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Developing a Collaborative Virtual Learning Environment between Students in Cross Disciplines to Meet the New College Structure

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Abstract

Integrated project delivery is a rapidly developing approach to design and construction that uses business structures, new technologies, and newly developing practices to collaboratively use the talents and contributions of all participants in the design and construction process. This project replicates this approach by creating a collaborative project between the Department of Construction Management and Technology and the Department of Quantity Surveying. The term "collaborative learning" refers to an instruction method in which students at various performance levels work together in small groups toward a common goal. The students are responsible for one another's learning as well as their own (see Dillenbourg 1999). The objectives of this collaborative project are to

1. promote interaction between students from different but related courses
2. enhance students' ability to think creatively, solve problems, and make decisions as a team
3. evaluate the benefits of using a virtual learning environment for assessment
4. examine the benefits of BIM as a tool in feedback.

There are a number of benefits to this project with an emphasis being given to the interaction of the students. The collaborative learning approach provides a format for the students to interact including giving and receiving help, exchanging information and resources, giving and receiving feedback, challenging and encouraging each other, and jointly reflecting on progress. The other perceived benefit is in the use of a virtual learning environment and information communication tools.

Keywords: assessment strategies, building information modelling, collaborative learning, group work, virtual learning

Introduction

"Complications arising from poor collaboration are the source of a variety of the construction industry's biggest problems" (Bouchlaghem 2012). It is now widely recognised that an effective collaboration strategy based on the implementation of information systems and careful consideration of the wider organisational issues are the key to delivering construction projects successfully. Bouchlaghem (2012) defines collaboration in construction as "an activity in which a shared task is achievable only when the collective resources of a team are assembled. Contributions to the work are coordinated through communications and the sharing of information and knowledge." Our construction practices and procedures are subject to a rapidly evolving information technology sector, enhanced by worldwide advances in communications technology. These technologies are providing construction professionals with the tools to implement new collaborative strategies. Any given construction project involves the collaboration, at some level between architects, engineers, quantity surveyors, project managers, and many other construction professionals, depending on the magnitude and complexity of that project. Much of this process is based on a traditional sequential approach in which many of the participants often work independently, make decisions that inevitably affect others and then come together in face-to-face meetings. As educators, we must equip students with the skills and knowledge to prepare them for an industry so dependent on collaboration. Dublin Institute of Technology delivers a comprehensive list of construction-related courses, which are recognised worldwide for the quality of their graduates. Yet the authors have found very little evidence of interaction between these courses. This research aims to address this shortfall, and sets the stage for more elaborate collaboration in the future.

Collaborative Project Overview

The teaching delivery relating to both courses taking part on this project includes traditional lectures supplemented by tutorials. Blight (2000) reinforces that lecturing is still the most common method of delivery despite advances in new technologies. This paper does not advocate radical changes to our current modus operandi of delivery on these courses; however it does support enhancement of the traditional approach. This collaborative project intertwines collaboration with information technology. Bouchlaghem (2012) advises that much of the recent development on collaborative working in the construction industry has focused on the delivery of technological solutions, concentrating on the web. We have made this a central component of this project by tasking students with the creation of web platforms via PBworks on the internet. This facilitates a high level of interaction between students, who are already comfortable with using more socially based web platforms. It also familiarises students with current IT tools, and creates a spirit of innovation which is currently demanded by employers in industry. Macfarlene (2004) advises that our courses must endeavour to introduce real life situations or problems into our content, to prepare students with the challenges that await them in industry.

A common theme which runs through this project relates to common skills essential for both disciplines, and how students from each discipline can benefit from interaction with each other. Pickens and Jagger (2005) describe the function of measurement carried out by quantity surveyors as the process concerned with converting construction drawings into words and numbers in accordance with a strict set of rules. The exact same terminology could be used when describing the construction manager's role when producing a programme of works or schedule for any given project. Both disciplines require a number of holistic skills, which are not technical in nature such as: patience, accuracy and initiative. These skills can only be attained through practical project work, and the completed tasks have helped students become more proficient in these areas.

Project Assessment

Hamlin and Szorenyi-Reischl (2006) state that "development of assessment strategies that guide students towards desired approaches to learning and validly and reliably measure student performance". This was critical when developing the assessment strategy for this collaborative project. The assessment is designed to give Quantity Surveying students and Construction Management students a manageable set of tasks that will facilitate collaboration and promote critical thinking.

Students were furnished with a set of drawings of a real life project from which they were expected to complete a number of tasks; each task had been designed to ensure that the students interacted with each other and worked in a collaborative manner. This allowed the student to think critically about the design of the building and recommend any changes to the current design. The students were encouraged to examine the constructability of the project and were expected to propose alternative construction techniques that would improve the efficiency of the build process.

Once the students became familiar with all the drawings and the project specification, the tasks were agreed with the students with a number of submission dates spaced over the two semesters on which the project ran. The students were split into groups, with two students from the Construction Management Programme and two students from the Quantity Surveying Programme in each group. Once the students were familiar with each other and with the project drawings they were required to develop a virtual learning environment (VLE). All their work was submitted through this platform and feedback was given through the VLE also. For the Construction Management students the project assessment accounted for 50% of their AutoCAD module and 30% of their Construction Technology module; for the Quantity Surveying student it accounted for 50% of their AutoCAD module and 30% of their Quantity Surveying module. For this reason it was essential that the tasks assigned to the groups encompassed the learning outcomes of the modules included.

Virtual Learning Environment

Despite the enthusiasm for digital technologies, and the fact that wikis (blogs) have existed for over a decade, their use is relatively new in academia. It should however be noted that it is a very fast growing area within academia. On previous projects when blogs have been used for assessment the feedback from the students has been very positive. Students have tended to be very innovative in their use of blogs and have interfaced different software into their blogs. It has also been observed that the computer skills of students who were involved in the blogs were significantly improved on students from previous years who were not involved in the blogs.

The students will be given a tutorial on how to create and manage all the material through a virtual learning environment at the start of the semester. This will be the medium for the delivery of all assessment and feedback. The preferred platform of VLE for this project will be through the medium of PBworks (http://pbworks.com/). In deciding on the web tool to use for this project there were a number of considerations that needed to be taken into account such as accessibility, ability to upload documents, cost, ease of use, ability to create individual design and security. There are many different web tools available online that met many of our requirements such as Google Blogger, Dropbox and Google+, however, PBworks was selected as it allowed students to upload documents and to comment on the uploaded documents. It also allowed the tutor to create a section for feedback and to upload sample answers. PBworks also allowed the students to personalise their site and to create an online portfolio that could be useful in future career applications.

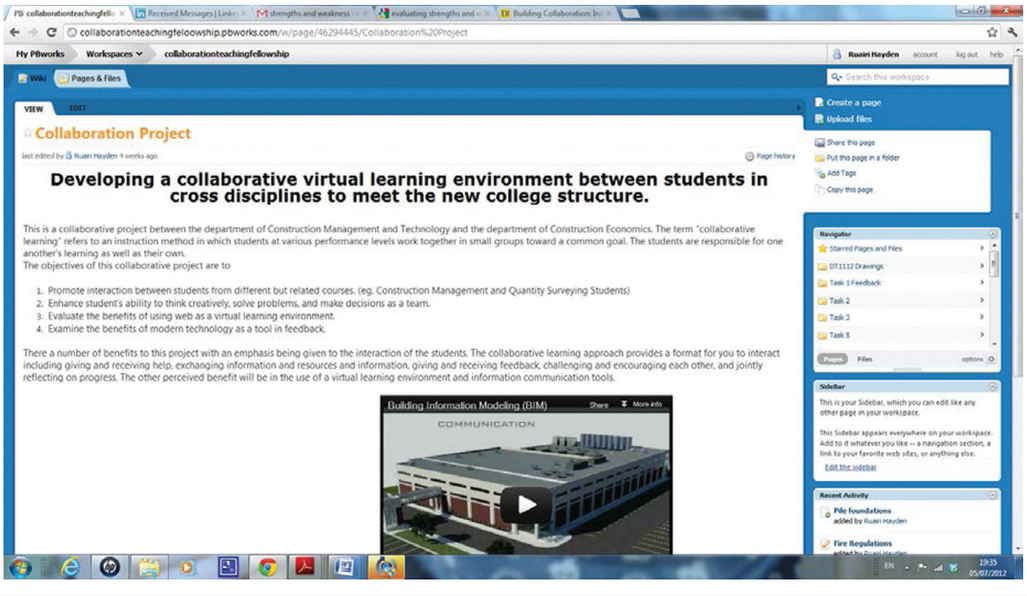

Figure7.1
Tutor's PBworks wiki page

Figure 7.2
Revit model of project building used for feedback

Project Evaluation

The evaluation strategy for this project was twofold, the first element of the evaluation involved feedback from the students. To ensure that all students participated in this process the students were set a personal reflection task which accounted for 5% of the overall mark. Their personal reflection of the project was to include the following:

- their reaction to the collaboration project as a whole;
- how their interaction with students from other courses improved their learning;
- how they felt the use of a virtual learning environment improved their overall learning during this project;
- their thoughts on the use of a 3d model as a feedback tool;
- how they felt the project should be improved.

We compiled the data arising from the student feedback contained in their personal reflections into charts, representing the levels of their enthusiasm or criticism under the first four areas listed above.

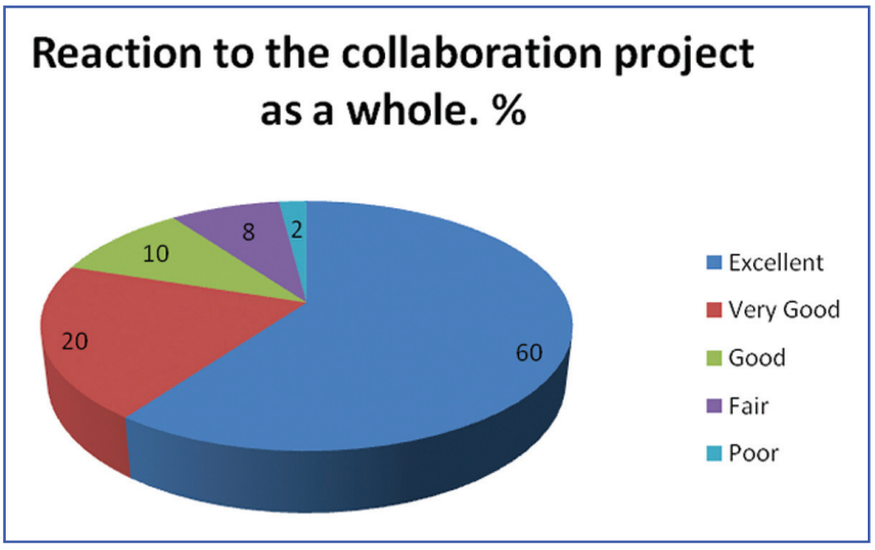

Figure 7.3

Figure 7.3 illustrates a very positive sentiment towards the project as a whole with only 10% of students finding the project only fair or weak. These findings strongly support the retention of this form of project for both courses in the coming year. Students enjoyed working with colleagues from other related courses. It gave them a taste of the collaborative environment which exists in industry where many different construction professionals work together on a daily basis. The only negative points were the logistical problems associated with organising meetings due to timetabling constraints. Many students were unwilling to be present in the college at times where no lectures were scheduled for their particular course

The Irish construction industry is currently experiencing major technological changes with the introduction of BIM (Building Information Modelling), which facilitates a collaborative approach to construction, with an impact on all construction professionals going forward.

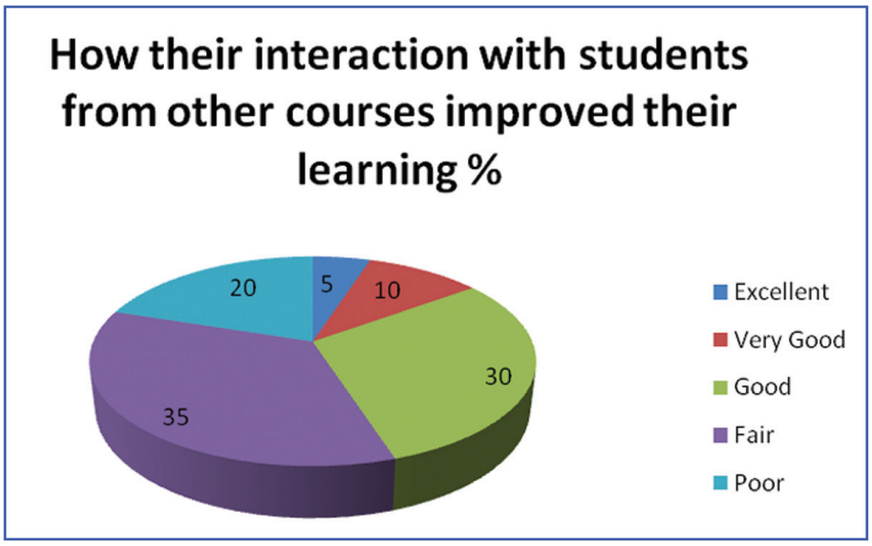

Figure 7.4

Figure 7.4 gives a breakdown of student opinion on how interaction actually worked on the ground. The students enjoyed the interactive concept, which they felt mirrored the construction workplace where many different professionals must work together as a team in order to deliver a completed project. They recognised the importance of group work, and that this would be a major part of their working life in the future. It was felt that there was no incentive for students to work on tasks outside their field which stunted interaction. Secondly, students complained that the project was not facilitated by coordinating timetables, i.e. common times scheduled for students from both courses to meet in the presence of lecturers. There were also complaints which are experienced on all projects where there is a group work element involved such as: certain students not completing a fair share of the workload, students not engaging, personality clashes, and other problems of that nature.

We feel that these criticisms can be easily addressed in the coming year. With the help of Department heads on both courses, timetables for these modules can be synchronized, which will facilitate interaction between students for meetings and assistance from lecturers. Many students also felt that lecturers should play a more pivotal role with regards to delegation of tasks.

Students were very positive with regards to pb works as an interactive platform. They enjoyed this aspect of the project, and were comfortable with regards to uploading work, and leaving comments on the open page forum. They felt that this was a novel approach to learning not present on any other modules.

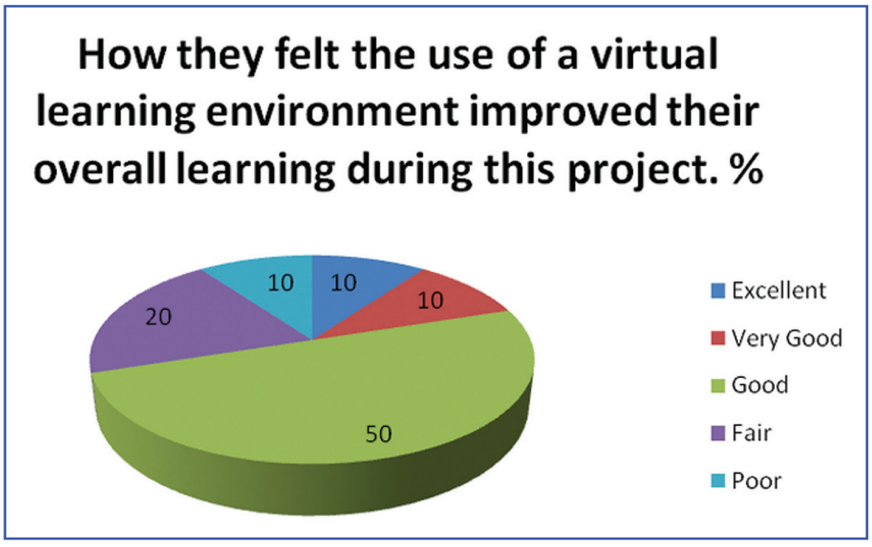

Figure 7.5

Figure 7.5 demonstrates how using a VLE improved the overall learning experience for students. This was generally well received by students, who are used to using Facebook, Twitter, blogs and so on in their social lives. Students were very supportive of this concept with 70% of responses in the good to excellent category. Some students expressed their concerns relating to posting negative comments on the web platform. Many students advised that texting or email was a more practical method of communication. There were also criticisms relating to lack of lecturer activity on the platform, with a deficiency on their part with regard to comments and advice.

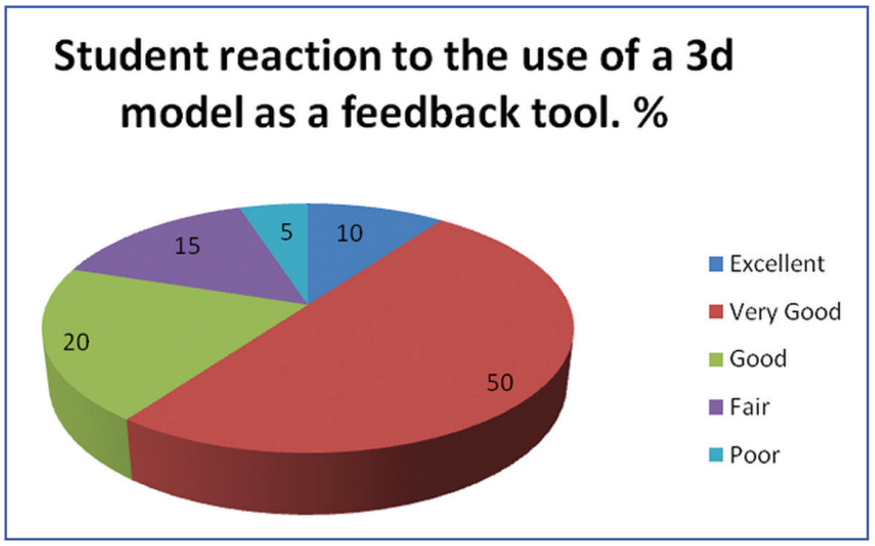

Figure 7.6

Figure 7.6 depicts a strong student sentiment towards the use of a 3d model as a feedback tool, and this was evident especially among the Quantity Surveying students who found the model very beneficial when reviewing measurement tasks. Students expressed many opinions relating to how the project could be improved, and these suggestions were generally in line with the responses illustrated in the above figures. We have summarised the student suggestions into four main points:

- Lecturers to provide more regular feedback as tasks are completed, offering advice on where improvements can be made.
- Timetables relating to modules on both courses to be synchronised in the future to facilitate meetings and face to face group work.
- The number of tasks to be reduced, and lecturer involvement included with regard to delegation of workload.
- Marking scheme to be more reflective of the work involved with each task.

The second evaluation strategy will examine future student's results with the students from this year's project and will examine what effect the future work and recommendations will have on the students learning.

Conclusion

With the advances in technology and the changing methods of communications, the research has shown that the use of information technology and the virtual learning environment has enhanced the student's experience. This would ensure that the methods being used are current and up to date. The use of a VLE and the creation of a portfolio have increased the skill level, confidence and productivity of the student and have allowed for a greater level of collaboration between group members. The VLE selected (PBworks) was deemed to be appropriate for a collaborative project and had benefits that other online recourses did not; however the new version of webcourses recently introduced in the DIT seems to meet all the requirements for future projects.

In an attempt to reflect the built environment in an academic setting, this project has developed a model for collaborative learning and teaching among students from different disciplines. This model is designed to help built environment academics develop programmes that will reflect real life projects. The model addresses the module delivery, the assessment method, group work and the benefits of a VLE in collaboration projects. The model may be used in any area of built environment education, and allows academics to analyse the benefits of using such a model. The introduction of a collaborative project will enhance the profile of the courses it is being delivered to and help attract the most competent and ambitious student and, this is turn should help in student retention.

Future Work and Recommendations

The collaboration project will run again for the next academic year with many of the developmental aspects of the evaluation being incorporated into the project. The students will be given more time at the start of the modules to familiarise themselves with the VLE and also with their fellow group members. It is also clear from the student feedback that time needs to be set aside for the students to meet under the guidance of the tutors. This will be implemented in 2013 and its benefits will be monitored on an on-going basis.

The emergence of BIM in the construction industry is an important development that needs to be recognised by the DIT. This project recognises this and will incorporate more BIM and the use of Autodesk Revit in future projects. This would encourage other disciplines within the DIT to become involved, with the potential to see all the construction disciplines working together on one model to deliver the different learning outcomes of their courses. This would ideally be coordinated through a project leader who would coordinate all the disciplines to achieve the final goal. The future will demand professionals with BIM skills, in order to achieve this. The DIT will require support and resources from industry in developing and implementing BIM-based education.

Bibliography

Benckendorff, P. (2009) *"Using wikis to help first year students develop collaborative knowledge management skills for tomorrow"*, Proceedings of the 12th Pacific Rim First Year in Higher Education Conference, 29 June to 1 July 2009, Townsville, QLD, Australia.

Blight, D. (2000) What's the Use of Lectures? Jossey-Bass Higher and Adult Education Series, New York: John Wiley & Sons.

Bouchlaghem, D. (2012) Collaborative Working in Construction, London: Taylor & Francis.

Brown, S. and Knight, P. (1994) Assessing Learners in Higher Education, London: Kogan Page.

Dillenbourg, P. (1999) Collaborative Learning: Cognitive and Computational Approaches, New York: Elsevier Science.

Hamlin,G. and Szorenyi-Reischl, N. (2006) *"Biting off more than you can chew! Can first year programs successfully meet the challenge of the current emphasis on education best practice?"*; available online at http://www.fyhe.com.au/past_papers/papers09/content/pdf/13d.pdf

Marsh, H.W. and Roche, L.A. (1994) The Use of Students' Evaluations of University Teaching to Improve Teaching Effectiveness, Canberra, Australia: Australian Government Publishing Service.

Macfarlane, B. (2004) Teaching with Integrity, London: Routledge Falmer.

Pickens, D. and Jagger, D. (2005) *"Whither measurement"*, RICS Journal, 12(05): 45.

Vygotski, L.S. (1978) Mind in Society: The Development of Higher Psychological Processes, Boston: Harvard University Press.