

Peers Supporting Peers through Structured Bulletin Boards

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Abstract On-line forums or bulletin boards provide opportunity and potential for collaborative work, dialogue and study that can increase the flexibility of learning while motivating participants. By enabling peer-to-peer interaction, online bulletin boards can support the essential elements of a learning conversation by providing scope for discussion, dialogue and interaction.

The structure of the bulletin boards used in this investigation were carefully considered, and based on cognitive apprenticeship models of learning, whereby learning is scaffolded by peers and experts. In the particular environment of the study, technology is integral and supportive of the social processes of learning by enabling asynchronous communication. The combination of peer-supported teams and tasks designed for self-direction supported the key learning outcomes of collaboration, social responsibility and decision-making.

Introduction

In the case study described in this paper, learning tasks were defined to help engage learners in active, constructive, intentional and cooperative learning. These were supported with technology and instructional design principles with a view of promoting the development life skills such as using online collaboration.

The benefits of collaborative learning are well documented in the literature for learners at all levels and contexts (Johnson and Johnson, 2000). For example, Slavin (1996) has demonstrated that collaborative learning has positive effects on motivation, social skills and attitudes. Research indicates that the benefits of collaborative learning can be transferred to the electronic environment, resulting in increased motivation and learning gains. McConnell (2000) provides examples of groupware and computer supported collaborative learning systems to support communication, document sharing and asynchronous conferencing systems supported by courseware management systems such as WebCT and Blackboard.

The capacity to enable collaborative learning has been recognised as a feature of successful web-based environments that help improve learning (English and Yazdani, 1999). For example, group-based project work has been advocated for its capacity to foster professional skills and experiential learning (Klemm and Snell, 1996; McLoughlin and Luca, 2000a). By enabling online groups to work on complex tasks in a problem-based learning format,

opportunities are provided to develop independent and interdependent skills such as teamwork and communication (McConnell, 2000; McAteer et al, 1997).

Collis (1998) describes the adoption of group-based project work wherein groups work together to share responsibility for solving complex tasks. In these groups, complex real world problems are shared giving students opportunities to articulate and defend their ideas and reach consensus on decisions. The learning processes are akin to social constructivist learning whereby articulation, peer review of ideas, revision and collaborative knowledge construction are fostered (Brush, 1998; Tenebaum et al, 2001).

Peer learning at university: focus on processes of learning

In student-centred learning environments on the Web, where students are provided with increased responsibility for their learning, there is a need to make effective use of technological tools to scaffold important process skills, such as discussion, review of ideas, inquiry and reflection. Traditional university education may sometimes operate within a “transmissive paradigm”, emphasising the transfer of knowledge from lecturer to student. Such a view of learning is not conducive to meaningful, active learning where students take a pro-active role in questioning, sharing ideas and applying prior knowledge to new ideas. However, the increased emphasis on generic transferable skills has required a re-alignment of teaching practices with desired learning outcomes (Biggs, 1999). This means that if independent lifelong learning and critical skills are expected of graduates, teaching methods must foster such processes and skills. Figure 1 summarises the potential of peer learning to support transferable skills.

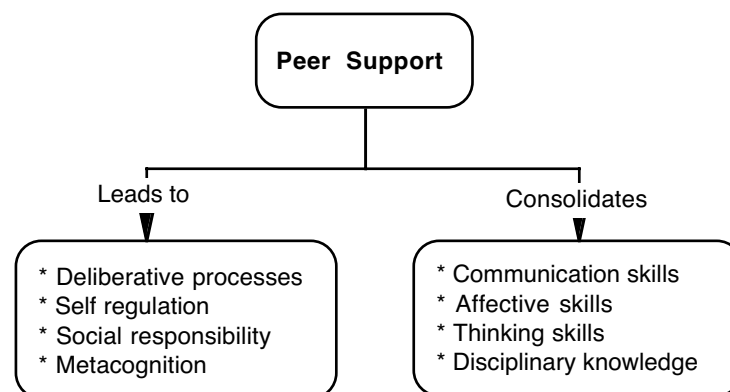


Figure 1: Schematic overview of how peer learning can support generic skills

Recent research has identified students’ approaches to be either surface level or deep level (Biggs, 1994; Ramsden, 1992). A deep learning approach is consistent with a search for knowledge and understanding, whereas a surface learner is concerned only with passing exams by memorising facts. Applied to assessment and teaching approaches in higher education, the implication is that the creation of an appropriate learning environment can foster a deep approach. This can be achieved by enabling learners to take an active role in learning by initiating, managing, monitoring, reflecting and evaluating learning tasks and processes. The relevance of the process-based approach is that the adoption of learner-centred

pedagogies increases learner interdependence and equips learners with professional skills and attributes.

The strengths of collaborative peer learning flows from the argument that the synergies available through group work create multiple perspectives on learning and problem solving. There is a growing body of research on group work in higher education with an emphasis on participative and peer learning, with the realisation that students are more likely to learn from experience than from transmissive pedagogies. There has also been an increased awareness so the importance of catering to the needs of diverse range of students by providing varied learning experiences supported by information and communications technologies. Research shows that collaborative learning and peer partnerships foster learning because:

- Peer learning moves away from traditional educational contexts which are teacher dominated and so promote active, independent learning;
 - Learning webs exist in society and are a highly productive form of social interactivity and a major source of learning;
 - Adult learning principles require acknowledgment of prior knowledge and sharing of ideas;
 - Peer work brings positive socio-emotional benefits.
- (See Kitchen and McDougall, 1998; McConnell, 2000; English and Yazdani, 1999).

The implication of these findings to enhancing the e-learning experience is that we need to use the attributes of technology to increase the benefits of peer work and interdependence by designing learning environments that enable students to develop social, collaborative, professional and communicative skills.

Context of the study

At Edith Cowan University, final year multimedia students are required to complete IMM3330/4330 “Industry Project Development”. The aim of this unit is to consolidate core multimedia skills developed in other units, while at the same time making industry contacts and developing a portfolio item to assist with job applications. Students are provided with industry projects made available through the Faculty, or they can negotiate a project of their own, as long as it fulfils the course requirements — that it is team-based, commercial in nature and not trivial. Students are required to perform a needs analysis, provide a design specification, develop the web site, evaluate it, implement it and produce the required documentation (legal, procedures, metrics, templates and standards).

Students are responsible for making contact with the client and discussing the scope and legal aspects of the project (educational software, IP, etc). These are negotiated so that the clients’ needs satisfied, while at the same time the students produce authentic assessment items that conform to the requirements of the unit. This involves firstly understanding the client’s needs and “educating” the client about web production, maintenance and costs. The project based nature of this unit enables students to develop a relationship with a client, create solutions to a design problem and develop a project brief, as in a real scenario. In addition, project teams had to report on progress to other teams, compare project plans and reflect on learning processes, assessment processes and team dynamics. Each of these involves partnerships with industry clients and result in the development of websites — see <http://studentprojects.scam.ecu.edu.au/>.

The unit runs over a fifteen-week semester, with three hours allocated per week for tutorials and lectures. However, there are no formal face-to-face classes, as the unit is largely run online from a Bulletin Board, which provides a rich arena for advice, comments and feedback. The number of participants subscribed on the Bulletin Board varies from semester to semester from 30 through to 100. Students post questions or ideas, and receive responses from others to help guide them in managing their projects, and creating multimedia products. The rationale used in structuring the project unit around a bulletin board, was that students could benefit from the experiences of other students, industry representatives and academic tutors in an environment that promotes collaboration, negotiation and the exchange of ideas. Figure 2 shows a screen dump of the bulletin board.

IMM3330

Industry Project Development

Teamwork:	new	Topics	Views	last post
Discuss team issues, problems, faults and how they were resolved				
Reflection on your success/failure & considering other feedback		3	58	Wed 16 Apr @ 10:10 am
Team communications strategies:		4	66	Wed 02 Apr @ 03:41 pm
Interpersonal & Social Skills		2	52	Tue 01 Apr @ 08:24 pm
Clearly defined goals & responsibilities		3	62	Tue 01 Apr @ 08:18 pm
Supporting & Encouraging Peers		2	27	Fri 21 Mar @ 02:55 pm

Industry Project Forum:	new	Topics	Views	last post
Design Issues		4	75	Tue 22 Apr @ 10:49 pm
Project Management Issues		13	251	Tue 22 Apr @ 09:26 pm
Technical Issues		6	94	Tue 22 Apr @ 06:48 pm
Syllabus & Unit Information		3	106	Tue 01 Apr @ 08:28 pm
Other Issues		5	98	Tue 01 Apr @ 03:33 pm

Figure 2: Screen Dump of Web Site created using Apple Technology

Pedagogical Design of the Bulletin Boards to Support Collaboration

The Bulletin Board consists of two main sections that students can contribute to — Teamwork and Industry Project Forum (Figure 2). The Teamwork section gives students the opportunity to discuss team issues, problems, faults and how they were resolved. Based on the literature on collaborative work, five group processes were identified and used to create a framework for categorising Bulletin Board interactions. The intention was to foster team skills, and so the environment was designed to scaffold or support teamwork processes. Scaffolding is a supportive process through which learner efforts are assisted while engaging in a learning or performance task (McLoughlin and Luca, 2000b). Students engaging in

teamwork for the first time are often unaware of how to self-manage their own performance and that of others, while also learning new conceptual knowledge. In this Apple technology-supported learning environment, it was intended to provide student support for managing group processes associated with effective teamwork (Johnson and Johnson, 2000).

The design of tasks was informed by the research literature on the qualities of effective collaboration as identified by researchers of computer supported collaborative learning (CSCL) Koschmann (1996). The definition of team that informed the research is that of Katzenbach and Smith (1993) which is “.. *is a temporary or an ongoing task group whose members are charged with working together to identify problems, form a consensus about what should be done, and implement necessary actions in relation to a particular task area.*”

Support for team formation was achieved by designing an interface where the support for communication and on-task behaviour was built into the environment. That is, for each type of communication desired, a corresponding category was established:

- Reflection on your success/failure and considering other feedback
- Team communications strategies
- Interpersonal and social skills
- Clearly defined goals and responsibilities
- Supporting and encouraging peers

The Industry Project Forum section allows students to ask questions or discuss issues related to the course and syllabus under the following headings:

- Design Issues — discuss design issues
- Project Management Issues — PM issues include client, legal, time tracking etc.
- Technical Issues — discuss programming issues
- Syllabus and unit information — questions related to marks, dates, syllabus etc
- Other Issues — any other issues not related to the above categories

Technical Development of the Bulletin Boards

The bulletin boards were designed and developed to be an open source product that could be run on most systems providing they had the following installed technologies:

- Apache Web Server <http://www.apache.org/>
- PHP for Apache <http://www.php.net/>
- MySQL Database Server <http://www.mysql.org/>

Mac OS X server was used for its implementation, as it comes pre-installed Apache webserver, PHP and webDAV modules, Tomcat and JSP, MySQL and directory tools such as LDAP. These tools provide many possibilities for online development without having to source other software development applications. This is a direct result of Apple’s continual support in providing open source technology in the Mac OS X environment. It was the inclusion of these “free” and “open source” tools that lead to the fast and efficient development of a complete courseware management system, which included these bulletin boards.

Within this environment, PHP was used as the main programming tool. It offers developers many programming tools and libraries for deploying applications to the web. A recent survey

found 12,000,000 domains using php-enabled websites have been developed since January 1999 (PHP, 2003). MySQL was chosen as the database back-end, having proven itself with an estimated 4,000,000 customers worldwide (MySQL, 2003). As an open source technology it provides a huge support base of developers and in our situation, 100% uptime. Another key feature of the MySQL database system is its operational speed and reliability. PHP, MySQL and the Mac OSX operating system has enabled the bulletin board system (integrated with a courseware management system) to be a truly versatile, usable and dynamic application.

Integrated assessment

To help ensure students were motivated to use these bulletin boards, some assessment is allocated to individual contributions made to these Bulletin Boards such as seeking feedback, giving advice and promoting the dialogue. Instructions for Bulletin Board given is given in the syllabus as follows:

Each team member is encouraged to use the BB to discuss different project management issues, share experiences and help other students. Individuals are expected to contribute their expertise to issues raised. This can be in the form of advice, problem solving ideas, sympathy, praise or assisting other students with technical knowledge or other helpful advice. The more meaningful the contributions the more marks you get. Assessment of comments are ranked as follows:

- *Irrelevant, unhelpful — attract no marks and are monitored for disruptive influence. Nobody appreciates “junk” mail.*
- *Attempt at involvement, not fully grasping ideas, asking for help — this is mainly what the Listserv has been set up for ie. as a means of communicating and receiving help from students and tutors.*
- *Contributing with help, progressing debate, new ideas, summarising difficult concepts*
- *Sending 3-5 quality comments per assessment item can obtain full marks. Quality input is needed, not quantity! i.e. students are not required to answer every question*
- *Appropriate language must be used respect shown for others student’s questions. Also, making fun of other student’s questions, being sarcastic, making rude or irrelevant comments will attract penalty marks*

The Bulletin Board allowed students to discuss their team progress, which included students posting design ideas and prototypes to a shared workspace (<http://studentprojects.scam.ecu.edu.au/>) and requesting feedback from others to help make improvements. When students requested comments or help from others, tutors were instructed not to answer immediately, but to for a couple of days to allow peers the chance of responding (Figure 3).

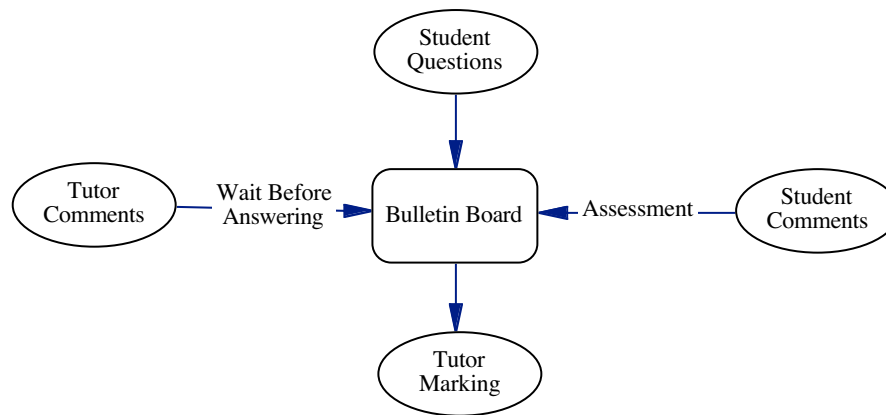


Figure 3: Online Bulletin Boards

The tutors' involvement on the Bulletin Board was structured to be non-interventionist so that they acted more as facilitators by focusing discussion, rather than as the "fonts of all wisdom". Figure 3 outlines the model used for promoting discussion. Issues were generated from team design and production issues or from individual queries about technical, content, procedural, client, communication, team/peer issues sent to the list serv. Tutors, industry experts and ex-students then responded. Also, student had the opportunity to post other open questions, comments and reflective statements in the *Teamwork* area. As the semester progressed, we found that students more freely contributed to the Bulletin Board with many other issues, some of which were more philosophical in nature.

Project based learning and use of multimedia technologies

As part of the project requirements, students were responsible for making contact with the client and discussing the scope and legal aspects of the development (educational software, IP, etc). These had to be negotiated so that the client had their needs satisfied, while at the same time the students were involved in producing a web-site that conformed to the requirements of an academic unit. This often involved firstly understanding the client's needs and "educating" the client about web production, maintenance and costs. In this online unit, project based learning enabled students to develop a relationship with a client, create solutions to a design problem and develop a project brief. In addition, project teams who worked on creating the had to report on progress to other teams, compare project plans and reflect on learning processes, assessment processes and team dynamics. Each of these involved partnerships with industry clients as and resulted in the development of multimedia products (usually websites) as shown in Table 1. The final web site can be viewed at <http://studentprojects.scam.ecu.edu.au/>.

Team No	Project Description
1.	Oil and Gas Resource Web Site
2.	On-line course module for Westone
3.	Benchmark Furniture Online Catalogue
4.	Curriculum Council web site
5.	Medical web site for Edith Cowan University
6.	Cancer Foundation web site
7.	Indigenous Art 1
8.	Photomedia web site for Edith Cowan University
9.	Ecotourism web site
10.	Solo Travellers Club
11.	Wine Club
12.	I Mac Touch Screen

Table 1: Multimedia projects created by the students

The student learning process

The framework used in this course to promote the student-learning process is shown in Figure 3. It is focused on using learner-centred strategies, which encourage learner independence and peer support, which in turn promote the development of professional skills and process knowledge. These skills are integral to the development of generic learning outcomes such as planning, design, project management skills and the capacity to manage a team. The task drew on team skills and content knowledge, and the underlying pedagogy was process-based and directed at encouraging interdependence among learners, with a large measure of autonomy (McLoughlin and Luca, 2000b). As stated above, in order to support team skills, several support processes were provided to foster team communication and social interaction. The bulletin board interface showed that students were expected to categorise their postings, reflect on team processes, allocate of responsibility, maintain progress checks and ensure supportive team behaviours (see Figure 2).

Also, as part of the authentic learning task, students had to share their knowledge with their industry partners, who in many cases were not fully informed about online design and the potential of technology. This experience raised industry awareness about opportunities for business promotion using the web, while industry partners assisted students by briefing them on market needs, business practice, commercial, legal and ethical constants. So, not only did the students gain experience by liaising with clients, but the clients also benefit by the reciprocal relationship and exchange of knowledge. In this way the learning transaction is based on the notion of partnership (McLoughlin and Luca, 2002a).

Student Usage

While students used each thread defined in the bulletin board (Table 2), most comments were posted to the “Development of team communication strategies” thread, followed by “Reflection on success or failure” and “Defining Goals”. The students then saw these three categories as more important than “Positive use of interpersonal and social skills” and “Supporting and encouraging peers”.

After discussing this issue with some students, it appeared that the two least popular categories were not specific enough. Students preferred categories that were clearly defined, and easy to relate to. Also, they considered the first three less confrontational or personal i.e. they could discuss these in an objective manner.

Bulletin Board posting categories indicating social support	% Comments
Developing team communication strategies	33%
Reflecting on success or failure	26%
Defining goals and responsibilities	23%
Positive use of interpersonal and social skills	11%
Supporting and encouraging peers	5%

Table 2: Analysis of Bulletin Board postings according to percentages in each category

Many comments were well thought through, and students discussed issues that affected the team performance, with comments from others that helped support ideas and queries. The following shows one thread in the “Goals and Responsibilities” thread:

- *All my group members have responded well to their work. We all agree that this project is important and useful for our up coming project and real life work. Therefore we realise that in order to reach main purposes in-group work, firstly the group should have the same common goals and fully response in their tasks. Clearly understand goals are the main thing to keep group work in to the same track.*
- *Yeah it was good that we all like “fitted in” to our roles in the project, so that its not just an assignment to put together, it’s something we like to do. Since we all want a good result, not only in terms of the final grade but to put up a good portfolio for future reference, its good to know that its not just another project we are doing.*
- *I think we all have goals of getting good marks in this unit, which is definitely the way to go. On a more personal level I am looking for more than a good mark, I would like to come away from this project knowing that the clients needs had been met, everyone was satisfied with the final results, that I had conducted myself in a professional manner through out the project and that I had learnt new ways of dealing with challenges that I will be able to any future job I have.*
- *I agree. Defining the goals of each group member to begin with helps clear up any confusion or resentment in the future. If everybody has a clear understanding of what the others want to achieve the work will progress smoothly. For example, in my team we have all stipulated that we want to attempt to achieve high distinctions for this unit. This is great for all of us as it means each member will be prepared to pull their weight and put in the time and effort to achieve results. It is probably lucky we all want good marks, and there wasn’t a group member only aiming for a pass :)*

These comments show how the bulletin board helped students reinforce important skills needed to manage team-based projects, and support others through their own experiences.

Conclusion

Supportive cooperative teams build positive interdependence and work together to achieve team goals, support each other and plan for team outcomes (Tarricone and Luca, 2002). The findings in this study are consistent with others on peer-to-peer interactions in electronic environments, and with the types of activities that have been found to be productive of socio-cognitive interactions leading to effective teamwork (McLoughlin, 2002). Productive interactions have been found between peers who:

- Offer and receive assistance;
- Exchange resources and information;
- Explain and elaborate on concepts
- Share existing knowledge;
- Give and receive feedback;
- Challenge others' contributions;
- Monitor each others contributions and encourage achievement;
- Engage in collaborative tasks; and
- Negotiate solutions to problems.

The creation of appropriate contexts, tasks and support roles for teachers and peers are fundamental to development of these processes (McLoughlin and Luca, 2000b). Collaborative learning technologies and tools offer some unique opportunities both for peer and electronic support of team building and collaboration, and online forums and bulletin boards provide opportunities for student dialogue that stimulate interchange of ideas and reflective processes. In the context of the present study, where students were engaged in learning about project management, peer support online was found to be essential in the maintenance of a positive and supportive environment to meet the learning outcomes.

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