at any time. The participants

in the interview were all students studying Construction Management at the Dublin Institute of Technology and the researcher was careful not to cause any undue intrusion. This was unlikely as the questions had been sent to the participants prior to the group interview and if they wanted any changes to the questions they could request this. On completion of the research analysis, this element of the research was forwarded to the students to ensure their satisfaction.

Analysis

Biggs (2003) advises on the importance of pedagogic methods having a student-centred approach, and the role student feedback plays in developing future teaching practice. The focus group interviews allowed common themes to be extracted and to be further analysed to identify the differing views of the key stakeholders interviewed. Creswell (2012) advises on the importance of identifying significant statements that explain the experience of the situation and draw out key themes to produce rich descriptions. Different respondents to the same question, naturally, will respond differently by using words or phrases that do not match yet are still conceptually related. 'One of the most difficult stages of research for the qualitative researcher is that of analysis: what to do with the data (field notes or transcripts of interviews) that are produced' (Durand & Chantler, 2014, p.77).

There were two stages to analysis - the identification of themes and the use of codes to manage the data. The audio recordings from the interviews were transcribed and a qualitative thematic analysis was undertaken, which is one of the most common approaches to qualitative data analysis (Bryman, 2015). Transcripts were reviewed on a line-by-line basis and notes were taken, identifying key themes/patterns as they appeared in the data. This information was subsequently sorted into different categories/subcategories to facilitate

coding. The research codes were drawn from the opinions of the respondents in the focus group. In terms of developing a coding scheme, the information codes were named and this included a definition and description of each code. The coding process was time consuming but a valuable exercise in terms of generating ideas and building theory. The key headings from the coding scheme formed the basis of our findings. From this data, themes were further merged to allow broader categories of particularly relevant data to develop.

The data was then prioritised giving the relevant themes a hierarchical structure that can be used in relating the data to the objectives of the research. The themes that met the requirement of the research were ordered, while other themes may be examined within the research or be recommended for further research. Once this process is complete, the data analysis was reviewed in the light of other research in the area. A particular focus was given to analysis that might appear to contradict emerging data in the field. The themes that emerged from the coding process were the following:

- Flexible approach to learning
- Innovation
- Independent learning
- Timetabling
- Peer learning

Evaluation, Results and Implications of the Study

Of the 42 students in class, 29 (69%) completed the focus groups; the eight (19%) of students that did not, indicated that they would like to contribute at a later stage. The questions put to the students focused on four different areas: online delivery, teaching and learning methodologies, technologies and participant opinion.

The questions prepared for the focus group were as follows:

1. How would you describe how the Construction Technology Module is delivered?
2. Did you find the use of online live lectures a benefit to your learning in the Construction Technology module?
3. How and where did you view the material, through laptops, tablets, smart phones?
4. Have you found the range of teaching and learning methods used on the module to be appropriate?
5. Did you use the recorded lectures for your revision work?
6. How did you find the site visits and the subsequent videos as a form of assessment?
7. How would you rate the online lecture to the F2F in class lecture?
8. Where do you think the delivery of the module could be improved?
9. If you were to recommend the module to another student what would you say was the highlight of the module?
10. Did the module expose you to information technology that you had not previously used?

The majority (24 students, 83%) of respondents found that the blended learning method to be an innovative approach to teaching Construction Technology and contributed positively to the student learning experience. Attendance was excellent and students engaged with the process, highlighted the value in terms of coursework, flexibility of provision and found the mix of in class, construction site visits and online learning to be an active learning experience that they really enjoyed. There were a number of interesting observations with students highlighting the ability to be able to work in an independent manner - in terms of viewing class material before and after the lecture and being able to attend lectures remotely.

Independent Learning

- *“The online delivery allowed me to work independently while knowing that I had online support from the lecturer, in this environment I was more likely to ask questions”*
- *“I watched back the lectures that I was unsure about and this allowed me to clarify a number of issues in my head”*
- *“The online videos were a great resource for issues that I had difficulty with, especially any calculation questions.”*

Student feedback emphasised the value of the range of teaching and learning methods employed on the module; indicating that the new technologies (laptops, tablets, smart phones), that they working with and the delivery modes used enhanced independent learning, critical thinking and analysis, all of which they felt would improve their academic progression. Discussions with the students indicated the learning experience had been enhanced and the students were very clear about the learning benefits as well as the practical benefits of this type of delivery.

Flexible approach to learning

- *“If I missed a lecture I was able to watch it back at a later date”*
- *“I was able to watch the webinar on my tablet on my commute home”*

The blended learning approach was helpful for both the students and the tutors, allowing a greater level of flexibility to the students in their learning. Six (21% of respondents) students also felt that the less rigid structure of the module allowed them to concentrate on areas of the course that they found difficult. The blended approach engaged the student’s interest in elements of the module through videos that may not have been available if the entire module was delivered face-to-face. 16 students (55% of respondents) responded most positively to

the online video snippets that dealt with issues that the students tended to have difficulty with; this mode of delivery was regarded as the most beneficial by the students.

Consequently, the authors intend to grow the number of readily available online video material and redesign the face-to-face learning and teaching to compliment this.

Peer Learning

- *“I missed the interaction that you get from a classroom environment”*
- *“I found it difficult to concentrate on the lecture due to the distraction of home when watching the lecture from home.*

Five students (17%) while finding the new teaching and learning environment beneficial did however indicate that the lack of interaction with the lecturer and classmates was something to be considered. Different learning styles amongst students also posed challenges with four (14%) students leaning toward traditional learning methods.

Timetabling

- *“This would only work if it is on a day that we are not timetabled for anything else, as one of the big benefits is not having to travel to the college”*
- *“Friday is our study day and we should be allowed to have this completely free from college commitments”*

Another issue that students highlighted related to their timetable; 16 students (55%) felt that timetabling the online delivery on their study day (a day in the week they are not normally timetabled) made it difficult for them to focus on their project work on this day; while 10 students (34%) believed that if it was timetabled on a day when they are in the college for other lectures, it would be difficult to find a place to view the online delivery.

Innovation

- *“This innovative approach encouraged me to use other cloud based technologies in my learning”*

In general, feedback on the new learning activities was positive with 22 students (76%) feeling that it would deepen their knowledge and understanding of the subject area. Students also felt that it led to the creation of a learning community and a community of practice between construction management students, tutors and lecturers. On completion of the module, the students believed they were far better equipped to use ICT in other elements of their programme including their work placement. The research has indicated that the communication and sharing of information between students allowed for peer learning to take place. It is recommended that similar technologies that allow students to share information online be introduced into other modules on the programme. An example of this would be for the work placement students to share their experiences through videos created from their workplace. This would allow them to show their learning and demonstrate the practical side of Construction Management to their peers.

From the lecturer’s perspective, there was a significant amount of technology to be adopted and the resources and time commitment to set up the module on Blackboard was substantial. This often went unrecognised with no allowances given on the timetable for the preparation of online material. Although the lecturer found that Blackboard met most of their needs, there was a problem in the first six weeks of the semester, with students who had issues registering, unable to access the online lectures.

Another issue was the ICT infrastructure requirements for delivering online lectures; the lecturer had to deliver the online lectures from home, as there was no facility for recording or

broadcasting online material within the School. The problems encountered with delivering live lectures from home were controlling background noise, outside distractions and the reliability of Internet service. If blended learning modules are to be delivered, this is something that will have to be addressed at College and Institute level.

Conclusions and Recommendations

The project was regarded as a great success within the School of Surveying and Construction Management, demonstrating that online teaching can be adapted to construction related courses. Students engaged with the flexible delivery mode and feedback indicated that the blended learning approach was a valuable alternative to face-to-face teaching.

There are a number of areas that require further research and could be improved in the future delivery of the module, such as:

- Timetables to be reviewed within the context of providing further flexible delivery of construction related courses.
- A consistent approach to module delivery through blended learning which could be facilitated through training and further professional development for academic staff in terms of pedagogy and technology.
- To examine the transferability of this delivery mode to other programmes within the School.
- Future research could also perhaps indicate whether the delivery methods employed have made a difference to student grades on construction related courses in Dublin Institute of Technology.

Overall, this innovative and collaborative project has proven to have transformed and enriched the learning experience for students undertaking construction related courses in the

Dublin Institute of Technology leading to a deeper, self-directed learning approach. This will help to facilitate the: “creating of a ‘Smart Campus’ that recognises the changing profiles of the 21st century student and provide flexible blended learning opportunities to meet the personal ‘pace and place’ needs of an increasingly diverse student base” (Technological University Dublin 2015a, p.3).

The project has also promoted best practice in flexible delivery methods and the collaborative nature of the work with the Institute of Technology Tallaght has added value to teaching and learning activities within the wider higher education community particularly within the context of the development of the state’s first Technological University.

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