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Learning with cyberfriends: the development of professional reflection-on-action skills through online partnerships

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Abstract: One the crises facing the professions is the scepticism surrounding the nature of professional knowledge and whether individuals can cope with the increased complexity of society and the changing demands of the workplace. Tertiary institutions have now strengthened their links with industry and have produced lists of attributes and communication skills they aim to cultivate in graduates. In order to develop these skills students need to be able to reflect on their learning experiences, integrate them with prior knowledge, self-evaluate and develop their own decision-making and planning processes. Online technologies can be used to support the process skills underpinning reflection-onaction (*reflexivity*). The development of reflexivity is presented in the context of an online tertiary unit where students proceed through the cycle of action, reflection, planning and abstract conceptualisation by engaging in a range of communication skills including peer assessment and problem solving. The study shows how online tasks can support reflexivity.

Introduction

Information and communication technologies have the capacity to support a wide range of learning goals and are now integrated into teaching approaches of many higher educational institutions. Laurillard (1993) for instance suggests that computer-based learning has a major role in promoting quality learning outcomes such as:

• self-directed learning and increased student autonomy;
• keeping the educational system in line with technological development;
• increased information literacy, ensuring that graduate skills are in tune with those of employers; and
• increased productivity and efficiency in higher education.

Through computer facilitated learning, students can access WWW sites, bulletin boards and on-line resources to support their own learning and consequently promote the development of generic research skills, information literacy, retrieval and management of data. However, many students find their experience in tertiary institutions too general or out of context, and cannot transfer these skills into realworld contexts, or link them with prior knowledge (Taylor, 1997). The use of information technology within a structured environment can offer learners contextualised support within which to anchor their learning and reflective skills.

Development of reflective skills in higher education

One of the characteristics of being considered professional is having the capacity for self-direction and being able to apply practical strategies and skills in contexts that require them. Professionals have a body of expertise that is developed through experience within community of practice and lifelong learning skills. Boud and Keogh (1985) suggest that the capacity for self-directed learning includes elements of independence, dependence and interdependence and propose that these form a continuum whereby the learner progresses from dependence, to independence and then to interdependence (Figure 1). Each of these stages requires learners who are able to reflect on and assess their own skills and capacities.

Figure 1: Continuum from dependent to   dependence   independence   interdependence

showing progress interdependent
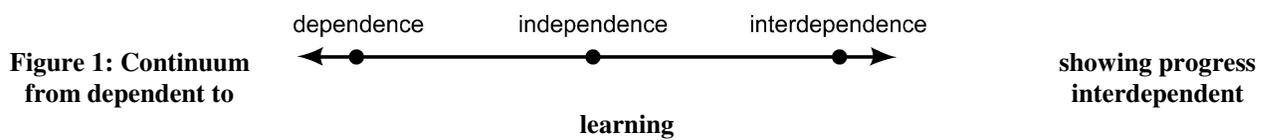
learning

It is widely accepted that graduates should not only be technically competent but they should also be skilled in communication and teamwork, have social and global awareness, be self-directed and be prepared for life-long learning. However it is much less clear how these "soft skills" are best developed in undergraduate students in the context of their studies. One recommendation is that pedagogy needs to change from transmissive, didactic approaches towards transformative, student centred approaches. In the present study, this has been achieved in the context of a project-based unit of study, involving both individual and group work, located within a Web-based learning environment.

Theoretical framework: experiential learning and reflective processes

According to several theorists, authentic learning occurs only through reflecting upon personal experiences (Dewey, 1993, Schön,1990). Reflection is often defined as a process that enables connections between the various elements of an experience, and Dewey refers to reflection on experience as a learning loop that 'runs back and forth' between the experience and the relationships being inferred. The concept of the learning loop has gained popularity through the work of Kolb (1984) and his four stage experiential learning model in which learners move through a series of phases involving experience, reflection, generalising/theorising and planning.   Therefore, the ideal experiential learner will be able to:

•   involve themselves in new experiences without bias
•   reflect upon experiences from multiple perspectives
•   integrate their observations into logically sound theories, and
•   use these theories in decision making and problem solving. This kind of practice is being promoted by new accreditation processes for graduate engineers in Australia (Jolley, & Radcliffe, 2000) and has the potential to deliver on many of the recommendations about graduate attributes now recommended by Australian Universities (McLoughlin & Luca, 2000).

The terms reflection and reflexivity need to be clarified at this point. *Reflection* has a focus on phenomena more divorced from the practitioner, whereas *reflexivity* is reflection based on personal experiences of learning, which fundamentally changes the relationship between the learners and the learning process. To illustrate this point Argyris (1988) distinguishes between single-loop learning and double-loop learning. Single loop learning occurs when the learner detects an error and corrects this without questioning or altering his/her learning approach. Double loop learning occurs when errors are corrected by examining and altering the learning processes and the actions surrounding learning in general. The distinction is important as reflection merely changes the outcomes of learning, while reflexivity changes the person and the process. Schön (1995) also makes a similar point by distinguishing between *reflection-**in**-action* and *reflection-**on**-action*. Refection-inaction is tacit and is designed to improve action and performance. Reflection-on-action (reflexivity) is a higher order skill designed to improving self and future practice. These processes can be supported and fostered in Web-based learning environments.
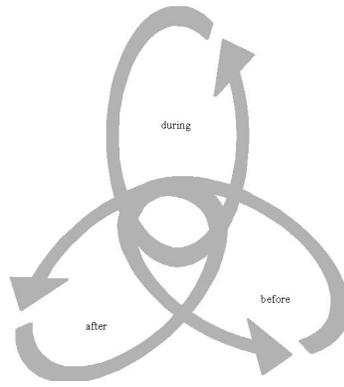
Figure 2: Reflection before, during and after experience

Design of the learning environment: using technology to support reflection

The connectivity and communicative possibilities offered by online technology make possible a range of cognitive and metacognitive processes including the capacity to reflect, both individually and as a group. Reflective dialogue using computer-mediated communication is enabled when learners engage in collaborative tasks (McLoughlin & Oliver, 1998). Revision, reconstruction and rethinking of ideas occurs when tasks enable students to exchange ideas, comment on each others' work and engage in critical self-assessment (Seale & Cann, 2000). In other studies, both individual and group reflection are fostered when gaps and contradictions in knowledge are identified and by using technology to support self-explanation and articulation of ideas. In this case, the emphasis is usually on immediate reflection rather than reflexivity, which is the higher order cognitive process. In the study reported here, online debate and problem solving were regarded as the primary mechanisms to support both individual and collaborative reflexivity. The combination of problem solving tasks with collaborative social discourse were investigated as triggers of metacognitive thinking in the learners who participated in the study.

Context of the study

The context of the study was tertiary level online unit in project management that is part of a degree program in Communications and Multimedia. The unit of study on project management is currently delivered on-line using WebCT software, and is available on-campus and in the distance mode of study. Project management skills such as needs analysis, design specifications, storyboards, concept maps, evaluation, legal issues, quality auditing, and scheduling are developed and applied in the creation of a Web site by "project teams", or small groups of students who work collaboratively as they would in an industry context. The objective of the team project is to promote team and client collaboration skills by focussing on a common task. Learning and assessment processes are integrated throughout the duration of the one semester unit. The assessment consists of project team-based work, team problem solving, peer assessment, individual reflective reports, a client mark and individual postings to a weekly online forum.

Assessment in the online unit is based on authentic tasks planned for their relevance to workplace settings. Students worked in teams to create a product that is offered to clients (peers) for evaluation, and tested for functionality in a real context. Working online enabled students to provide multiple forms of peer support though shared tasks, teamwork, collaborative work, and opportunities for feedback and peer review. These supportive processes developed communication skills while creating an affective climate of support for thinking skills, discussion, negotiation and reflective processes.

Theoretical framework: experiential learning

Through the design of problem solving tasks, the project management unit introduced learners to situations and ways of working with others that were experientially based. The processes of learning were emphasised from the outset and students were encouraged to have ownership of the learning, assessment and reflection processes.   For Kolb (1984), the actual experiences people go through become the starting points for learning, and this underlying educational approach was reflected in the design of the online environment. Emotion and reflection are also an integral part of the cycle of learning, and reflective processes are intrinsic to learning from experience. In an experiential learning cycle, the learner passes though each of four stages: concrete experience, reflective observation, abstract conceptualisation, and active experimentation. Our design ensured that we linked the experiential learning cycle to the online environment and the collaborative tools afforded by the technology as follows:

•   *Active experimentation:* Students engaged in the discussion and resolution of problems through online discussion using multimedia tools to support the display of responses (eg., Cox, 1994).

•   *Task engagement*: Peers analysed the output of the task, and compared problem-solving approaches through discussion, email and conferencing activity (Bonk & Cummings, 1998).

•   *Reflection:* Individuals analysed and reflected on the learning tasks, group processes and self-development as they tested new ideas and perspectives in virtual learning groups (English & Yazdani, 1999).

•   *Formation of an abstract concepts:* Utilising peer and tutor feedback, students developed understandings of key course concepts through engagement with new ideas supported via communications networks (Collis, 1998).
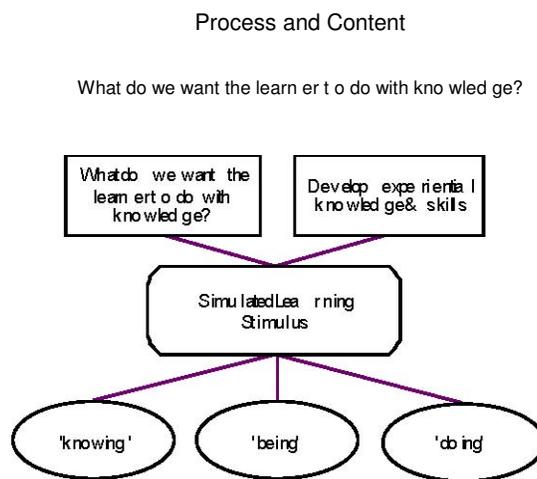
Process and Content

What do we want the learn er t o do with kno wled ge?

Figure 3: Course pedagogy

Experiential learning was reinforced in various ways through the course pedagogy, which focussed on both process and content aspects of learning. (See figure 3). Students participated in decision-making processes by choosing and defining a topic for their project, creating and managing their own development team and negotiating peer assessment. The design was based on pedagogical and curriculum philosophies that acknowledge group work, peer feedback and support as essential to the development of independent learners and practitioners (Candy, 1994; Boud, 1985). Reciprocity in giving and receiving peer feedback provides learners with opportunities to deepen their interpersonal skills. Through these processes they also developed reflective skills, and learnt to monitor their own learning and appreciate the contribution of others to their learning. Thus, by focussing on learning process and peer supported activities, the learning tasks took on a broader perspective, to include the totality of the learning experience while consolidating those aspects of professional learning that would enable the learners to develop transferable skills.

Student reflections on problem solving strategies

The student participants formed four teams who engaged in problem solving, giving feedback on each others' solutions and peer assessment processes. These students completed authentic problems, where they were required to implement these skills in a 'real' environment, with 'real' clients and produce 'real' product. This work place component is designed in order to engage students in a range of experiential learning tasks in which they give feedback on each others' performance in groups and reflect on their own and others' performance. In the first task students were asked to reflect on the problem-solving processes they had engaged in while solving problems and then asked to articulate these during class discussions. This enabled the students to reflect on their own strategies, to identify areas of weaknesses and to conceptualise ways of addressing those weaknesses. Students were asked to write down the major strategies used when solving problems. As shown in Table 2, the salient features of student problem solving strategies were:

• researching the topic thoroughly;
• reading the question carefully and considering different angles;
• checking that the content used is correct;
• comparing ideas with other students; and
• brainstorming to consider different views and ways of approaching the problem.
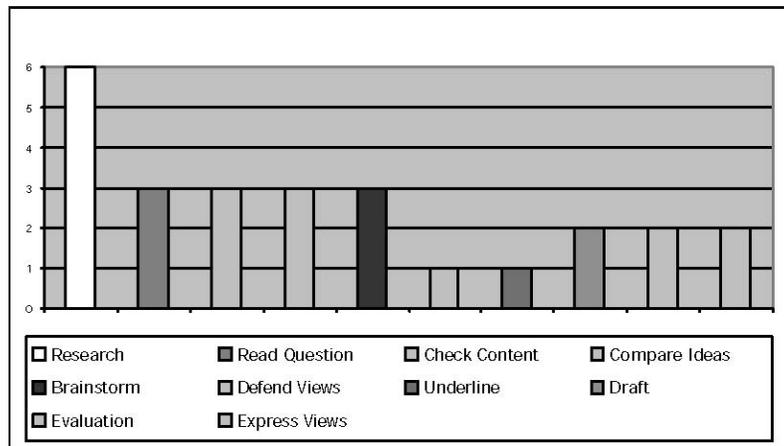

Table 2: Summary of student responses to problem solving tasks

While these processes represent some of the major elements of expert problem solving strategies (Lipman, 1991; Paul, 1994), they nevertheless do not include all of the possible expert problem solving strategies such as planning, testing possible solutions, revising and checking details.

Student perceptions of peer feedback as support for learning

Students were encouraged to articulate the changes they would make to their solutions in the light of feedback from peers, and to use this feedback to improve their own learning and problem solving. This form of reflective practice is part of experiential learning and supported by the work of Mezirow (1990) who emphasises the role of critical reflection in self-directed learning. On-line learning can support critical self-reflection and peer reflection by providing access to others' work, but the actual reflective process needs to be facilitated by a tutor. Comments made by learners on how they would improve their problem solving strategies included the following:

• *Do more research;*
• *Plan my time;*
• *Read the questions and predict what the solution might be;*
• *Develop my solution further with examples; and*
• Add specific details on various points and provide examples of these.

In addition, students were asked to document and explain the impact of peer feedback on their own learning approaches. They found this task unusual, and had not previously considered that other student views would influence their own ways of thinking and problem solving. The responses demonstrate that students did in fact adopt a deep approach to learning and that the peer support promoted reflection and further dialogue. Table 3 provides examples of comments made and links these comments to implicit learning processes. The learning processes identified in Table 3 are indicators that student learning was enhanced by peer support and feedback and that participants raised their awareness of other's perspectives and became more aware of their own strategies.

Table 3: Reflections on individual conceptual growth

Student comment	Learning process
I learn to see things from a different angle	Conceptual change
I found it helpful to see what others had said and how they had different views	Consideration of multiple perspectives
Critical feedback helps me develop my solutions and see my poor points	Self evaluation
I learnt that there were many aspects that I might have considered by brainstorming	Strategic learning
You learn how people's positions can vary greatly and you have to be open	Openness and a sense of inquiry
Being able to see and hear others' feedback is good for my learning and brings up points that I had not considered	Acting on feedback

The tasks that fostered reflective practice were built into the learning environment and also integrated with the assessment tasks that students were required to complete. Each assignment required students to record their reflections on self, task and others. Table 4 shows the summary of typical responses from individuals.

Table 4: Summary of reflection on self, task and others

Self	Task	Peer collaboration
Increased knowledge breadth	Capacity to anlsyse problems	Changed relationships with colleagues
Development of evaluation skills	Improved planning processes	Evaluating claims
Improved group communication skills	Increased ability to heck & monitor progress	Dealing with power relations
Enhanced relationships with colleagues	Enhanced skills in gathering data	Improving participation and negotiation skills
Expansion of personal vision	Increased awareness of whether task goals had been achieved	Becoming more attuned o the needs of others

Conclusions

It could be argued that the best way to make expert knowledge accessible to non-experts is to foster the use of reflective activities on successes and failures. This was achieved in the online environment by enabling group and individual reflection through both online and offline activities. In the study reported here, this combination proved to be very productive, where reflection was systematically built into the environment through both task design and assessment. The learning activities helped students develop responsibility for their own learning, and gave them the scope to develop personally and professionally. The technological support afforded by online communication tools and asynchronous conferencing were integral to the development of the course.

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