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USE OF COLLABORATIVE LEARNING TECHNOLOGY TO SUPPORT CROSS-FACULTY GROUP LEARNING

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Abstract

The scope of applications of computer supported collaborative learning (CSCL) has grown exponentially in recent years. This group of techniques has been found to be extremely effective as a collaborative tool to inspire scaffolding between students. It is also useful when several academic supervisors wish to view the same project work.

This paper describes the process and the motivation behind the first implementation of a campus pack-based project in Year 3 of Dublin Institute of Technology's (DIT) BSc. in Product Design programme. Issues have been encountered in previous years with this cross-faculty managed project, but this work shows the potential that exists in harnessing technology to unlock the true learning potential of collaborative work at undergraduate level. The paper reviews the collaborative learning field and continues to describe the DIT implementation. This description includes initial hurdles encountered, approaches taken to resolve these, learning about the process of using Wikis for collaborative work and conclusions for future implementations.

Keywords - Computer Supported Collaborative Learning, Problem Based Learning, Group Work, New Product Development, Innovation

1 INTRODUCTION

The project described in this paper consists of an open-ended design brief to which third year Product Design students are expected to apply design, engineering and business skills in order to produce a viable and marketable product. Given the multi-disciplinary nature of this brief, a lecturing team which is spread across multiple sites and faculties is required. Of particular concern to the lecturing team was the aim of encouraging deeper learning through use of group work rather than previous approaches, which have tended to focus on retention and reproduction of material delivered in a traditional lecture setting.

The specific tool of Wikis was chosen as it was felt that this would best provide the students with a platform which would allow the necessary collaboration and would provide the lecturing team with the ability to monitor the progress of the teams involved. This was particularly useful as the lecturing team are located in two different sites in Dublin city and do not have any regular forum in which to meet to discuss progress. As the course is delivered in a single semester, the use of a Wiki would circumvent the necessity to devote valuable class-time to monitoring group progress, as it could be done on-line by the lecturing team. In addition, due to the existence of an Evaluation tool within the technology, the Wiki potentially provided a valuable conflict resolution tool for groups where work was not progressing or individual team members were not fully contributing.

The voice of the student has particular importance in this paper. Students were initially surveyed about their experience of collaborative work, their traditional means of completing collaborative tasks and the issues which they have encountered in the past. This survey also sought to gain an understanding of the students' technology literacy and familiarity with the various tools available to them. At the conclusion of the project, the students were also required to submit a reflective account of their experiences using the computer supported collaborative learning (CSCL) system. This is designed to provide the students perspective on the process of collaborative work utilising the Wiki.

2 PROJECT BACKGROUND

2.1 Collaborative Learning: Definition and Drivers

Angelo [1] proposes that collaborative learning has three distinctive elements; firstly, it is designed to be carried out in small groups or pairs. Secondly, participants must engage actively in working towards stated objectives, and finally, meaningful learning takes place through that intentioned, engaged collaboration. Other similar activities identified include cooperative learning, team learning, group learning and peer-assisted learning; philosophical differences have been outlined between these various approaches. Boud et al [2] discuss the differing terminology used to describe the concept of students learning both with and from each other. Although the terms used include collaborative, group, peer and reciprocal learning, it may be concluded that the project based activity described in this work is adequately described by the term collaborative student work.

Jaques [3] noted that there is no single agreed definition of a group, rather he identified the characteristics or qualities one expects to see in a collection of people: collective perception in that they see themselves as a group, the ability of the group to satisfy some need of their members, shared aims, interdependence, social organisation with norms, roles, statuses, power and emotional relationships and interaction between members. Jaques also identifies that 'theme centred interaction (TCI) is concerned with three constituent factors, each of equal importance; the 'I', the 'We' and the 'It'.

Gammie and Matson [4], in their review of group assessment at final degree level, note that the desire to include group assessment is being largely driven by the changing skill sets being demanded of graduates by employers. From the literature, they noted that the skills required beyond subject matter expertise included communications, problem solving, personal and interpersonal skills, responsibility and organisational ability. They note that many of these skills are encompassed in team work and this is a significant driver in incorporating this form of working into a curriculum design. Furthermore they note that despite the problematic nature of assessing group work, given that 'assessment is the single most powerful influence on learning', an effective mechanism must be found. One of the most significant issues which they identify in the literature is the valid concern that weaker or less motivated students are carried along by their stronger colleagues and these harder working students do not receive the mark they deserve due to this 'free-riding'.

Boud et al [2] considered that collaborative or peer learning has a 'broader educational agenda' beyond the limited subject content learning traditionally assessed or examined. This work proposed that the interest in developing peer or collaborative learning is being driven by the need to teach larger student groups without increasing staff workload, an increasing requirement to develop generic learning outcomes which are demanded by employers and the acceptance that collective forms of learning may suit some students better than the more individualistic approaches. Generic graduate attributes are the skills knowledge and abilities of university graduates, beyond disciplinary content knowledge, which are applicable to a range of contexts and are considered vital to employability. Teaching students how to work collaboratively at undergraduate level is one of the most important factors in helping them to develop such key generic skills for the workplace [5], [6].

According to Victoria University of Wellington [7] the adoption of a group approach to learning should be considered where the goals of the course are best achieved through students working together, where resources are limited and the tasks involved are large, complex and can only be carried out by a group.

2.2 Opportunities, Benefits and Hurdles of Collaborative Work

Webb et al [8] describe the learning opportunities provided by engaging in group work and these include giving and receiving help, recognising and resolving contradictions between different perspectives and by internalizing problem solving processes and strategies. Boud et al [2] identify four areas of benefit associated with peer learning:

1) the development of team working and planning skills,
2) increased opportunities to engage in reflection and exploration of ideas without the authority of the teacher,
3) increased student communication and critiquing skills,

4) development of a learning to learn suite of skills through collective responsibility for the project

The Victoria University of Wellington (VUW) 2004 Guidelines on Group Work and Group Assessment [7] identifies from the literature a range of benefits for the students including the development of co-operation and planning skills, opportunities for leadership and shared leadership, increased active participation and involvement in the course, improved student performance, opportunities for students to work on large and /or complex projects and the promotion of student autonomy by transferring some of the responsibility for teaching and learning to students.

Webb [8] identified that the reasons for using group work may not coincide with purposes of assessment. She cautioned that we need to carefully consider the effects of collaboration on assessment and the purpose of the assessment. VUW [7] also identified that there may be particular issues in organising collaborative work for distance education/ part-time students although it is noted that this approach may alleviate feelings of isolation. They identified a number of typical issues including the following:

- Poor internal group dynamics
- Exclusion or marginalization of individual group members
- Inappropriate tasks or assessment criteria for the subject or the range of students
- Less than desired levels of academic support or intervention
- Assessment of group work where there is no acknowledgement of differences in individual contributions
- Excessive amount of group work compared with individual work in a course

2.3 Computer Supported Collaborative Learning

Kollias et al [9] interviewed fifty-six teachers from four European countries in order to gain an understanding of their attitudes to collaborative learning environments (CLE). In general the teachers were found to have a positive attitude towards CLEs and were aware of the need for diligent planning to ensure successful implementation. However, it was also found that the teachers tended to lack an understanding of either specific strategies through which they can guide students' inquiries in CLEs or techniques for assessing new competencies which may characterise student performance in the CLEs, a view supported by other work [10].

Kali et al [11] studied how curriculum can be designed with two aims in mind; firstly to engage learners in peer instruction, and secondly to reuse student artefacts as a resource for further learning. The implementation of CSCL described in this paper shared these aims. Finger et al [12] described a study on a computer environment, the Kiva Web, designed to support the activities of group collaboration for interdisciplinary engineering design teams. They also examined the possible applications of this tool in both academic and industrial settings.

Rubens et al [13] described the pedagogical principles used to guide the development process of two web-based software systems aimed at providing a collaborative virtual environment. These were: designing for flexibility and modularity, facilitation of knowledge building, scaffolding progressive inquiry, role of tutoring in progressive inquiry, provision of tools for structuring and coordinating activity, design of tools for process analysis and finally provision of support for community building.

Strijbos et al [14] identified a need to adopt a more systematic approach in the design of computer-supported group-based learning, which focuses explicitly on the group interaction processes. They believe interaction to be "the heart of the matter" where group learning is concerned. Lahti et al [15] examined the intensity of collaboration in computer supported collaboration on a design project. They studied the ways in which ten teams of university level students of textile teaching shared their designing process in a virtual learning environment. This work identified three characteristic patterns and varying intensity in design process collaboration: coordination, cooperation, and collaboration.

3 METHODOLOGY

3.1 Project Structure

In this work, seven teams of four students each were tasked with an open ended brief:

"Develop a marketable product which displays creative design flair, an understanding of technical issues, and real business potential"

The students were given a twelve-week long semester to work on this project. Supervision was performed jointly by the authors, based in the School of Marketing and the School of Manufacturing and Design Engineering respectively. The project spanned two modules, Enterprise Development and New Product Introduction. A number of key learning outcomes from both modules were to be applied in the students' work.

The collaborative tool made available to the students was a commercially available learning environment (Fig. 1) purchased by DIT, named CampusPack Fusion (Learning Objects, Washington, DC). This tool aims to make web 2.0 technologies available to student groups in order to "promote active and reflective learning, increase student engagement and enhance learning outcomes" [16]. The project described in this paper represents one of the first large-scale implementations of CampusPack in DIT.

Outputs from the project included the wiki page, which was used to document the entire design process from initial primary and secondary research through conceptualisation, prototyping, and engineering specification to a final design. Students were also required to produce a written business plan, and their design was also entered into an international design competition, in the form of a poster, Fig.2. The final component of the final submission was a group presentation to the supervision panel, shown in Fig. 3.

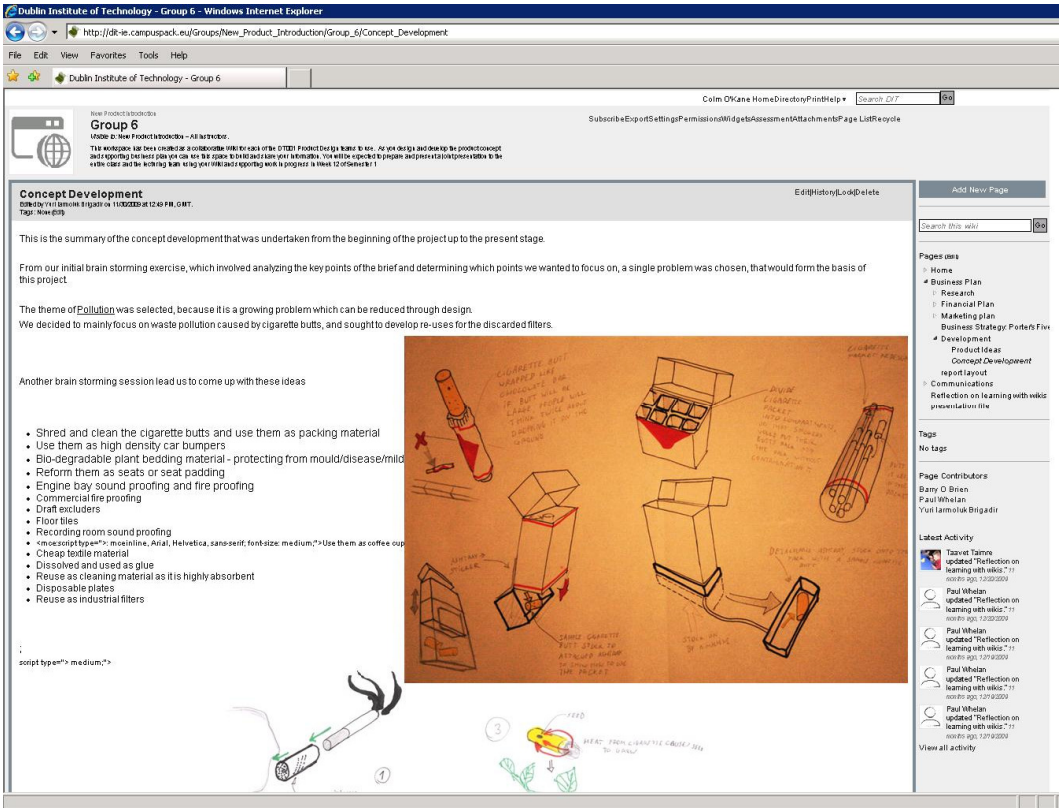

Figure 1: Sample Screenshot of CampusPack Fusion homepage

Figure 2: Sample Poster

Figure 3: Final Presentation of Project Work

3.2 Preparation and Initial Survey

Webb et al [8] note that effective preparation of students for engagement in group working activity is required to encourage learning. They identified that training in general interpersonal and teamwork skills are needed for all kinds of collaborative group work. As a result it was determined that one class at the outset of the semester would be allocated to training students both in the technology and the softer team working skills. Lee-Davies [17] discusses the work of Tuckman [18] and this was used to introduce the concept of teams and the different project stages through which they progress. This session was used to probe the students on their own experience of using group or collaborative work in the past. Although the semester is short and the teaching opportunities are limited, this was a necessary use of valuable student contact time.

At the outset of the project, students were surveyed about their experience of collaborative work, their traditional means of completing collaborative tasks and the benefits and issues which they have encountered in the past. In addition the survey sought to get an understanding of the students' technology literacy and familiarity with the specific Wiki tool. The results are shown below.

- 94% of students in the group reported that they sometimes or quite often used Group or team work in completing assignments
- The top three reported positive aspects to team working were reported as the variety of difference ideas and opinions (29%), the sharing or work (29%) and the support of team members (10%).
- The top three reported negative aspects of team working were reported as the fact that some people do not do enough work in the team (31%), conflict within the team (24%) and the difficulties of meeting up (24%).
- With regard to the approach to completing the work the students reported that the most common approach is that each individual completes a section and then it is pasted together (33%) followed by one or two of the team members completing the majority of the work (27%).
- In investigating the tools used to complete the tasks the use of USB keys was reported by nearly all students (94%) followed by emails (63%) and sharing of written documents (50%).
- With regard to the familiarity with using Wikis only 2 (13%) of the students reported having used a WIKI in the past.
- 88% of the students were aware of the most famous Wiki site, Wikipedia however not all were active contributors with only 43% having made a contribution to the site in the past.

This last point is interesting. Giles [19] conducted a special report in Nature which identified that over 70% of the 1000 scientists that they surveyed had heard of Wikipedia but only 10% chose to update it. The student group studied here was evidently more aware of the site and more eager to contribute to it. This difference may be partly down to the growth in Wikipedia's popularity since the report by Giles.

3.3 Account of Project Progress

An interesting aspect which emerged early in the project was that the students, while technology friendly, had no real understanding of what a Wiki was designed for. This made the early training difficult for the trainer and the student and also meant that the initial usage of the Wiki was slow and patchy.

At the outset the lecturing team decided that it was necessary to support and encourage the students to use the technology now available to them. Initially adoption was limited to one group who were using it well as a collaborative site and repository for their work in progress.

The Evaluation tool in the Wiki was a very useful aspect of the technology and was used weekly by the lecturing team to evaluate progress and usage by each group. In order to stimulate discussion and competition we decided to display the evaluation results periodically in class. By Week 4 of the Semester a short survey of usage of the Wiki pages illustrated that the uptake was still slow but improving with groups using the Wiki for recording of their meetings and the actions agreed and as a repository for Web sites and work completed to date. However given the generally poor usage at this stage by the remaining 5 groups a short session was conducted in class on structuring their Wiki site and a template for the pages it should contain was provided.

As the Semester progressed it was no longer necessary to continue to use the Evaluation tool in the class as the groups were actively using their own Wiki sites and needed no further encouragement. The element of competition from the in-class display of activity overcame any inhibitions which the students had in adopting the new approach to completing group work and the Wiki adoption was significant from this time period onwards.

4 RESULTS & CONCLUSIONS

4.1 Results

At the conclusion of the project, students were required to compile a reflection on their experience, designed to provide their perspective on the process of collaborative work utilising the Wiki. The overall finding from these reflections is that the students' attitude to the provision of a collaborative technology to support their group work is hugely positive. They found the technical limitations of the system more frustrating as their work progressed and this may be viewed as a demonstration of how quickly they assimilated the use of a collaborative technology into their group working. This is significant as only 2 students had any previous experience of using a Wiki. The positive aspects of using the Wiki were reported as increased ease of communication which allowed both independent and team based working, monitoring of their own work and the progress of other members of the team, the provision of a universal platform for storage and access and a greater structuring of the work. Another benefit noted by the students, is that the lecturing staff also have the ability to review the ongoing work of each group.

There were some issues related to the technical operation of the system which will not be dealt with here. The non-technical problems encountered were of more interest from the learning and teaching perspective. The main issues related to the initial structuring of the Wiki which required more specification at the outset. The grading rubric needs to be created in order to ensure that the students fully understand the requirements particularly where the students are required to use the Wiki. This would assist in ensuring that students concentrated on those issues which are of most importance and would support Biggs' concept of constructive alignment [20]. Particular problems for students with specific learning difficulties need to be considered, particularly where the system does not support a spell checking option.

4.2 Conclusions & Reflection

Webb et al [8] identify four ways in which the teacher can promote greater productivity in terms of helping small groups:

1. Establishing positive norms for group work which establish the expectation that members will both seek and provide support to each other with particular emphasis on the need for collaboration rather than individualised working and the development of a positive group environment where ideas can be tested,
2. Structuring the tasks in ways that support learning and understanding and require a deeper level of learning, removal of both time pressures by properly structuring the work and also the reduced emphasis on the final group mark or grading
3. Modelling desired behaviours through effective questioning and discussion in the classroom taking time to explain the conceptual basis for answers given and
4. Actively monitoring group work to ensure the nature, extent and content of the interactions between the members of conducive to learning. In evaluating the learning outcomes of the trial implementation of the Wiki to support group work it was necessary to consider whether or not my own role was useful. I considered Webb and concluded that:

While the initial training was useful for the students the norms of behaviour required from the students needs to be built into each class throughout the semester, little assumption can be made about the students propensity to adopt the new approach.

Greater structure for the use of the Wiki needs to be provided at the outset. This needs to include an appropriate assessment element for the completion of specific tasks within a time frame. This will encourage earlier usage and completion of earlier tasks.

The in-class discussion of the project and the allocation of three of the twelve classes to tutorials and training was very useful in developing the inquiry and discussion between the groups. To this end each group was required to present their projects to the entire class twice towards the end of the semester. This encouraged discussion and debates which was useful for the students. In the past the production of extensive handouts effectively robbed students of the any sense of ownership of the contents or indeed reason to attend the lecture at all. Students no longer viewed the lecture as a

didactic process and indeed the structure of the lectures was broadly discussion rather than lecture based.

Monitoring of the work of the groups was facilitated by the Evaluation tool on the Wiki and the continued discussion in class of the activity levels of each group was useful. According to Brown and Race [21] the use of praise and positive feedback is a powerful aid to motivation. The response of students to the obvious monitoring by lecturers of their work supported this belief.

It is perhaps unsurprising that the students reacted poorly to the technical limitations of the tool given their usual experience of technology. According to Ashraf [22] the Web 2.0 universe is packed full of powerful tools and technologies which facilitate their personal on-line sharing, collaboration and opportunities for self expression. He comments that 'everything is to hand, easy to search and filter via internet browsers'.

The concept that the Wiki will not replace face to face meetings is hardly surprising. In fact Deng & Yuen [23] define blended learning as 'the thoughtful infusion of face-to-face and online learning experiences'. According to Ashraf [22] if we want to understand and engage with our students to enhance their learning experience, we need to be alert to what has been term 'groundswell'; the shifting pattern in the way in which we communicate and interact with each other. The advent of web 2.0 technology in education [23] is currently a major part of this groundswell."

In conclusion, the implementation of computer supported collaborative learning described in this paper was recognised to be a significant improvement on previous incarnations of the module, and it was determined that it would be further pursued and developed for future implementations.

References

[1] D'Angelo, Barbara J. (2003) "If they build it will they come? Cooperation and collaboration to create a customized library" Reference Librarian 83/84:237-250. Co-published simultaneously in Cooperative Reference: Social Interaction in the Workplace (Celia Hales Mabry, ed.)

[2] Boud D, Cohen R and Sampson J (1999) Peer learning and assessment, Assessment in Higher Education 24: 413–26.

[3] Jaques, D. (2001), Learning in Groups. London: Kogan Page

[4] Gammie, E. and Matson, M., (2007), Group Assessment at final degree level: an evaluation, Accounting education: an international journal, 16, 2, 185-206.

[5] Barrie S (2004) A research based approach to generic graduate attributes policy. Higher Education Research and Development. 23(3): 261–75.

[6] Crebert, G., Bates, M., Bell, B., Patrick, C. and Cragnolini, V. (2004) Developing generic skills at university, during work placement and in employment: graduates' perceptions, Higher Education Research & Development, 23(2), 147 - 165.

[7] Victoria University of Wellington. (2004). Improving Teaching and Learning Group Work and Group Assessment (UTDC Guidelines). Wellington, Australia.

[8] Webb, E. Et al. (2004) Using e-learning dialogues in higher education Innovations in Education and Teaching International Volume 41, Issue 1, 2004, Pages 93 - 103

[9] Kollias V, Mamalougos N, Vamvakoussi X, Lakkala M, Vosniadou S. Teachers' attitudes to and beliefs about web-based Collaborative Learning Environments in the context of an international implementation. Computers & Education. 2005;45(3):295-315.

[10], Vosniadou S. Teachers' attitudes to and beliefs about web-based Collaborative Learning Environments in the context of an international implementation. Computers & Education. 2005;45(3):295-315.

[11] Kali Y, Levin-Peled R, Dori YJ. The role of design-principles in designing courses that promote collaborative learning in higher-education. Computers in Human Behavior. 2009;25(5):1067-78.

[12] Finger S, Gelman D, Fay A, Szczerban M, Smailagic A, Siewiorek DP. Supporting collaborative learning in engineering design. Expert Systems with Applications. 2006;31(4):734-41.

[13] Rubens W, Emans B, Leinonen T, Skarmeta AG, Simons R-J. Design of web-based collaborative learning environments. Translating the pedagogical learning principles to human computer interface. Computers & Education. 2005;45(3):276-94.

[14] Strijbos JW, Martens RL, Jochems WMG. Designing for interaction: Six steps to designing computer-supported group-based learning. Computers & Education. 2004;42(4):403-24.

[15] Lahti H, Seitamaa-Hakkarainen P, Hakkarainen K. Collaboration patterns in computer supported collaborative designing. Design Studies. 2004;25(4):351-71.

[16] Inc. LO. 2010 [20 January 2010]; CampusPack Fusion]. Available from www.learningobjects.com/campuspackfusion.jsp.

[17] Lee-Davies, L. 2007. Developing Work and Study Skills. Australia: Thomson.

[18] Tuckman, B.W. 1965. “Developmental Sequence in Small Groups,” Psychological Bulletin (63:6), pp 384-399.

[19] Giles, Jim. “Wikipedia rival calls in the experts.” Nature 443.7111 (2006): 493

[20] John Biggs (1999): Teaching for Quality Learning at University, (SRHE and Open University Press, Buckingham)

[21] Brown, S and Race, P (2002) Lecturing: a Practical Guide London: Routledge.

[22] Ashraf, B (2009) Teaching the Google-eyed YouTube generation, Education + Training, vol.51, no.5-6, pp.343-352.

[23] Deng, L. & Yuen, H.K. (2009). Chapter 14: Designing Blended Learning Communities: Principles and Implementation, In F.L. Wang, J. Fong, & R.C. Kwan (Eds.) Handbook of Research on Hybrid Learning Models: Advanced Tools, Technologies, and Application, IGI Global publications, pp. 228-243.

[24] Anderson, Paul (2007). "What is Web 2.0? Ideas, technologies and implications for education". JISC Technology and Standards Watch