

The online learning environment—A new model using social constructivism and the concept of ‘Ba’ as a theoretical framework

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Abstract Organisations that provide education are businesses and, as such, are not immune from the impact that the Internet has had in recent years, both on the way organisations conduct their business *and* as a business supporting technology. Indeed, the use of the Internet as a facilitating mechanism for educational course delivery has been growing steadily over the last 5–8 years and, although there are some significant issues that have arisen in that time in relation to the quality of learning that can be achieved, there is no doubt that it will continue to be developed as an educational tool. The real issue for educators is, therefore, not *whether* the Internet will be used in course delivery, or *if* it is a useful tool, but rather *how* can a teacher make best use of it to enhance learning? This article documents a study that has analysed five years of student reflections on the scaffolding mechanisms used to promote and encourage learning in five Internet-based courses at the University of Queensland run between 2001 and 2005. The courses involved include three Internet-delivered Masters coursework courses and two Internet-delivered undergraduate courses in three different discipline areas. The outcomes of the study are: (1) a Report Card documenting student evaluations of the scaffolding mechanisms used; (2) a What, Why, How, Where framework of scaffolding mechanisms that are best suited to enabling deep learning through the online environment, and (3) a proposed new model of knowledge acquisition in online learning environments entitled ESCIE, which is based on Nonaka’s SECI and Ba models of knowledge creation.

Keywords Ba · Knowledge acquisition · Learning environment · Online learning · Scaffolding · Social constructivism

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Introduction

Online education—that is, education delivered via the Internet—has been growing in popularity across all levels of education, and particularly in higher education institutes, since the mid-1990s (Harmon and Jones 1999). Originally seen as a means of extending the reach of organisations participating in the distance-education market, it is also regarded as a cheap and flexible alternative to print materials for delivering courseware and content to students who are studying remotely from their educational institute (McMahon 1997; Oliver and Herrington 2001).

Of course, there has been some concern that educational institutes are investing in such delivery modes as a response to a ‘technological imperative’ (Holt and Thompson 1998) or as a cost-cutting exercise (Jackson and Anagnostopoulou 2001), rather than for good educational and pedagogical reasons. Further, it has been argued that such educational delivery neither is what students want (Simonsen 1995), nor delivers a good learning environment (Reeves 1994).

Without a doubt, such concerns need to be addressed, but Bennet et al. (1999), Bryceson (2001), Neo and Neo (2001) and Torrisi-Steele (2002) all indicate that it is not the actual technology of delivery that is important, but rather it is how the teacher/lecturer uses that technology to create new experiences for the learner that are important in creating a good learning experience. There is also a growing body of literature arguing the need to create Internet-based learning solutions that are explicitly grounded in learning theory (McMahon 1997; Neo and Neo 2001; Pear and Crone-Todd 2002; Ring and McMahon 1997) to ensure a high-quality learning environment.

The goal of the study outlined here was to address the main teaching issues associated with developing appropriate scaffolding mechanisms for enhancing and extending learning in an online environment. This was accomplished in two stages—the first stage was a review of learning theory, scaffolding, online teaching and knowledge management literature in order to provide the context and background to the study. The second stage was an evaluation of the scaffolding mechanisms employed in five Internet-based courses developed and delivered at the University of Queensland between 2001 and 2005, using student reflections on their learning outcomes for each course as the evaluation instrument.

The project is described in the following sections, which put forward the main theoretical approaches involved, the background to the methodology and data used for evaluation, the outcomes of the analysis, the development of a new online learning model entitled ‘ESCIE’ and a best practice What, Why, How, Where online scaffolding framework.

Theoretical approaches

There are four broad theoretical approaches associated with learning: Behaviourism, Cognitive Theory, Constructivism and Social Constructivism. In this section, these four broad approaches are briefly described, as are knowledge creation/acquisition and knowledge management theory in which the Communities of Practice work of Wenger (1998) and the ‘SECI’ and ‘Ba’ models of Nonaka (1991, 1994) and Nonaka and Konno (1998) are focused upon.

In the *Behaviourism* approach, Skinner (1974) argues that the learner is a passive recipient of knowledge and that the teacher is the active dispenser of knowledge and feedback. Behaviourism focuses on the belief that learning takes place through a

mechanism of stimulus and response and focuses on three main learning processes: classical conditioning, operant conditioning, and imitation (Langford 1989). The main problem associated with this theoretical approach is that it relies on observable behaviour as an evaluation mechanism of learning and does not account for how a person's thoughts, tacit knowledge and internal conceptions might have altered during the learning experience.

The *Cognitive Theory* approach to learning, put forward by Bruner et al. (1956), was developed from neurophysiological and psychological research into understanding how the brain processes and captures information through encoding and retrieval from memory. The main problem with this approach to learning is that it takes the view that the learner is simply a processor of information who learns through problem solving and critical analysis of the information, with the lecturer being the dispenser of that information.

Constructivism examines the ways in which learners make meaning from experience. This approach focuses on how the learner creates an interpretation of the world based upon their past experiences and their interactions with the world. In other words, the learner is a constructor of knowledge who autonomically controls his/her own processes of learning, within an overall situational learning context. Most constructivist approaches argue that learning should be durable, transferable and self-regulated (Di Vesta 1987) and mechanisms such as some form of interactivity or active learning must be in place to engage interest and to facilitate the deeper learning necessary for this to occur (Biggs 1999). This is especially true in online environments (Bryceson 2001, 2002; McMahon 1997; Neo and Neo 2001).

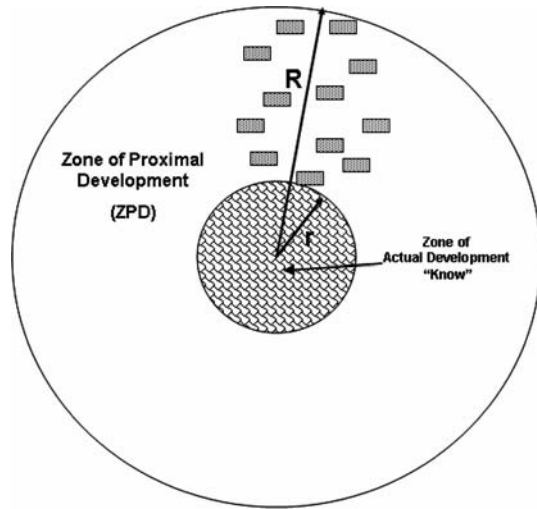
Cognitive Constructivism (Piaget 1977) combines aspects of both Cognitive Theory and Constructivism and argues that learning is a process of accommodation, assimilation and equilibrium. Thus, where knowledge is highly interconnected and complex, many different representations of content are necessary to create deep learning. From an online education perspective, the Internet has provided a technological backbone for creating a highly complex interconnected information environment (primarily via hypertext links) where knowledge can be acquired. However, how the engagement of a learner's interest takes place in such a complex information environment is not addressed by Piaget's theory—mainly because it was developed long before the Internet became a serious facilitator in education.

Social Constructivism goes a step further in the theory of learning. Put forward by Vygotsky (1978), this theory argues that learning is not purely an internal process, nor is it passive, but that culture and context are highly important in forming understanding and hence the beginnings of deep learning. Thus, learning is seen as the development of higher-level psychological processes occurring first on an interpersonal level through social interaction and then being internalised.

Vygotsky (1978, p. 86) also introduced the concept of the Zone of Proximal Development (ZPD) (Fig. 1) which he defines as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined by problem solving under adult guidance or in collaboration with more capable peers”. He went on to say that the ZPD is that intangible area in which optimal learning takes place and that, through a process of ‘scaffolding’ in the ZPD, a learner can be extended beyond their current capabilities to the extent that “the (physical) development process lags behind the learning process” (Vygotsky 1978, p. 89).

Earlier, scaffolding had been described by Wood et al. (1976, p. 9) as “...controlling those elements of the task that are initially beyond the learner's capability thus permitting him to concentrate upon and complete only those elements that are within his range of competence”, and thus it can be thought of as an instructional tool that reduces learning ambiguity, thereby increasing growth opportunities. In other words, the lecturer (or other

Fig. 1 Diagrammatic illustration of Social Constructivist Theory (r: radius of core knowledge development; R: radius of potential ZPD boundary; shaded boxes: scaffolding mechanisms)



knowledgeable person) provides a supporting structure that initiates (engages) student interest at the edge of a student's competence and which then helps to progress the student's knowledge development and control of the tasks involved. Eventually the scaffolding is removed when the student accepts full control of the task, which is termed 'fading' (Oliver and Herrington 2001).

Scaffolding, in this sense, translates to a model of learning through incremental assistance (Tharp and Gallimore 1988) with the teacher/lecturer having an important role as the 'knowledge guide'. Table 1 outlines the essential elements of this type of scaffolding as described by Hogan and Pressley (1997), including the pre-contact element of good curriculum design as well as elements associated with establishing shared goals, tailored learning assistance and feedback provision.

However, within the framework of Vygotsky's ZPD, scaffolding is a more complex socio-collaborative process whereby social interaction and communication in the form of conversation of some sort is prevalent, ideally with all participants contributing equally. In so doing, the interactions of the scaffolding mechanism create new meanings beyond that which any of the participants already have, through the notion of inter-subjectivity or shared meaning of the task (Rogoff 1990). The new external meanings and interpersonal processes are appropriated by the individuals concerned, creating deep, internal knowledge acquisition and skills development that are regarded as useful by learners (Roehler and Cantlon 1997).

The challenge for online education within such a theoretical context is the need to identify the balance between a student's Zone of Actual Development and their Zone of Potential Development—when the Face-to-Face contact necessary with the lecturer and/or with other students to create the social context might be infrequent or not at all. This challenge is exacerbated by the need to engage the student's interest at a distance by using scaffolding mechanisms that actively encourage socialisation online and then create the platform from which deep learning can develop.

Another view of scaffolding which is of interest in terms of online learning is the 'weaving' metaphor (Brown 1994) which expands the idea of scaffolding beyond the individual to the whole classroom where there are multiple ZPDs operating simultaneously. In this instance, the teacher/lecturer provides not only the scaffolding but is also

Table 1 Scaffolding elements (taken from Hogan and Pressley 1997)

Scaffolding element	General description
Pre-engagement	The teacher selecting an appropriate task by anticipating student difficulties, needs and strategies and by considering curriculum goals.
Establishing a shared goal	Motivation as a crucial component for success—students' ownership of goals is imperative
Diagnosing needs of learner	Needs a knowledge of content and a sensitivity to the learners' current knowledge
Providing tailored assistance	Assistance in the form of: <ul style="list-style-type: none"> • questioning • cueing • prompting • coaching • modelling ideal performance • direct instruction • discussion.
Maintaining the pursuit of a goal	Maintaining of concentration on a task by requesting clarification, asking questions, offering praise, etc.
Giving feedback	Summarising progress, pointing out behaviours that led to the success, comparing with the ideal, explicitly restating the concept behind a task.
Controlling frustration and risk	Creating a 'safe' environment where mistakes are appreciated as part of the learning process
Assisting internalisation, independence and generalisation to other contexts	Helping the students become less dependent on the teacher

the 'Master Weaver' who supports the students' integration of ideas. McLoughlin et al. (2000) describe a number of tools and applications that can be used as online scaffolding mechanisms that also double as aids for the Master Weaver concept:

- *Email* for conversation, questioning and group dialogues
- *Threaded computer conferencing* for collaborative problem solving, articulation and elaboration of views
- *Frequently-asked question lists* that develop meta-cognition and self-direction
- *Hyperlinked resources* to promote exploration, searching and resource selection and evaluation
- *Collaborative workspaces* to provide multiple perspectives and social responsibility
- *Online chat* to promote socio-cognitive dialogue, questioning and peer support.

Some of the above scaffolding mechanisms and their application are discussed in more detail in the Findings section in relation to student reflections of them in the online courses used in the study.

Knowledge creation, knowledge management and the concept of 'Ba'

In addition to the classical educational learning theory literature, the knowledge-creation and knowledge-management literature of the late twentieth century is also of interest to this

study of online learning. The knowledge-management literature moved away from early philosophical and psychological approaches to knowledge which focuses on the nature of knowledge ('what is knowledge', 'how does it come about?') to a more business-centred or commercial focus ('how can knowledge create competitive advantage?'). For example, in Nonaka's much-quoted 1991 work on knowledge creation, it is stated that: "In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge" (Nonaka 1991, p. 96). Based on this premise, Nonaka and Takeuchi wrote the book *The Knowledge-Creating Company* in 1995 which is still widely regarded as a seminal piece of literature on the topic of knowledge management in the corporate world. Similarly, Drucker (1995, p. 271), in *Managing in a Time of Great Change*, writes that: "Knowledge has become the key economic resource and the dominant—and perhaps even the only—source of comparative advantage."

Such statements linking knowledge to corporate profitability and sustainability from leading workers in corporate management research have had a great impact on organisations, and have led to questions such as 'What are the fundamental conditions for knowledge creation?', 'Where is knowledge creation located?' and 'Is it possible to manage knowledge?'

In terms of providing a secondary context for this study, such literature is important because developing both individual and corporate knowledge and competencies (Dall'alba and Sandberg 1996; Jubb and Robotham 1997) via online education is a corporate reality (Fahey et al. 2001; Lau 1999) which to date has not been very successful—perhaps due to a nonalignment of methods, scaffolding and/or theoretical models of learning.

Historically, 'knowledge' has been one of the most studied of subjects across a wide range of disciplines. From the days of Plato to the current time, the nature of knowledge has been a major focus of work and has resulted in many definitions dependent on the approach or discipline from which the researcher has come. For this study, which is not about determining 'what knowledge is', but rather what helps learning to occur as part of the process of knowledge acquisition, a good working definition of knowledge is that it is 'a fluid mix of experiences, values, contextual information, expert insight and intuition' with a more concise version of that definition being that 'knowledge is information in context plus understanding'.

Knowledge as defined above has two components: *tacit* knowledge which is an in-head, unspoken background knowledge that can be difficult to transfer (Polanyi 1967); and *explicit* knowledge which is a structured and codified knowledge which can be articulated in formal language and is easily transferred (Nonaka 1991, 1994). While some argue that explicit knowledge is merely information, with tacit knowledge as defined by Polanyi (1967) being the only 'true' knowledge (Stenmark 2002), both components are involved in the context of learning.

In an attempt to define how knowledge is acquired, Nonaka (1991, 1994) describes a four-stage model of knowledge creation called the SECI model or 'Knowledge Spiral'. The SECI model describes how tacit knowledge, through a process of Socialisation, is Externalised (becomes explicit), with the explicit knowledge then being Combined via communication and diffusion processes across peers or a group, to be finally Internalised by group members as learning.

This early work was followed by von Krogh (1998) who proposed that knowledge is a social construct based on observation and is context sensitive, and by Wenger (1998, pp. 164–172) who looked at the role of participation in a community of practice (defined as "the process of social learning that occurs when people who have a common interest in

some subject or problem, collaborate to share ideas, find solutions, and build innovations” [Community of Practice 2006]) in learning and thus in knowledge creation.

Finally, Nonaka and Konno (1998) introduced the Japanese concept of ‘Ba’ which in English is roughly translated to mean ‘place’, as a means of describing where and how knowledge is created. According to Nonaka and Konno, Ba can be thought of as a shared space for emerging relationships and can be *physical*, such as an office, *virtual*, such as through email, *mental*, as through shared ideas or experiences, or a combination of all three. Further, it is believed that knowledge is embedded in Ba where it is then acquired through one’s own experience or reflections on the experiences of others. To participate in Ba means to get involved and transcend one’s own limited perspectives or boundaries (somewhat akin to Vygotsky’s Zone of Proximal Development).

Nonaka and Konno (1998) also proposed that Ba should be considered a framework in which knowledge is activated as a resource for the creation of new knowledge. Because knowledge is intangible, boundary-less and dynamic, the use of it requires a concentration of resources in time and space—and Ba is the platform for that resource concentration (read scaffolding mechanisms) necessary for knowledge creation. It thus enables applied knowledge to be collected and integrated. Nonaka and Konno (1998) describe four types of Ba which they equate with the four stages of the SECI model (Fig. 2):

- *Originating or Existential Ba*: a ‘place’ where individuals share feelings, experiences and mental models and which can be equated to the *Socialisation* stage of the SECI model and to the ZPD of Vygotsky.
- *Interacting or Reflective Ba*: a more consciously constructed ‘place’ where individuals share mental models but reflect and analyse their own. Interacting Ba can be equated to the *Externalisation* stage in the SECI model.
- *Cyber or Virtual Ba*: a place of interaction in a virtual world instead of real space and time, and represents the *Combination* stage in the SECI model.
- *Exercising Ba*: a ‘place’ that facilitates the conversion of tacit to explicit knowledge. It thus equates to the *Internalisation* stage of the SECI model where deep learning and knowledge creation actually take place.

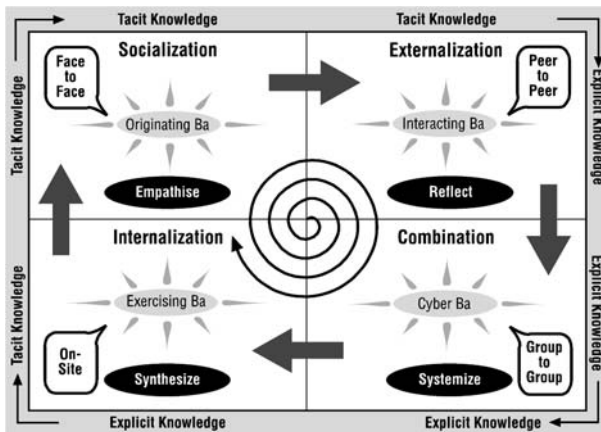


Fig. 2 The Spiral Evolution of Knowledge Creation (SECI) and the four characteristics of Ba (after Nonaka and Konno 1998)

Ba provides “a platform for advancing individual and/or collective knowledge creation”, it may also be thought of as “the recognition of self in all” and can be considered “a shared space that serves as a foundation for knowledge creation” (Nonaka and Konno 1998, p. 40). Ba therefore provides an explanation that extends beyond what knowledge is and why it exists to an understanding of how knowledge is created.

In short, what we have in Ba is an ancient Eastern concept that can be equated with social constructivist thinking and the application of scaffolding mechanisms to enhance learning. We thus have a combined concept that links classical learning theory and knowledge creation/acquisition theory in which to examine not only *what* scaffolding mechanisms should be used to facilitate online learning and *why* they should be used, but also *how* they should be used and *where* they should be placed in physical, virtual and mental space.

Methodology

The objective of this study was to determine what generic scaffolding mechanisms are regarded as best by students undertaking a multidisciplinary spectrum of courses, in engaging them and in promoting deep learning when online delivery is the major mode of teaching. The proposed outcome was a best-practice framework course template which could be easily modified to address specialist discipline/course needs while retaining a structure grounded in good pedagogy.

The methodology involved a learner-focused evaluation of a wide range of scaffolding mechanisms being used in five Internet-delivered courses (three Masters-level and two undergraduate-level courses from different programs—see Table 2) at the University of Queensland, Australia, between 2001 and 2005.

All courses had been developed in the Learning Management System (LMS) WebCt (2001–2004) or Blackboard (from 2005—with all ongoing courses converted from WebCt at the end of 2004 when the University of Queensland changed their LMS [Steel

Table 2 Courses involved in the scaffolding mechanism analysis with student numbers

Year	Course name	Number of students	Program
2001 (S1)	eBusiness Migration	81	Master of Technology Management
2001 (S2)	Managing e-Technology & Information Systems	65	Master of Technology Management
2003 (S1)	Decision Support Systems	36	Bachelor of Environmental Management
2003 (S2)	Agribusiness in the eLandscape	57	Bachelor of Agribusiness
2004 (S1)	Decision Support Systems	28	Bachelor of Environmental Management
2004 (S1)	eAgribusiness	11	Master of Agribusiness
2004 (S2)	Agribusiness in the eLandscape	59	Bachelor of Agribusiness
2005 (S1)	Decision Support Systems	27	Bachelor of Environmental Management
2005 (S2)	Agribusiness in the eLandscape	42	Bachelor of Agribusiness
2005 (S2)	eAgribusiness	8	Master of Agribusiness
Total		414	

2005]). The scaffolding mechanisms used in all five courses included (Bryceson 2001, 2002):

- *Content*: 10- to 15-page Module (1/week = 13 Modules/course) dot points, diagrams, tables, review questions, speciality case studies
- *Hyperlinks*: within the content to web sites or articles online
- *Structured Discussion Boards*: available 24 h a day and 7 days a week—compulsory and assessable. Students are asked to go to a URL where a short article on a current industry issue is to be read. Three ‘starter’ questions on the content matter of the article are set and students then have open discussions for 2–3 weeks. At the end of each three-week period, students are required to hand in a Dot Point Report on what they think have been the five major points of the discussion (but not necessarily of the original article).
- *Unstructured Discussions and Chat Rooms*: general discussion
- *Face-to-Face Lectures*: 12–26 h/course—weekly, fortnightly or short full-time intensive over a weekend (depending on course)
- *Assignments*: the timing and type aligned to online course content positioning
- *Skills Portfolios (SKPs)*: These are freeform in language and format and, while compulsory, receive no marks in an effort to promote honest and open reflection by the students on what they have learnt and by what mechanisms (e.g. lectures, content, discussions, etc.).

The evaluation instrument used was the set of qualitative and unstructured student reflections (SKPs) collected from the five courses run between 2001 and 2005. Each student evaluated what they had learnt, how and where during the course. Three hundred and forty (340) SKPs were used (out of a possible 414). Some SKPs were omitted from the evaluation because they were not handed in or did not address the requirements of the SKP as outlined in the assignment criteria for the course.

The approach to analysing the information in the SKPs was determined by the free-form nature of the SKP language (as encouraged to ensure that students reflected on the course and scaffolding mechanisms in language that held meaning for them), and the need to speedily assimilate any information from them that impacted on the need to make changes or upgrades to courses before the next running of the course.

Practically this meant that the analysis involved noting, classifying and numerating the responses associated with a particular scaffolding mechanism into either Yes (indicated by comments such as “I liked this, or it was useful/very useful”) and No (“I did not like this, did not use, not useful”). Because there were relatively large numbers of students over the five courses and time-span (Table 2), enough data could be generated in this way to enable a simple quantification of answers and to enable generically-applicable statements to be made about the data.

Findings

The major findings after analysing 340 SKPs of students taking the five courses identified above are listed in Table 3 as a Report Card detailing the scaffolding mechanisms used in those courses, and a simple quantified analysis of the students’ evaluation of each mechanism as detailed in the Methodology section.

These findings suggest that overall, a well-structured, content-rich website providing the explicit information associated with the discipline in module format and which acts as the

Table 3 Scaffolding Mechanism Report Card: Student evaluation in terms of percentage of total SKPs falling into the Yes/No classification

Scaffolding mechanism	Student evaluation	Brief comments	% of SKPs
Content with hyperlinks	Yes	<ul style="list-style-type: none"> • Good structure • Good resource 	90
Module/week			
<i>Allows exploration</i>			
Unstructured discussion boards discussion	No	<ul style="list-style-type: none"> • Hyperlinked articles and websites—Good up-to-date resource • Very little, if any, activity 	98
<i>Freeform group socialisation space</i>			
Structured Discussion Board's discussion	Yes	<ul style="list-style-type: none"> • Major learning forum • Enjoyed different cultural interaction • Good idea to assess participation as well as Dot Point report • Good idea to assess Dot Point report on online discussion not on précis of article • Can take a long time to read • Good value 	96
<i>Group working space</i>			
<i>Assessed</i>			
Lecturer involved in BB discussion	Yes		85
<i>Tacit knowledge transmission</i>			
<i>Moderator</i>			
Email contact	Yes but not used very much	<ul style="list-style-type: none"> • Through LMS • Via normal email 	10
Telephone contact	No	<ul style="list-style-type: none"> • Not regarded as necessary generally 	3
Interactivity	No	<ul style="list-style-type: none"> • Lose interactivity when download content 	99
Content management tools (WebCt only)	Yes	<ul style="list-style-type: none"> • Allows downloading and printing of content • Keyword search and hyperlinking to Module 	100
Compile			75
Search			
Mixed mode delivery Face-to-Face lectures	Yes	<ul style="list-style-type: none"> • Powerpoints good • Prefer a session at the start and one halfway through (postgraduates) • Difficult but research a good learning tool 	92
Intensive mode			
Aligned assignments	Yes		90
<i>Experiential, situated, lateral thinking</i>			
Skills portfolio	Yes	<ul style="list-style-type: none"> • Useful to reflect on learning 	95

Total number of SKPs = 340

focus for the presentation and organisation of the course is highly regarded as a learning resource. This is particularly so if there are opportunities for exploration via numerous hyperlinks to URLs where articles and interactive tasks can be found. The only qualification is that the content must be easily navigated, stimulating and academically robust because it is often used as a resource for later reference and reflection. Additionally, comments in the SKPs indicate that the use of overviews, diagrams, industry examples and targeted and structured discussion topics brings the course material together in a logical and cogent way for students.

The structured online discussions are also highlighted by students in the SKPs as being very much liked as they provide opportunities for interaction and socialisation with other students and the development of group processes and a feeling of inclusiveness in the course. These online discussions are seen as stimulating additional learning associated with real-time items of interest discussed in an industry-based context in areas not directly addressed by the course content.

Face-to-Face lectures are noted in the SKPs as being enjoyable and useful. They are designed to complement the online material and are all based around Powerpoint with animations, videos and Internet access in real time so that up-to-the-minute examples can be incorporated to create added interest and stimulation.

Finally, assignments in the courses involved in this study are aligned with the progression of the course content and are structured to promote enquiry, critical thinking and good communication skills. Over the course, they build from a simple essay at the beginning to a much more complex final project which attempts to get the 'Know What' that students have acquired throughout the course translated into 'Know How' capabilities. A degree of fantasy and 'thinking out of the box' is encouraged. The following is a sample of student comments in their SKPs on the assignments:

The last assignment was the most rewarding as it gave you scope with the fantasy element.

Really enjoyed making my own business as the concepts learnt throughout the course were applied.

The DB's were a great assessment and were extremely relevant to today and what I am studying.

The assignments, particularly the consultancy report, DSS in practice and the final project all gave me practical skills, which many courses do not allow for.

As a general comment, online delivery of the courses is highly regarded as it allows students flexibility to study in their own time, which is an increasing requirement as more and more students work part-time.

Using the SKP evaluations and Hogan and Pressley's (1997) work on scaffolding mechanisms as a base, a What, Why, How, Where scaffolding framework was developed and is shown in Table 4.

Discussion of findings within the theoretical context

In earlier sections, both learning and knowledge management theories were reviewed. It was proposed that Vygotsky's (1978) Social Constructivist Theory of Learning, Wenger's (1998) Communities of Practice model, Nonaka's (1991, 1994) SECI model, and Nonaka and Konno's (1998) Concept of 'Ba' (as the foundation of knowledge creation) would

Table 4 What, Why, How, Where scaffolding framework for online teaching

Educational strategy	Scaffolding mechanism	Why employ it	How to employ it	Where to employ it
Prior to course commencement	Course Introduction materials	Preparation of students for online learning issues, LMS facilities, assignment requirements	Preferably Face-to-Face, or video conference, at worst, print materials	Location/time that majority of students can attend. Print materials—sent out and uploaded to Course LMS website
Establishing a shared goal	Skills Portfolio	Deep learning—a personal reflective mechanism	Mandatory component not assessable. Started prior to course and maintained during course	As part of the assessment requirements—post details online
Diagnosing needs of learner	Half-to-one-page background on learner, provided by learner	Provides information and reinforces both ownership of current knowledge and goal of the student	Written document	Uploaded into Course LMS assignment drop box
Tailored assistance				
• Anchored learning	Content with hyperlinks	Provides explicit information associated with the discipline and opportunities for exploration	Online in modular format	Course LMS website and on CD (with navigation and search facilities)
• Social development	Structured discussion boards Discussions Chat rooms	Group socialisation mechanism	Intensive Face-to-Face lectures	Hyperlinked to content in Course LMS website Mixed mode delivery Course LMS website
• Modelling ideal performance	Simulation models	Situated learning	Hyperlinked article and 'starter' questions	Details posted on Course LMS website
• Lateral thinking	Project involving imagination	Generation of new ideas and novel solutions	Undertaken singly or in groups via online chat rooms	Assignments handed in via assignment drop box
Experiential learning	Prepared video clips and small case studies	Provides real person/company examples—provokes interest and learning	Short video clips of senior people in the area discussing key issues	Online (download capability) and on CD

Table 4 continued

Educational strategy	Scaffolding mechanism	Why employ it	How to employ it	Where to employ it
Internalisation feedback	Assignments Reports Discussion boards Dot point reports	Ensures reading of content, extra research and assessment	Align assignments with course content timeline. Develop requirements and assessment criteria	Details posted on Course LMS website Assignments handed in via assignment drop box

provide the theoretical background from which to examine scaffolding mechanisms aimed at enhancing learning in the online environment.

Such theories suggest that deep learning originates from within a social context created by discussion amongst peers and teachers, followed by an externalisation of in-head, tacit knowledge, a combining of this now-explicit information with personal experiences and knowledge (either already existing or promoted by scaffolding mechanisms such as simulation modelling or experiential learning), and finally an internalisation and deep appreciation of the new information as knowledge.

The teaching and learning issue associated with such theories in an online learning environment is that individuals are generally geographically distributed and physically isolated behind a computer screen with little or no means for social interaction to occur. The primary requirement in establishing a learning environment when using the Internet as a facilitator is thus to establish a socialisation mechanism (i.e. a means of group communication), in a place that is easily and routinely accessible. It is also important that this mechanism/place be regarded as 'safe'—that is, a medium by which individuals are not intimidated or threatened and where discussions and assessments are moderated by someone trusted by the participants.

It is clear from this study's findings that students regard using the online Discussion Board facility of Internet-based LMSs as a successful socialisation mechanism. From a theoretical perspective, these discussions are similar to the development of an online community of practice (Wenger 1998). What is also clear, however, is that, by itself, the facility does not perform the function—it is necessary to have a structured approach to its use. For example, from comments supplied by students briefly précised in Table 3, it appears necessary to:

- formally require students to visit the Discussion Boards where they are then sent to explore a linked web site to find a specified article of interest that looks at some real-time, course content related issue.
- set some initial 'start off' questions on the article to promote interest and discussion over a set time period (e.g. three weeks).
- have the lecturer participate in the discussion in a non-judgemental manner but at the same time making sure that he/she moderates the discussion to keep it on track.
- make the discussion participation assessable but in a not-too-onerous fashion (each discussion worth about 10%), for example, by requiring a one-page, five dot-point report on the *discussion* that takes place in relation to the article and ensuing discussion tangents, but *not* on the article itself.
- repeat the discussion process a number of times in a semester to maintain the need to participate in the course and develop online socialisation.

What is also clear and surprising is that a heavy content load in module format is regarded as important by students in their learning process. The surprise is because most educational designers advocate minimal text for online delivery because it is perceived as being a rather turgid and boring way of delivering information. In terms of the theory, this content represents a means of externalising (making explicit) the lecturer's tacit knowledge which, when read by students in combination with other explicit information such as articles, Face-to-Face lectures and the online discussions on related topics, helps students to internalise knowledge, thus creating an environment for deep learning. The content is therefore an extremely important scaffolding component of learning online because it must 'hook' or engage the student from the start in isolation of peer support, and it must be created with this understanding.

In reality, in the online teaching and learning situation, what we see is a slightly different knowledge-creation model from that of Nonaka and Takeuchi’s (1995) SECI model. Rather than starting the knowledge-creation process with socialisation involving discussion, followed by combination and internalisation, in the online environment (represented by a course website), the knowledge-creation process commences with a student visiting the website and encountering the course content which is the lecturer’s externalisation of his/her knowledge of the course subject matter. Students then progress through a socialisation stage which results in their tacit knowledge being made explicit through the online Discussion Boards. Simultaneously, they go through the combination stage where information gathered from the online discussions is combined with that obtained from the content. Internalisation of the new-found information is facilitated by aligned assignments that are designed to require a knowledge of the content up to that designated assignment due date, as well as any other research knowledge acquired in attempting the assignment. Externalisation of this new internalised knowledge is through assignment and work related report writing.

The new model has been called ESCIE—not only because it is an acronym for the processes involved (Fig. 3) but also because the term ‘esky’ is the name given to that most iconoclastic of Australian socialising equipment—a cool box containing drinks (usually beer) taken on picnics or BBQs.

Figure 3 illustrates the series of steps involved in ESCIE. It can be seen that these depict a new ‘Figure-of-Eight’ flow of learning which can continue ad infinitum if necessary (or allowed), but which will inevitably come to at least a formal end, at the end of a semester, in a course situation.

The concept of Ba as a ‘place’ where knowledge creation fits into this model of online learning very well because Ba itself is essentially virtual. Ba has no physical presence but it is proposed that it can act as a conceptual meeting place for the minds of individuals who are physically and geographically separated by time and distance. Similarly, Ba can provide a virtual fabric in which to hang scaffolding mechanisms. In turn, this encourages and facilitates students to push the boundaries of their own and others’ ZPDs.

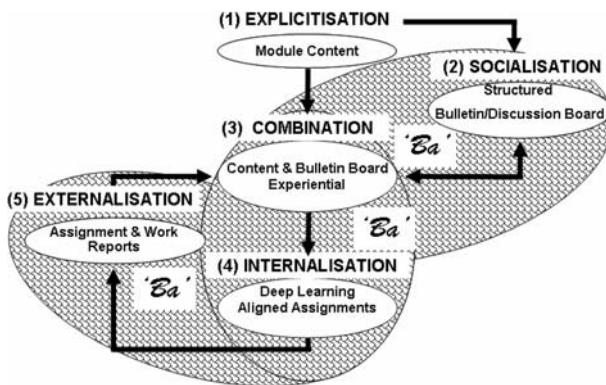


Fig. 3 A diagrammatic depiction of ESCIE—the new online learning model described in the text. ([1]–[5] are the steps in the knowledge-creation and acquisition process described in the model.)

Conclusion

The learning theory literature and the knowledge management literature all suggest that a good learning environment for students involves some form of socialisation which, in online education, can be difficult to foster. An evaluation of scaffolding mechanisms used by the author in five courses developed and delivered via the Internet between 2001 and 2005, indicate that formal socialisation components provide an excellent learning environment online for a variety of students from different program areas. This finding led to the development of a new model of online learning which is presented as ESCIE.

ESCIE, as a model for online learning, is grounded in learning and knowledge-acquisition theory and allows the real-life contextualisation of the content and the creation of a passionate ‘course culture’ when it is fleshed out with appropriate scaffolding mechanisms such as hyperlinked content, discussion boards and online chat rooms. Being part of such a course culture provides students with an important social backdrop and tacit knowledge platform (Polanyi 1967; Stenmark 2002) to learning the core material of the course, most particularly for distance-education students who are attempting to learn in physical isolation of their peers.

Further, the Report Card created from the evaluations of the scaffolding mechanisms employed has been used as the basis for creating a ‘Best Practice’ What, Why, How, Where framework for developing and implementing scaffolding mechanisms in the online environment.

Finally, the outcomes from this study support the use of Learning Management Systems such as WebCt and Blackboard for disseminating course content and for promoting communication and discussion across a whole group of students—when they are used in conjunction with sound pedagogical models grounded in learning theory (remembering that it is not the technology itself, but *how* the technology is used). As such, they are part of the embedded knowledge resources described by Nonaka and Konno (1998) as being facilitated by Ba—as well as providing a useful platform for creating a course culture. However, conversely, if such softwares are used without thought on a ‘build and it shall be used’ approach, a poor learning outcome for students can ensue with none of the socialisation needs being met and without deep learning taking place.

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References

- Bennet, S., Priest, A., & Macpherson, C. (1999). Learning about online learning: An approach to staff development for university teachers. *Australian Journal of Educational Technology*, 15, 207–221.
- Biggs, J. (1999). *Teaching for quality learning at university*. Buckingham, UK: SRHE and Open University Press.
- Brown, A. L. (1994). The advancement of learning. *Educational Researcher*, 23, 4–12.
- Bruner, J., Goodnow, J., & Austin, A. (1956). *A study of thinking*. New York: Wiley.
- Bryceson, K. (2001, May). Thoughts of a first-time online course developer: Issues and resolutions. *Teaching & Education News*, 11(1). Retrieved January 23, 2006, from <http://www.tedi.uq.edu.au/TEN>.
- Bryceson, K. (2002). *Scaffolding for online teaching: Using social constructivism and the concept of ‘Ba’ as a theoretical framework*. Unpublished Graduate Certificate of Higher Education thesis, University of Queensland, Brisbane, Australia.

- Community of Practice. (2006). In *Wikipedia, The Free Encyclopedia*. Retrieved January 23, 2006, from http://en.wikipedia.org/wiki/Community_of_practice.
- Dall'alba G., & Sandberg, J. (1996). Educating for competencies in professional practice. *Instructional Science*, 24, 411–437.
- Di Vesta, F. J. (1987). The cognitive movement and education. In J. A. Glover & R. R. Ronning (Eds.), *Historical foundations of educational psychology* (pp. 203–233). New York: Plenum Press.
- Drucker, P. F. (1995). *Managing in a time of great change*. New York: Plume Books.
- Fahey, L., Srivastava, R., Sharon, J. S., & Smith, D. E. (2001). Linking eBusiness and operating processes in the role of knowledge management. *Journal of Knowledge Management*, 40(4), 889–907.
- Harmon, S. W., & Jones, M. C. (1999). The five levels of Web use in education: Factors to consider in planning online courses. *Educational Technology*, 39(6), 28–31.
- Hogan, K., & Pressley, M. (Eds.). (1997). *Scaffolding student learning: Instructional approaches & issues* (Advances in Teaching and Learning Series). Cambridge, MA: Brookline Books.
- Holt, D. M., & Thompson, D. J. (1998). Managing information technology in open and distance education. *Distance Education*, 19(2), 197–216.
- Jackson, B., & Anagnostopoulou, K. (2001). Making the right connections: Improving quality in online learning. In J. Stephenson (Ed.), *Teaching and learning online: New pedagogies for new technologies* (pp. 53–64). London: Routledge.
- Jubb, R., & Robotham, D. (1997). Competencies in management development: Challenging the myths. *Journal of European Industrial Training*, 21(5), 171–175.
- Langford, P. (1989). The process of learning. In P. Langford (Ed.), *Educational psychology: An Australian perspective* (pp. 43–64). Melbourne, Australia: Longman Cheshire.
- Lau, T. T. (1999). The impact of Web-based training systems for distance education: A corporate perspective. In *IPCC 99: Communication Jazz: Improvising the New International Communication Culture: Proceedings 1999 IEEE International Professional Communication Conference* (pp. 257–260). Piscataway, NJ: Institute of Electrical and Electronic Engineers (IEEE).
- McLoughlin, C., Winnips, K., & Oliver, R. (2000). Supporting constructivist learning through Learner Support On-line. In J. Bourdeau & R. Heller (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2000* (pp. 674–680). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).
- McMahon, M. (1997, December). *Social constructivism and the World Wide Web—A paradigm for learning*. Paper presented at the annual meeting of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE), Perth, Australia. Retrieved January 23, 2006, from <http://www.ascilite.org.au/conferences/perth97/papers/Mcmahon/Mcmahon.html>.
- Neo, K. T. K., & Neo, M. (2001). A constructivist learning experience: Reconstructing a web site using web based multimedia authoring tools. *Australian Journal of Educational Technology*, 17(3), 330–350.
- Nonaka, I. (1991). The knowledge-creating company. *Harvard Business Review*, 6(8), 96–104.
- Nonaka, I. (1994). A dynamic theory of organisational knowledge creation. *Organisational Science*, 5(1), 14–37.
- Nonaka, I., & Konno, N. (1998). The concept of 'Ba': Building a foundation for knowledge creation. *California Management Review*, 40(3), 40–54.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.
- Oliver, R., & Herrington, J. (2001). *Teaching and learning online: A beginner's guide to e-learning and e-teaching in higher education*. Perth, Australia: Edith Cowan University Press.
- Pear, J. J., & Crone-Todd, D. E. (2002). A social constructivist approach to computer-mediated instruction. *Computers and Education*, 38, 221–231.
- Piaget, J. (1977). *The development of thought: Equilibrium of cognitive structures*. New York: Viking.
- Polanyi, M. (1967). *The tacit dimension*. New York: Anchor Books.
- Reeves, T. C. (1994). Evaluating what really matters in computer-based education. In M. Wild & D. Kirkpatrick (Eds.), *Computer education: New perspectives* (pp. 219–246). Perth, Australia: MASTEC.
- Ring, G., & McMahon, M. (1997, December). *Web instruction: Searching for a theoretical basis*. Paper presented at the International Conference on Computers in Education (ICCE97), Kuching, Malaysia.
- Roehler, L., & Cantlon, D. (1997). Scaffolding: A powerful tool in social constructivist classrooms. In K. Hogan & M. Pressley (Eds.), *Scaffolding student learning* (pp. 6–42). Cambridge, MA: Brookline Books.
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.
- Simonsen, M. (1995). Does anyone really want to learn at a distance? *Techtrends*, 40(5), 12.

- Skinner, B. F. (1974). *About behaviorism*. New York: Knopf.
- Steel, C. (2005). Game for change? Balancing an enterprise-level LMS implementation. In H. Goss (Ed.), *Balance, fidelity, mobility: Maintaining the momentum? Proceedings of the 22nd ASCILITE Conference, Brisbane, 4–7 December, 2005* (pp. 637–647). Brisbane, Australia: Queensland University of Technology, Department of Teaching and Learning Support Services.
- Stenmark, D. (2002). Information vs. knowledge: The role of intranets in knowledge management. In *Proceedings of the Thirty-Fifth Annual Hawaii International Conference on System Sciences*, January 7–10, 2002 (CD-ROM, IEEE Computer Society Press, 2002, pp. 1–10). Retrieved January 23, 2006, from <http://www.viktoria.se/~dixi/publ/ddoml02.pdf>.
- Tharp, R. G., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning and schooling in social context*. New York: Cambridge University Press.
- Torrise-Steele, G. (2002). Technology for the sake of learning—A planning approach for integrating new technologies in tertiary learning environments. In A. Treloar & A. Ellis (Eds.), *AusWeb02: The web enabled global village. Proceedings, AusWeb02 The Eighth Australian World Wide Web Conference, 6–10 July, Twin Waters Resort, Sunshine Coast, Australia* (pp. 349–362). Lismore, Australia: Southern Cross University. Retrieved January 23, 2006, from <http://www.ausweb.scu.edu.au/aw02/papers/refereed/torrise/index.html>.
- von Krogh, G. (1998). Care in knowledge creation. *California Management Review*, 40(3), 133–153.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Cambridge, MA: Harvard University Press.
- Wenger, E. (1998). *Communities of practice: Learning, meaning, identity*. New York: Cambridge University Press.
- Wood, S. S., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, 17, 89–100.