MEANINGFUL ONLINE LEARNING: EXPLORING INTERACTION

IN A WEB-BASED LEARNING ENVIRONMENT USING AUTHENTIC TASKS

by

YOUNGHEE WOO

(Under the Direction of Thomas C. Reeves)

ABSTRACT

This study explored a Web-based learning case which was designed using authentic tasks and based on social constructivism to provide a deeper understanding of meaningful interaction through the lens of social constructivism. The case was a master's level course offered online by a university in Australia and the participants in this study consisted of the students and instructor in the course.

First, the study examined how the students interacted to accomplish the authentic task in the WBLE. The analysis of the transcripts of the online discussion forum, chat room, and interviews yielded a detailed picture of the interaction occurring in a WBLE structured around authentic tasks. Through the analysis, three major categories with multiple themes were identified: the nature of online interaction (i.e., means to an ends, authenticity, and scaffolding), the process of the interaction (i.e., getting into task, defining, accomplishing, and reflecting), and strategies for improving the quality of the interaction (i.e., designing incrementally more challenging tasks, and providing active facilitation).

Second, the study explored what meaningful experiences the students had that supported their learning. Through the interview, which was conducted for better understanding students'

perspectives about the whole experience of being in a WBLE using authentic tasks, students were encouraged to reflect on their experiences in the course. The analysis of the interview transcripts yielded a category called the Learning Effect. Three themes emerged related to the main learning effects in the WBLE using authentic tasks: high motivation, opportunities for reflection, and meaningful experiences.

The identification process described what meaningful interaction looks like in a WBLE and clearly showed using authentic tasks in a WBLE led to meaningful interaction that directly influenced students' learning growth.

INDEX WORDS: online learning, interaction, meaningful interaction, social constructivism, authentic task, web-based learning

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A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2006

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December 2006

DEDICATION

This dissertation is dedicated to my parents who made all of this possible for their endless love and encouragement.

ACKNOWLEDGEMENTS

The writing of a dissertation can be a lonely and isolating experience, but it is obviously not possible without the personal and practical support of numerous people. I extend special thanks to my admirable advisor Prof. Thomas C. Reeves, for his countless hours of reflecting, reading, encouraging, and most of all patience throughout the entire process. I am grateful for his time and effort. My other committee members, Dr. Michael J. Hannafin, Dr. Janette R. Hill, and Dr. Mary Ann Fitzgerald, all gave their time and effort to help me produce this dissertation. Their efforts and support are greatly appreciated.

I would like to acknowledge and thank Dr. Jan Herrington and Dr. Shirley Agostinho, faculty at the University of Wollongong in Australia, for allowing me to conduct my research in their classes and for providing any assistance requested. Their help allowed me to give my research a truly global scale, broadening and deepening my understanding of the online learning community.

My thanks must go also to Dr. Jung Sun Hahn, who is a professor of EWHA Womans University. She has consistently helped me keep perspective on what is important in life and given me encouragement and emotional support in whatever I have pursued since our first meeting in 1994.

Above all, I would like to thank my parents and two brothers whose unconditional love and understanding have kept me going over the past four years. I owe special thanks to my husband, Jaesuk, who has expressed an unwavering belief in my ability to succeed. In closing, I thank God. For only through God's grace and blessings has this pursuit been possible.

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

Introduction

Instructional Technologists and other proponents of using technology in education have tried hard to increase the effectiveness of instruction and learning through the integration of pedagogy and technology. One of the key components of good pedagogy is interaction. Because interaction is a necessary and fundamental process for knowledge acquisition and the development of both cognitive and physical skills (Barker, 1994), it is an essential ingredient in any instructional delivery model (e.g., face-to-face classroom-based, synchronous/asynchronous online education, or a blended approach). Thus, increasing interaction has been one of the most important and most challenging research topics in IT (Bannan-Ritland, 2002; Hannafin, 1989; Vrasidas, 2000). Instructional technologists believe that using technology has the potential to increase opportunities for and quality of interaction within various instructional delivery models. This belief has grown with the development of Internet/web technology (Hirumi, 2002; Northrup, 2001; Sims, 2003). This dissertation study is a sincere effort of a researcher who shares this belief in the potential of technology to enhance interaction in learning, but who also is cognizant of the enormous hurdles inherent in realizing this potential.

Within the context of Web-based learning, email, chat, online discussion forums, and other technologies are exposing people to other people of greater variety more frequently than humans have ever interacted with before. Although interactions online may have both positive and negative consequences, they have become a significant part of day-to-day life for many people around the globe. However, not all interaction is meaningful for students' learning. It might be said that when interaction influences learners' intellectual growth and increases beneficial learning outcomes, then we can say the interaction is meaningful. Therefore,

depending on how learning is defined, the image of meaningful interaction is changed (Deubel, 2003; Hannafin, 1989; Vrasidas, 2000).

In particular, social constructivists emphasize that meaningful learning and deep reflective thinking usually take place in social contexts. This principle is especially important in what has come to be know as authentic or situated learning, where the student takes part in activities which are directly relevant to his/her real life and which take place within a context similar to the setting in which new knowledge and skills will eventually be applied (Brown, Collins, & Duguid, 1989). Therefore, in an online learning environment designed according to the principles of social constructivism, meaningful interaction should include responding, negotiating internally and socially, and offering alternative perspectives while solving some real life related tasks (Jonassen, Davidson, Collins, Campbell, & Haag, 1995; Lapadat, 2002; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978).

In an effort to enhance meaning making in an online learning situation, course designs that employ authentic tasks have become the center of attention for some researchers focused on employing social constructivism as a theoretical foundation for Web-based learning (Herrington, Reeves, Oliver, & Woo, 2004; Lourdusamy, Khine, & Sipusic, 2002). Because authentic activities mirror real world tasks, they require students to cooperate, communicate, negotiate, respect each other's view, and use other skills to complete the task successfully (Perreault, 1999). Using authentic tasks as the focus for learning is derived from the social constructivist principle of locating learning in the context of reality (Stage, Muller, Kinzie, & Simmons, 1998). Through such authentic processes, social constructivists believe that meaning making can be enhanced (Driscoll, 2000; Jonassen et al., 1995; Lave & Wenger, 1991; Vrasidas, 2000).

Therefore, it seems reasonable to conclude that well-designed and well-operated courses employing authentic tasks can meet the expectations of meaningful interaction that actually contributes to students' growth and learning. However, while this sounds good in theory, it must be examined in practice.

Chapter Overviews

To examine these issues in practice, this dissertation study explored a Web-based learning environment (WBLE) which was designed according to the concept of authentic tasks and based on principles of social constructivism. This dissertation has been conducted to provide a deeper understanding of meaningful interaction through the lens of social constructivism. How the students interacted to accomplish the authentic task in the WBLE and what meaningful experiences they had in their learning were the main foci of this study. A collection of four scholarly papers ready for submission to journals and one previously published journal article are included in this dissertation to present the design, process, and results of this study.

The first paper, *Meaningful Interaction in Web-Based Learning: A Social Constructivist Interpretation,* presents a conceptual framework for meaningful online interaction. The precise meaning of meaningful interaction is strongly related to the learning theories underlying the development of particular learning environments. The primary goal of this paper is to re-conceptualize online interaction in terms of meaningful learning based on the learning theory known as social constructivism. Analyzing interaction through this theoretical framework is intended to yield design principles needed to improve the quality of Web-based learning environments. A secondary goal of this paper is to present the implications of meaningful online interaction for researchers and developers. This paper has been submitted to the *Internet and Higher Education Journal(*http://www.sciencedirect.com/science/journal/10967516*)*.

The second paper, *Interaction in Asynchronous Web-Based Learning Environments: Strategies Supported with Educational Research*, reviews research related to the strategies for improving online learning quality. Because of the seemingly relentless promotion of Web-based learning environments (WBLEs) by both commercial interests and educational technologists, as well as the real and perceived advantages of WBLEs, knowing how to develop and implement WBLEs will probably not be a choice for most educators and trainers in the future, but a necessity. However, many educators still don't know the way to do this. Until now, research studies have demonstrated that the success or failure of online learning depends on the level of interaction. Indeed, it has been said that learning is impossible without interaction (Gunawardena, 1995). But effective interaction does not occur by itself; it must be planned, nurtured, and evaluated. The primary goal of this paper is to explore the importance and characteristics of meaningful interaction in online learning, especially, in asynchronous situations. A secondary goal of this paper is to present several pragmatic strategies for improving meaningful interactions

in WBLEs on the basis of a careful research review. This paper has been submitted to the *Journal of Asynchronous Learning Networks* (http://www.sloan-c.org/publications/jaln/index.asp).

The third paper, *Meaningful Online Learning: Exploring Interaction in a Web-Based Learning Environment Using Authentic Tasks*, presents a case study of a Web-based learning environment which was designed using authentic tasks. The analysis of this case was based on social constructivism to provide a deeper understanding of meaningful interaction through the lens of this contemporary learning theory. The case was a master's level course offered online by a university in Australia and the participants in this study consisted of the students and the instructor in the course. In particular, this case study sought to identify the nature and process of interaction occurring in a WBLE using authentic tasks and to suggest several strategies for designing and nurturing meaningful online interaction. In addition, the perspectives of students concerning the relationship between the interaction experiences and learning were analyzed. The research process revealed what meaningful interaction looks like in a WBLE and clearly showed that using authentic tasks in a WBLE led to meaningful interaction that in turn directly influenced students' learning growth. This paper will be submitted to the *Educational Technology Research and Development Journal* (http://www.aect.org/Intranet/Publications/index.asp).

The fourth paper, *Guidelines for Implementing Authentic Tasks to Increase Meaningful Interaction in Web-Based Learning Environments*, provides practical guidelines to practitioners including instructors or instructional designers who want to learn about and use authentic activities to improve the quality of interaction and learning in their online classrooms. To this end, this paper closely describes two cases that utilized authentic tasks as a way for students to

increase meaningful interaction in their Web Based Learning Environments (WBLEs). The descriptions center around the task design, the process of facilitating the tasks, and the learning outcomes. In addition, several suggestions related to task design, course management, and facilitation in a WBLE using authentic tasks were provided by the instructors who designed and operated the two courses described in the paper. This paper will be submitted to the *EDUCAUSE Quarterly Journal* (http://www.educause.edu/apps/eq/index.asp).

The fifth paper, *Designing Authentic Activities in Web-based Courses*, was co-authored during my first year in the Instructional Technology doctoral program. During my first semester at The University of Georgia, I was fortunate to accept an invitation to assist Dr. Jan Herrington, a visiting Fulbright Scholar from the University of Wollongong in New South Wales, in working on her research project with Professor Ron Oliver from Edith Cowan University in Australia and Professor Thomas C. Reeves, my advisor. The experience of working with Dr. Herrington, and of co-authoring my first refereed journal paper in effect launched my research agenda which I have pursued ever since (you can see the paper in Appendix K).

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CHAPTER 2

MEANINGFUL INTERACTION IN WEB-BASED LEARNING: A SOCIAL CONSTRUCTIVIST INTERPRETATION[1]

[1] Woo, Y., & Reeves, T. C. Has been submitted to *Internet and Higher Education*

Abstract

Interaction is an essential ingredient in any learning process. However, every interaction does not lead to increased learning. When interaction has a direct influence on learners' intellectual growth, we can say the interaction is meaningful. The precise meaning of meaningful interaction is strongly related to the learning theories underlying the development of particular learning environments. The primary goal of this paper is to re-conceptualize online interaction in terms of meaningful learning based on the learning theory known as social constructivism. Analyzing interaction through this theoretical framework may yield design principles needed to improve the quality of Web-based learning environments. A secondary goal of this paper is to present the implications of meaningful online interaction for researchers and developers.

Introduction

Instructional Technology is a design field in which people endeavor to increase the effectiveness of instruction and learning through the integration of pedagogy and technology. Instructional designers are practitioners within this design field. One of the key components of good pedagogy, regardless of whether technology is involved, is interaction. Interaction is an essential ingredient of any learning environment (face-to-face classroom-based, synchronous/asynchronous online education, or blended models). Interaction in learning is a necessary and fundamental process for knowledge acquisition and the development of both cognitive and physical skills (Barker, 1994). Thus, increasing interaction and enhancing its quality have long been important research goals for Instructional Technology researchers and instructional designers (Hannafin, 1989). Instructional designers believe the opportunities for and quality of interaction in support of learning can be improved by technology, a belief that has grown with the development of the Internet.

In Web-based learning environments, maintaining interaction is more challenging than in face-to-face learning contexts because of the time and space separation enabled by the technology (Angeli, Valanides, & Bonk, 2003; Bannan-Ritland, 2002). In the context of Web-based learning environments, researchers and designers (who are sometimes the same people) have shifted their focus from learner-content interaction to learner-learner interaction as well as from the quantity of interaction to its quality (Deubel, 2003; Moallem, 2003; Vrasidas, 2000). Despite advances, more and better research aimed at improving the learning effectiveness of online interaction is needed.

Unfortunately, instructional designers still lack sound theoretical foundations for determining what is good quality or meaningful interaction. Design guidelines for interaction in

online learning are more akin to heuristics than to research-based principles. To provide a starting point for improving this situation, we will argue in this paper that interaction in Web-based learning should be re-conceptualized based on the learning theory known as social constructivism (Gergen, 1999). We will start with a brief review of the definitions and types of online interaction.

Defining Online Interaction

The nature of interaction in various forms of learning environments has been defined in a variety of ways, based upon the participants' level of involvement in a specific learning opportunity such as a university course or a corporate training program and the objects of interaction such as other participants or content materials. The nature of interaction is also dependent upon the contexts in which interaction occurs, in a face-to-face situation or at a distance.

Moore's (1989) classic definition of interaction within distance education is based upon a communication-based framework, defining the sender and receiver of three types of interaction: learner-content, learner-instructor, and learner-learner. Also within the context of distance education, Wagner (1994) defined interaction as "the reciprocal events that require at least two objects and two actions" (p.8). The interactions occur when these two objects and events reciprocally influence each other. Hillman, Willis, and Gunawardena (1994) insisted that these and other past discussions of interaction overlooked the fact that all interaction is mediated via a medium in technology-based learning situations. On the basis of their research, Hillman et al. added a fourth kind of interaction, learner-interface interaction to Moore's three types of interaction. More controversially, Sutton (2001) defined a fifth type of interaction, vicarious interaction, which "takes place when a student actively observes and processes both sides of a

direct interaction between two other students or between another student and the instructor" (p. 227). Whether such "self-talking" or internal discourse interaction should be categorized with other forms of more directly observable interaction is debatable. Northrup (2001) proposed five interaction purposes: to interact with content, to collaborate, to converse, to help monitor and regulate learning (intrapersonal interaction), and to support performance.

Taking into account the previous definitions, Muirhead and Juwah (2004) described interaction as "a dialogue or discourse or event between two or more participants and objects which occurs synchronously and/or asynchronously mediated by response or feedback and interfaced by technology" (p.13). According to them, interaction serves a wide range of functions in the learning process: promoting active learning, enabling effective facilitation, allowing learner input in the learning process, enabling the development of higher order knowledge and abilities, and enhancing the quality and standards of the learning experiences.

The Meaning of Meaningful

Of course, every interaction in a Web-based learning environment does not have an influence on increased learning. Idle chatting, online surfing, or mindlessly clicking Web pages is unlikely to lead to substantive learning even though learners are interacting with other objects. In this context, Vrasidas and McIsaac (1999) focused on not just interaction but meaningful interaction. Hirumi (2002) also mentioned meaningful interaction emphasizing the quality of interaction on learning. Meaningful interaction is not just sharing personal opinions. Instead, the interaction must stimulate the learners' intellectual curiosity, engage them in productive instructional activities, and directly influence their learning (Hirumi, 2002; Vrasidas & McIsaac, 1999).

Depending on how learning is defined, the image of meaningful interaction is changed (Deubel, 2003; Hannafin, 1989; Vrasidas, 2000). That is, the meaning of meaningful interaction is strongly related to the learning theories underlying the development of particular learning environments. For example, in the behaviorist learning theory called operant conditioning (Skinner, 1954), learning is defined as a change in observable behavior. If the interactions in a learning environment primarily involve exposure to a stimulus (e.g., a multiple-choice question in a computer-based drill-and-practice program) and a learner response (e.g., selecting the correct response from the multiple choices) followed by reinforcement (e.g., a smiley face appearing on the screen and an audio clip saying "You are correct."), then the interactions are meaningful within the principles of that learning theory and within the context of the computer-based program that has been designed according to the theory of operant conditioning (Deubel, 2003; Hannafin, 1989). Within the behaviorist model, learners are viewed as somewhat passive, in need of external motivation, and directly affected by reinforcement (Skinner, 1954). Much of the research on interaction strategies has also emphasized behaviorist functions of the interaction between learner and content as mediated on a computer screen such as confirmation, pacing, and navigation (Burton, Moore, & Magliaro, 2004; Hannafin, 1989).

In an effort to increase meaningful interaction, instructional technology researchers and designers working from a communications or media theory framework (Krendl, Ware, Reid, & Warren, 1996) have studied the format in which content is presented to students in order to increase interaction with content (Moallem, 2003). One example of this kind of inquiry is message design research (Stemler, 1997) that has sought to identify the characteristics of visual, auditory, and multi-channel communications that enhance learning (Anglin, Vaez, & Cunningham, 2004; Barron, 2004; Moore, Burton, & Myers, 2004).

From a systems theory approach (Banathy & Jenlink, 2004), much research has been conducted in applying instructional design principles to the development of more effective online learning environments (Moallem, 2003). For example, the Instructional Technology Resource Center at Idaho State University (2002) developed the WebCT Ordinal Web Delivery Organization Companion (WOWDOC) to aid faculty to develop interactive online courses. The structure of the WOWDOC is based on the outline of instructional strategies offered in the Dick and Carey (2001) instructional design model (see http://www.isu.edu/itrc/resources/webct/wowdoc.pdf).

Another perspective on the meaning of interaction comes from cognitive learning theories such as information processing theory (Winn, 2004). For example, Kirschner, Sweller, and Clark (2006) maintain that "The aim of all instruction is to alter long-term memory. If nothing has changed in long-term memory, nothing has been learned" (p. 77). From what to some may seem to be an over-simplified perspective, learning is primarily about fostering the interaction between working memory and long term memory, most, often via what they call "direct instruction" (Klahr & Nigam, 2004).

Most researchers and practitioners do not work within only one framework. For example, Stemler (1997), on the basis of various theories such as Gagne's nine events of instruction, Keller's ARCS motivation model, human computer interaction theory, and message design theory, provided several suggestions for screen design in order to increase interaction quality:

- provide key information in prominent locations with critical information at the beginning of a message;
- place questions and important messages in the middle of the screen;
- use highlighting to focus attention;

- include orientation cues to assist in navigation;
- use universal icons that are familiar to learners.

Research and development based on behavioral, communications, systems, and cognitive theories still comprise a major part of online interaction research. These lines of research have contributed to the development of relatively simple heuristics, guidelines, and tips for designing Web-based learning environments. Winn (2002), among others, has criticized the oversimplification of the complexity of interaction. Critics point out that Web-based learning programs that are limited to learner–content interactions based on behaviorism rely too heavily on self-instructional text, failing to promote human-to-human interaction among students and instructors (Hirumi & Bermudez, 1996).

Since the 1990's, constructivism has exerted a strong influence on education in general and the Instructional Technology field in particular. Although there are many variants of constructivist learning theory (Fosnot, 1996), they share a perspective that learning is defined as meaning making. In other words, according to constructivists, learning requires the personal interpretation of phenomenon such as the construction of a mental model representing complex phenomenon. Therefore, when interactions in a learning environment are designed to enhance meaning making, then those interactions are meaningful within the principles of the constructivist learning theory and within context of interactive learning environments that have been designed according to the theory of constructivism (Gergen, 1999).

Constructivism has provided different forms of theoretical bases for effective online learning environments as well as for face-to-face classroom learning environments (Jonassen, 1999; Jonassen, Davidson, Collins, Campbell, & Haag, 1995). Constructivism is a theory about knowledge and learning. It describes both what "knowing" is and how one "comes to know."

(Fosnot, 2005, p. ix). Constructivism rests on the assumption that knowledge is constructed by learners as they attempt to make sense of their experiences (Driscoll, 2000). Knowledge is a function of how the individual creates meaning from his or her experiences (Jonassen et al, 1995). That is, knowledge is not objective truths to be transmitted via media, but formative, developmental, and constructed explanations by humans engaged in meaning-making process (Driscoll, 2000; Fosnot, 1996, 2005; Jonassen et al, 1995; Vrasidas, 2000). Clearly, learning from the constructivist perspective is a human meaning-making venture (Driscoll, 2000; Fosnot, 1996, 2005; Gergen, 1999; Jonassen et al, 1995; Vrasidas, 2000). However, there are various explanations on how we come to engage in meaning-making.

Constructivism was greatly influenced by the later work of Jean Piaget and the socio-historical work of Lev Vygotsky (Fosnot, 1996; Gergen, 1999). Piaget believed that in a cognitive sense, the human is also a developing organism just like in a physical and biological sense. He proposed that the mechanism promoting change in cognition is equilibration. Equilibration is described as a dynamic process of self-regulated behavior balancing two intrinsic extreme behaviors, assimilation and accommodation (Fosnot, 1996). According to Piaget's explanations, meaning making is a process of attaining 'equilibration' through thoughtful engagement in assimilation and accommodation; this is a process that occurs primarily at the individual cognitive level (Driscoll, 2000; Fosnot & Perry, 2005; von Glaserfeld, 1996). Thus, we call his theory cognitive constructivism.

Vygotsky, on the other hand, was more focused on the effects of social interaction, language, and culture on learning (Fosnot & Perry, 2005; Jonassen et al, 1995; Vrasidas, 2000). Vygotsky emphasized dialogue. He argued that all cognitive functions originate in social interactions and that learning is not simply the assimilation and accommodation of new

knowledge by learners; it is the process by which learners are integrated into a knowledge community (Fosnot & Perry, 2005; Jonassen, 1999; Jonassen et al, 1995; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978). Vygotsky was interested 'not only in the role of inner speech on the learning of concepts but also on the role of the adult and the learners' peers as they conversed, questioned, explained, and negotiated meaning' (Fosnot, 1996, p, 20). In his perspective, meaning making is the process of sharing various perspectives and experiences in communities of practice (Fosnot, 1996; Fosnot & Perry, 2005; Jonassen et al, 1995; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978). Therefore, learning is derived from rich conversation with other people who have similar or different perspectives based on their own life experiences (Jonassen, 1999; Jonassen et al, 1995). We call this theory social constructivism.

Rethinking Interaction from a Social Constructivist Perspective

Humans are social beings; we grow up through the social interactions in various communities. Recently, many educators have come to see the value of social constructivism as a foundation for the design of more effective learning environments. Social constructivists regard individual subjects and the social society as interconnected. Social constructivists assert that learners arrive at what they know mainly through participating in the social practices of a learning environment including collaborative projects and group assignments as well as in the social practices of the local communities including family life and church events (Stage, Muller, Kinzie, & Simmons, 1998). Learning is viewed primarily as a social product yielded by the processes of conversation, discussion and negotiation (Confrey, 1995; Ernest, 1995). In addition, social constructivists lay stress on the role of the adult and the learners' peers as they converse and negotiate meaning (Fosnot, 1996). Social constructivists argue that students can, with help from adults or peers who are more advanced in their meaning-making, begin to grasp concepts

and ideas that they cannot understand on their own. However, social constructivists do not maintain that all conversation and discussion occurring anywhere, anytime are meaningful for learning. They also emphasize that learning and thinking are situated in social contexts. One important social constructivist notion consists of authentic or situated learning, where the student takes part in activities which are directly relevant to his/her real life and which take place within a culture similar to an applied setting (Brown, Collins, & Duguid, 1989).

Social constructivism explains the foundational processes of learning using three concepts: 1) the 'Zone of Proximal Development (ZPD)', 2) 'Intersubjectivity,' and 3) 'Enculturation' (Fosnot, 1996; Fosnot & Perry, 2005; Jonassen, 1999; Jonassen et al, 1995; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978). The Zone of Proximal Development is where a child's (or novice's) spontaneous concepts meet the order and logic of adult (or expert) reasoning. Intersubjectivity refers to the mutual understanding that is achieved between people through effective communication. Enculturation is the process whereby the currently established culture enables an individual to learn the accepted norms and values of the culture or society in which the individual lives. In social constructivism, the meaning-making that is learning occurs through the process of intersubjectivity in the enculturalized Zone of Proximal Development. That is, learning occurs through communication with peers and experts or seniors in a context related to real life tasks. Table 2.1 summarizes the characteristics and applications of social constructivism for learning.

Table 2.1

When interaction has a direct influence on a learner's intellectual growth, we can say the interaction is meaningful (Hirumi, 2002; Vrasidas & McIssac, 1999). In an online learning environment designed on the principles of social constructivism, meaningful interaction should

include responding, negotiating internally and socially, arguing against points, adding to evolving ideas, and offering alternative perspectives with one another while solving some real tasks (Jonassen et al, 1995; Lapadat, 2002; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978). Figure 2.1 illustrates the concept of meaningful interaction in social constructivism.

Figure 2.1

While engaging in authentic learning tasks with various people including peers and experts, learners engage in defining the task, generating ideas, sharing resources and perspectives, negotiating, synthesizing individual thoughts with those of others, completing the tasks, and refining them on the basis of further sharing of insights and critiques. When learners are faced with confusion or conflict, they discuss the issues with one another at first and then they try to negotiate internally and socially to solve the problem. Finally, they arrive at some common understanding. Such a meaningful interaction process is required for meaning making and hence learning.

The Web as a Context for Meaningful Interaction in Social Constructivism

With the development of the Internet and its communication and sharing affordances such as Email, chat, Web discussion forums, and other technologies, people are being exposed to more varied and frequent interaction opportunities than humans have ever experienced before. According to Tapscott (1998), those under the age of twenty-five "embrace interaction media such as the Internet/web, CD-Rom and video games"(p.22), and according to Oblinger (2003) the students in what she calls the Net Generation simply cannot imagine their life without the Internet and computer technology. Web-based interaction for learning would seem to be a very attractive option for learners who experienced their formative adolescent years since the development of the easily browed Internet, but more research is needed before this is validated.

Herrington and Oliver (2000) and other online learning experts have asserted that educational applications of the Web can support and improve the effective types of learner-to-learner interactions based upon social constructivist learning theory. Internet communication tools, such as E-mail, listservs, and bulletin boards, allow learners to exchange information, contribute to discussions, and provide opportunities for learners to acquire examine alternative perspectives easily. Learners can communicate interactively one to one or in groups, making possible opportunities for collaboration such as team projects. Online teachers can provide, through various communication tools, guidance, advice, coaching, and feedback (Hong, Lai, & Holton, 2001). Moreover, the interactive nature of the Web allows learners to explore a variety of resources and establish connections with other knowledge domains that are meaningful to them (Jonassen, 1996; Vrasidas, 2000). But meaningful interactions are unlikely to occur without the provision of an instructional design model that fosters them.

Web-based Authentic Tasks and Meaningful Interaction in Social Constructivism

Authentic tasks have become the center of attention for some researchers focused on employing social constructivist as a theoretical foundation for Web-based learning (Herrington, Reeves, Oliver, & Woo, 2004; Lourdusamy, Khine, & Sipusic, 2002). Using authentic tasks is derived from the social constructivist principle of locating learning in realistic contexts (Stage, Muller, Kinzie, & Simmons, 1998). The use of authentic tasks is also advocated to foster learning transfer in the belief that the collaboration among students helps them learn not only the concepts under discussion but also how these concepts are used in the workplace or in life (Jaworski, 1994). To accomplish an authentic task, students must interact through sharing what they are thinking, relating their ideas to past experiences, collaborating with their peers, actively constructing their own meaning, and incorporating the diverse perspectives of others (Barr &

Tagg, 1995). This is an example of the meaningful interaction process supporting the process of intersubjectivity in the enculturalized ZPD. In particular, if students work together with various people including peers, experts, and seniors while solving an authentic task, this approach highlights the emphasis social constructivists place on the construction of knowledge through mediation and negotiation with others. It is also highlights the process of working closely with an expert who provides a model and gradually socializes the student into the culture of the profession or field (Gardner, 1991).

Given the potentiality of authentic activities for supporting meaningful interaction, several researchers have tried to find characteristics for its educational application. For example, Newmann and Wehlage (1993) outlined five standards for authentic activities: 1) higher order thinking; 2) depth of knowledge; 3) connectedness to the world; 4) substantive conversation; and 5) social support for students. Sheurman and Newmann (1998) provided three criteria of authenticity: 1) construction of knowledge, 2) disciplined inquiry, and 3) value beyond school. According to Perreault (1999), authentic activities typically require more class time than do traditional workbook exercises. Authentic activities also require a range of cognitive skills, some easier to assess than others. Learning assessment must reflect the important components of the activity. Perreault suggested that portfolios and scoring guides (or rubrics) are effective means of assessing the learning stemming from authentic activities. Ideally, students may be involved in the creation of the scoring guides and rubrics.

Among these efforts, the most representative and comprehensive one may be the one made by Reeves, Herrington, and Oliver (2002) to identify guidelines for educational applications of authentic activities within online learning environments. They identified the following ten main characteristics of authentic activities:

1. Authentic activities have real-world relevance.
2. Authentic activities are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity.
3. Authentic activities comprise complex tasks to be investigated by students over a sustained period of time.
4. Authentic activities provide the opportunity for students to examine the task from different perspectives, using a variety of resources.
5. Authentic activities provide the opportunity to collaborate.
6. Authentic activities provide the opportunity to reflect.
7. Authentic activities can be integrated and applied across different subject areas and lead beyond domain-specific outcomes.
8. Authentic activities are seamlessly integrated with assessment.
9. Authentic activities create polished products valuable in their own right rather than as preparation for something else.
10. Authentic activities allow competing solutions and diversity of outcomes.

Before the development of computers and Web technologies, it was difficult or impossible for instructors or instructional designers to use authentic activities in real life settings because of the limitations of the subject matter, costs, time restrictions, practical constraints such as physically moving students to fields of practice, and risks of danger in the field (Herrington et al., 2004). However, with the development of Web technology, such limitations are decreasing. The Web offers access to an enormous amount and variety of relevant content. Instructors can provide information about the latest research results as well as practical examples of the applications of research. The information can be presented in forms such as text, graphics, audio,

video, and virtually any combination of these. With the information, students can conduct exercises, play serious learning games, and even engage in virtual reality simulations on the Web with little or no risk.

Despite the obvious advantages of the Web, relatively few authentic web-based learning programs have been developed and implemented at various levels of education. But progress is being made. According to Winn's (2002) review, many science related programs and research projects now employ Web-based authentic activities such as "astronomy (Barab et al., 2000), meteorology (Hay, 1999), physical oceanography (Winn and Windschitl, 2001), maintenance of nuclear reactors (Kashiwa et al., 1995), subatomic chemistry (Byrne, 1996), and global warming (Jackson, 2000)" (p. 337). In these and similar authentic projects, students participate in scientific investigations conducted jointly with other students and experts online.

Herrington et al. (2004) described a *Graduate Certificate in Online Teaching and Learning* that has been developed using the characteristics of authentic activities mentioned above at a university in Western Australia. The authors described one of the courses in the certificate program as follows:

> The first course entitled *Online Teaching and Learning* was designed to explore issues associated with the creation of effective learning environments, and draws heavily on recent theory and research. The course is based upon a task wherein the student takes on a role in a scenario set in a fictitious university. The student is required to evaluate a website that has been set up as an exemplar for a consortium of universities planning to develop a joint online course. The students then, in collaboration with other students (posed as representatives from the other universities,) recommend a set of guidelines for

website development, and then redesign the original website (or one of their own choosing) according to those guidelines. (p.14)

In such a Web-based authentic learning environment, students draw their information from various sources for their projects, use powerful communications tools and networks for various kinds of collaboration, and learn critical global and information-age skills as well as context related knowledge and skills (Newman, 1994). But questions remain about the degree to which students become actively engaged in authentic tasks online and whether learners actually view their interactions as meaningful.

Recognizing Meaningfulness in Online Interactions

As noted above, when interaction influences students' meaning making and increases learning effects, we can say that interaction is meaningful. But this statement is obviously somewhat tautological. How can we really know whether interaction has affected learning through the process of intersubjectivity, especially in Web-based learning environments? Does the use of authentic tasks guarantee meaningful interaction? Certainly not. If we design a Web based learning environment using authentic tasks, the success depends on many factors including the way the task is presented, the scaffolding strategies instructors apply, the learners' interests and motivation, and so on. When an online learning environment is designed around authentic task, unexpected factors may emerge and some expected results are not always predictable. Therefore, to increase meaningful interaction and to design and apply better interaction activities in Web-based learning environments, the interaction processes need to be analyzed and understood in terms of learning.

Fortunately, many contemporary Web-based learning environments automatically create text-based archives or transcripts of interactions that occur during online learning (Harasim,

Hiltz, Teles, & Turoff, 1995). Different approaches to content analysis or discourse analysis can capture the richness of the student written interaction in Web-based learning environments. Content analysis is a generic name for a variety of textual analyses that typically involves comparing, contrasting, and categorizing a set of data (Schwandt, 1997). Discourse analysis has an analytic commitment to studying discourse as texts and talk in social practices (Potter, 1997). Discourse analysis differs from content analysis in that content variables are not predetermined and fixed but evolve in iterative readings of the text. The unit of analysis is of various length spanning sentences, paragraphs, pages, even whole texts (Davis & Brewer, 1997; Potter, 1997). To compensate for the weak points of each method, content analysis and discourse analysis are often used together. Several researchers have developed models and tools to facilitate the analysis of the data representing online interaction (Bales, 1950; Gunawardena, Lowe, & Anderson, 1997; Henri, 1992; Johnson & Johnson, 1996). As illustrated in Table 2.2, there are a variety of ways to analyze written online interaction (Campos, 2004).

Table 2.2

Based on a specific learning situation or research purpose, the most appropriate analysis model can be chosen from the models listed in Table 2.2 or developed anew. However, to increase learning and meaningful interaction, the important components of meaningful interaction mentioned previously specified should be checked during the analysis process regardless of the approach taken. That is, we should try to understand the following:

- how learners communicated actively with various people including peers and experts;
- how learners faced the inevitable conflict situations that arose during discussion,
- how they actively negotiated internally and socially to solve those situations; and
- how finally they arrived at some common understanding through those processes.

Based on the results, we will hopefully begin to understand clearly the nature of interaction and learning processes it enables. Based on this understanding, we can better manage and facilitate the interaction process as well as design more effective learning environments.

Conclusion

In order to improve the research and development related to Web-based learning, we recommend re-conceptualizing online interaction in terms of meaningful learning based on social constructivism learning theory. Meaningful interaction occurs in the process of intersubjectivity in the enculturalized ZPD (Fosnot & Perry, 2005; Driscoll, 2000; Jonassen et al, 1995; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978). Meaningful interaction should include responding, negotiating internally and socially, arguing against points, adding to evolving ideas, and offering alternative perspectives with one another while solving some authentic tasks (Jonassen et al, 1995; Lapadat, 2002; Lave & Wenger, 1991; Vrasidas, 2000;Vygotsky, 1978). As representative examples of meaningful interaction, we referenced a few notable attempts that use authentic activities in web-based learning environments (Herrington et al. 2003). In addition, we discussed the need for understanding and assessing the meaningfulness of online interaction through careful analysis. The bottom line is that to increase the learning effects of online interaction, we should, first of all, understand clearly the nature of interaction within the framework of social constructivist learning theory. Once we gain such an in-depth understanding, we should be able to engage in productive research and development to identify the necessary design principles for implementing more effective interaction activities within Web-based learning environments.

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Table 2.1

The characteristics and applications of social constructivism (Jaworski, 1994; Ernest, 1995)

Characteristics	- Active construction of knowledge based on experience with and previous knowledge of the physical and social worlds - Emphasis on the need for the ZPD - Emphasis on the influence of human culture and the sociocultural context - Recognition of the social construction of knowledge through dialogue and negotiation - Emphasis on the intersubjective construction of knowledge - Multiple interpretations of knowledge
Applications	- Emphasis on the critical role of peers, in particular more skilled students - Enculturation of students into the community of the particular academic discipline or profession - Use of relevant and authentic tasks - Appreciation of multiple perspectives - Problem solving in real world situations - Collaboration in the learning process - Opportunity for students to publicly share their work, revise their work based in social critiques, and reflect on what they have learned with others

Table 2.2

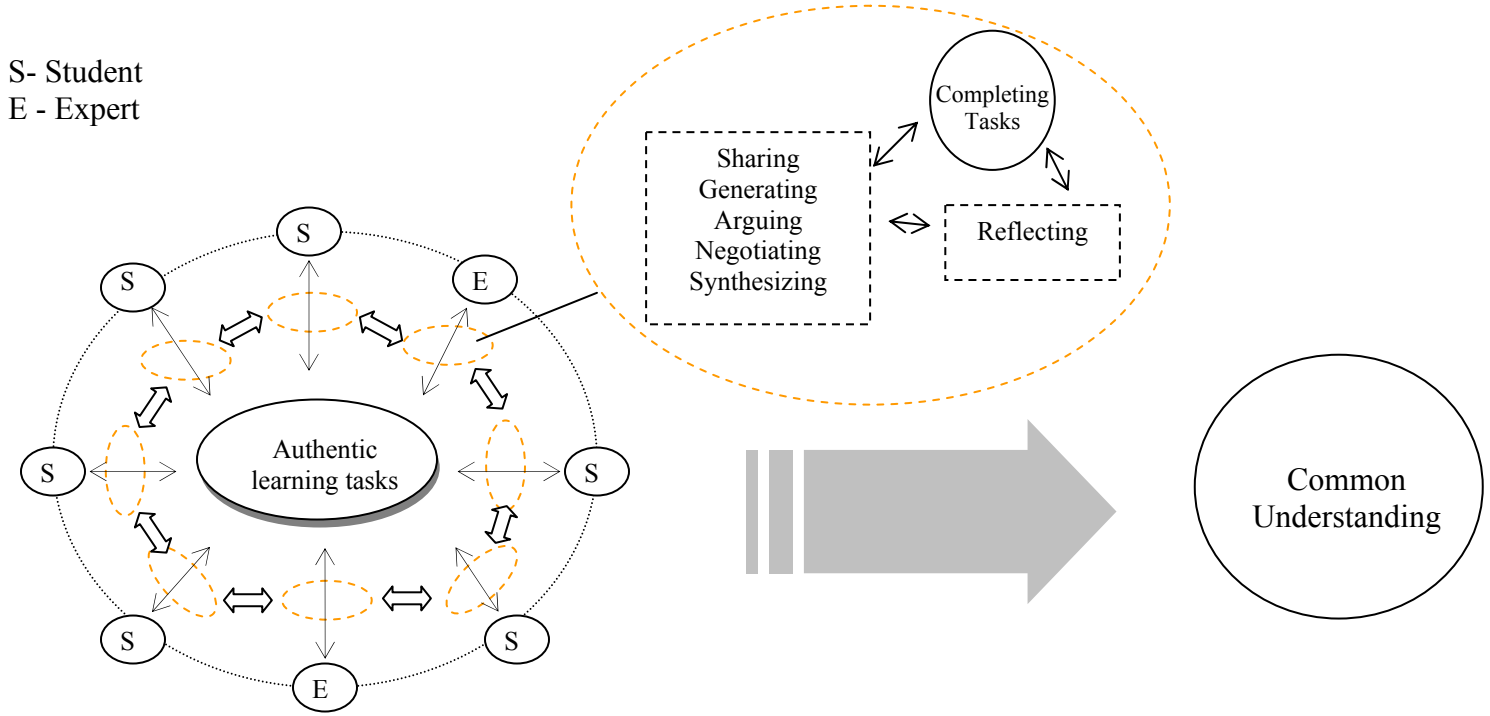
Interaction analysis models

Researchers	Research Purpose	Unit of Analysis	Analysis Model	Published Journal
Henri (1992)	To propose a content analysis method to assess learning processes	Meaning	Developing a five level analytical model including participative, social, interactive, cognitive and metacognitive dimensions	Collaborate learning through computer conferencing: The Najaden papers
Gunawardena, Low, and Anderson (1997)	To introduce a model of analysis to assess the social construction of knowledge and collaborative learning.	Message	Developing a five phase evolution of negotiation leading to the co-construction of knowledge: Sharing/comparing information, Discovery and exploration of dissonance, Negotiation of meaning/Co-construction of knowledge, Testing and modification of proposed synthesis, Phrasing of agreement, statement, and application of the newly constructed meaning	*Journal of Educational Computing Research*
Kanuka and Anderson (1998)	To understand and assess the learning that occurred during an online forum	Message	Using the model of Gunawardena, Low and Anderson complemented with discourse analysis	*Journal of Distance Education*
Hara, Bonk, and Angeli (2000)	To explore how electronic environments encourage higher-order cognitive and metacognitive processing	Paragraph or idea.	Using a transformed Henri method	*Instructional Science*
Fathy, Crawford, and Ally (2001)	To understand patterns of computer-mediated interaction	Sentence	Developing a tool named TAT (Transcripts Analysis Tool)	*International Review of Research in Open and Distance Learning*

Garrison, Anderson, and Archer (2001)	To introduce a practical approach to assess the nature and quality of critical discourse and thinking in a computer conference	Message	Developing an inquiry model, which focuses on cognitive presence	*American Journal of Distance Education*
Campos (2004)	To study conceptual change, higher order learning, and knowledge building in online communication	Sentence	Discourse analysis method referred to as ecological constructivist perspective	*Journal of Asynchronous Learning Network*

Figure 2.1

Meaningful interaction in social constructivism



CHAPTER 3

INTERACTION IN ASYNCHRONOUS WEB-BASED LEARNING ENVIRONMENTS: STRATEGIES SUPPORTED BY EDUCATIONAL RESEARCH[2]

[2] Woo, Y., & Reeves, T. C. Has been submitted to *Journal of Asynchronous Networks*

Abstract

Because of the perceived advantages and the promotion of Web-based learning environments (WBLEs) by commercial interests as well as educational technologists, knowing how to develop and implement WBLEs will probably not be a choice for most educators and trainers in the future, but a necessity. However, many instructors still don't know the most effective strategies for designing and implementing effective WBLEs even though numerous studies have demonstrated that the success or failure of online learning depends largely on the quality of interaction. Indeed, it has been said learning is impossible without meaningful cognitive interaction. However, this kind of interaction does not occur by itself. The primary goal of this paper is to explore the importance and characteristics of meaningful interaction in online learning, especially in asynchronous contexts. A secondary goal of this paper is to present several pragmatic strategies for improving meaningful interactions in WBLEs on the basis of a review of relevant research literature.

Introduction

Increasingly, the World Wide Web and other Internet technologies are becoming one of the main delivery systems for effective learning and teaching (Maeroff, 2003). From elementary schools to universities, as well as at the corporate level, educators and trainers are using the World Wide Web and other Internet technologies to supplement classroom instruction with information specifically designed for instructional purposes as well as with information found in online resources originally intended for other reasons (Bonk & Graham, 2006). A few innovators are even using the Internet to deliver unique learning experiences unavailable through other means (Aldrich, 2006; Schank, 2002). The potential for change and innovation in the instructional delivery approaches is still expanding, and there is no reason to think that the growth of technological innovations will be slowed (Collis, 1996; Shank, 2002).

Because of its perceived advantages and its seemingly relentless promotion by commercial interests as well as educational technologists, knowing how to develop and implement Web-based learning environments (WBLEs) probably will not be a choice for most educators and trainers in the future, but a necessity. Unfortunately, most instructors lack expertise in developing and facilitating WBLEs, and enhancing the quality of Web-based learning remains an important and necessary challenge.

Asynchronous Web-based Learning Environments

One of the most widely used affordances of the Internet in WBLEs is asynchronous learning through means of online discussion forums where students can exchange ideas, discuss issues, and collaboratively search for solutions to problems. Instructional technologists, among others, promote the integration of online discussion forums and similar tools into WBLEs in the

belief that students will use them to think and construct their own ideas, to compare their ideas with those of other people, and to reflect upon and reexamine their own understanding by reading and responding to peers' and instructors' postings (Gallini & Barron, 2002). Because of these perceived advantages, asynchronous text based technology is one of the most widely used tools across educational institutions around the world to support online learning (Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw, & Liu, 2006). Indeed, participating in and contributing to asynchronous discussions has become a required activity for many, if not most, college students today (Hawkes & Dennis, 2003; Johnson & Aragon, 2003).

However, the quality and effectiveness of supporting meaningful learning through Web-based learning and more specifically through asynchronous online discussions are still in doubt (Reeves, 2003). In a study involving 122 undergraduate students in the UK, Davies and Graff (2005) found that greater participation online discussions did not lead to better performance as measured by course grades. A recent review by Tallent-Runnels et al. (2006) found that such asynchronous communication facilitated in-depth discussion, but no more than in traditional face-to-face class sessions. Just as instructors often struggle to engage students in classroom discussions, many online instructors find that they must require students to make a certain number of postings per week in online discussion forums, and as a result, students often post comments that have little relationship to higher order thinking or learning just to meet the required number of postings (Hawkes & Dennis, 2003). Clearly, students who post to web-based discussion forums just to meet course requirements are unlikely to be engaged in meaningful interaction that stimulates learning.

Meaningful Interaction

One of the key components of good teaching and learning, online or otherwise, is interaction. It has been argued that success or failure of online learning depends on the level of interaction that occurs (Kearsley, 2000; Merriam & Caffarella, 1999). Milheim (1996), after reviewing the literature on interaction within online learning, concluded that the consideration of interaction is the most important element in designing online learning. Trentin (2000) also maintained that the quality of online learning depends on interaction, and he predicted that a 'third generation' of online technology would afford richer interaction and therefore increase the quality of learning. Beldarrain (2006) describes how emerging technology tools, including wikis, blogs, podcasts, and social software applications, are being used to foster student interaction in online learning.

The nature of learning interaction can be defined in a variety of ways, for example, based upon the types of tasks with which participants are challenged within a course ranging from traditional academic tasks or real world authentic tasks (Herrington & Oliver, 2000; Herrington, Reeves, & Oliver, 2006). In addition, interaction is obviously influenced by the relationship between the teacher and the learners and the degree to which a course is teacher-centered or learner-centered (Weimer, 2002). The nature and level of involvement by participants in a specific instructional experience is also dependent on whether the participants are in face-to-face situation or at a distance using online technologies (Kearsley, 2000).

Within the context of online learning, several of the existing definitions of interaction are derived from communications theories and tend to be somewhat abstract. For example, Wagner (1994) defined interaction as "the reciprocal events that require at least two objects and two actions" (p.8). The interactions occur when these two objects and events mutually influence each

other. Moore's (1989) definition of interaction is based upon a communication-based framework, defining the sender and receiver of three types of interaction: learner-content, learner-instructor, and learner-learner. Northrup (2001) proposed five interaction purposes: to interact with content, to collaborate, to converse, to help monitor and regulate learning (intrapersonal interaction), and to support performance.

A more insightful approach to defining interaction in WBLEs may be derived from the learning theories underlying the development of particular learning environments. For example, behaviorists would emphasize the arrangements of stimuli, responses, and reinforcements that underlie interaction whereas social constructivists would seek to maximize the degree to which learning interactions enhance meaning making (Gergen, 1999). According to social constructivism as a learning theory, meaning is constructed in communities of practice through social interaction focused on solving shared problems, and thus social constructivists emphasize establishing dialogic interaction within the learning environment to promote student learning (Driscoll, 2000).

The definition of interaction provided by Vrasidas and McIsaac (1999) follows the social constructivists' perspective. They defined "meaningful interaction" as "the intellectually stimulating exchange of ideas" (Vrasidas & McIsaac, 1999, p.22). Meaningful interaction is not just sharing personal opinions. Instead, the interaction must stimulate the learners' intellectual curiosity and directly influence their learning. This kind of meaningful interaction is an essential ingredient in any learning process. When students have engaging opportunities to interact with one another and their instructor, regardless of whether they are online or not, they can analyze, synthesize, and evaluate course content and use their new learning to construct shared meaning

and better understanding of their own knowledge (Lave & Wenger 1991). Indeed, it has been said that learning online is impossible without interaction (Gunawardena, 1995).

The Characteristics of Asynchronous Meaningful Interaction

At this time, asynchronous online courses are primarily dependent on written text as the communication medium. To have meaningful interaction within asynchronous learning environments requires that "others do respond; they argue against points, add to evolving ideas, answer questions, and offer alternative perspectives" (Lapadat, 2002, p. 12). According to studies of online learning, in comparison with oral interaction in a face-to-face classroom setting, asynchronous online written interaction focuses more on the topic, better supports the emergence of multiple perspectives, and encourages deeper reflection (Duffy, Dueber, & Hawley, 1998; Harasim, Hiltz, Teles, & Turoff, 1995; Lapadat, 2002).

Ideally, through meaningful interaction, learners can promote their learning because of unique benefits of an asynchronous WBLE such as the possibility to develop a better understanding of different perspectives, an ability to compare progress (and mistakes) with others or with set standards for interaction, opportunities for engaging in deeper reflection, and a richer exploration of the topic using Internet resources (Hill, 1997; Johnson & Aragon, 2003). Wilson and Stacey's (2004) analysis of the effects of online interaction on learning showed that group online interaction and sharing of resources helped students to become engaged in constructing new ideas and understanding other people's perspectives. In the context of asynchronous conferencing, students can negotiate meanings together, and, on the basis of the results of the negotiation, experience individual conceptual changes, a necessary process for effective learning (Lapadat, 2000).

Although successful meaningful interaction can provide opportunities for reflection, exposure to multiple perspectives, sharing of ideas, and the discovery of what others are doing to learn (Kanuka & Anderson, 1998), most present day Web-based learning environments do not live up to their potential for meaningful interaction (Reeves, 2003; Winiecki, 2003). At least some of this failure can be attributed to technological weaknesses that tend to force students to put more of their cognitive load capacity into handling the user interface of a WBLE than into the learning process itself. In general, courses that include online discussions among learners in higher education through the use of course management systems such as WebCT and BlackBoard have not proven to be very satisfactory for learners or instructors (Reeves, 2003). Students are often overwhelmed and frustrated by the enormous amount of materials surfacing on the discussion bulletin board during the duration of a course. For example, Kirby (1999) found that learners had difficulty tracking on-going discussions, and complained that it took several hours daily to keep up with the bulletin board. Hara and Kling (1999) described the frustration students experienced with unfriendly technology and unreliable teachers in an online learning environment.

Once the novelty factor of online discussion expire, many students appear to lose their desire to write regular postings to a course discussion forum (Williams, 2002). As a result, unless an instructor requires compulsory postings, learners usually fail to post their ideas on a regular basis, lose interest in the discussion, and the bulletin board gradually dies (Hammond, 2 000). It won't surprise any experienced instructor that required postings are often shallow in substance (Beaudoin, 2002). Kanuka and Anderson (1998) revealed that most of the interaction in their asynchronous online course was of a straightforward sharing and receiving information without meaningful dialog. When the students experienced information contradiction, there was a

tendency to ignore it, and thus students failed to engage in the cognitive processes required to construct new knowledge. Similarly, Pena-Shaff, Martin and Gay (2001) found that many of the messages posted on the discussion board looked more like monologues than dialogues, and there were also many postings in which students did not support their ideas with evidence. The so-called online discussion was only an opinion-sharing activity. In such situations, it is difficult to find evidence that meaningful interactions and learning have occurred. Kirschner, Strijbos, Kreijns, and Beers (2004) summed up the problems with contemporary WBLEs as follows:

> …these environments do not support such interactions in the same way that it occurs in face-to-face (i.e., time delay, lack of complete sensory contact, non-availability of off-task activities, etc.). The proximate result is often disgruntled or disappointed students and instructors, motivation that is quickly extinguished, poorly used environments, wasted time and money, and showcase environments that are often not much more than computer assisted page turning. The ultimate result is very similar to the first problem—no learning, because the students tend to give up. (pp. 47-48)

Meaningful interaction does not occur by itself, especially in the context of teaching and learning online. Learners cannot be expected to know how to interact meaningfully in an online situation, even all of the technological barriers were removed, without guidance and scaffolds. It should be clear that instructors who are striving to develop dynamic online environments and promote meaningful interaction within their online classes face many challenges (Jeong, 2003; Kollock, 1998).

How to Promote Meaningful Interaction

While it is evident that new technologies have expanded the potential for online interaction between students and instructors, meaningful interaction that actually contributes to

student growth and learning requires careful planning on the part of the instructor. Social constructivists, drawing on the work of Vygotsky (1978), have suggested that learning environments should involve 'guided interaction,' emphasizing the role of the instructor for providing the necessary guidance (Berge, 2002). Facilitating interaction among students is central to the role of the online-learning instructor (Levitch & Milheim, 2003). Instructors must provide the pedagogical foundation and structure to guide learners (Tu & Corry, 2003).

The level of interaction among online learners is influenced heavily by the structure of the course (Vrasidas & McIsaac, 1999), which in turn is driven by the pedagogical strategies employed by the instructor (Bannan-Ritland, Bragg, & Collins, in press; Hackman & Walker, 1990; Eastmond, 1992). According to a report from professors at the University of Illinois regarding teaching on the Internet (see http://www.vpaa.uillinois.edu/tid/report/), instructors should carefully organize student interactions, limit their lecturing, address student system familiarity, and intermittently summarize discussions and comments. Especially in asynchronous situations where there are few, if any, visual cues, the online instructor must be actively involved in monitoring and guiding the class to prevent it from being a simplistic opinion-sharing activity that fails to support learning. Regarding the need to guide meaningful interaction, Gallini and Barron (2002) said,

> Students need more specific guidelines and structures for interacting in asynchronous and synchronous environments, chat discussion groups, and even e-mail to become engaged in coherent group and meaningful interactions. (p.152)

In a similar vein, Johnson and Aragon (2003) wrote,

> Two things are important to keep in mind. First, although the quantity of interactions is important, the quality of interaction is what should be stressed. Second, it is important

> that the instructor model the expected type of interaction by providing quality comments to the discussion itself. (p.40)

Thus, one of instructors' more important tasks is to assist with strategies that facilitate meaningful use of the online educational environment for learning. Asynchronous online learning structured with instructor guidance can help students increase their learning by guiding them to engage in a process of critical and reflective thinking, but this requires the design and use of effective facilitation strategies (Duffy, Dueber, & Hawley, 1998). Research demonstrates clearly that instructors need to develop and apply better strategies that can foster meaningful interactions for learning on the WBLEs (Collis & Moonen, 2002; Johnson & Aragon, 2003; Jones, Valdez, Nowakowski, & Rasmussen, 1994; Muirhead, 2002).

Studies on Interaction Strategies in WBLEs

Although there is insufficient research that provides guiding strategies in online learning environments, some researchers have tried providing useful guidelines. Table 3.1 outlines the efforts.

Table 3.1

Through an in-depth literature review study, Bannan-Ritland et al., (in press) provided a framework that integrates educational constructs (e.g., reflective components, social components and content components) with learning principles and instructional activities to identify effective instructional strategies for Web-based courses. They suggested following similar strategies in each educational construct:

- providing individual and small group reflection opportunities,
- asking for periodic self-evaluation to support reflective components;
- using a project based learning approach to content components;

- organizing social components such as a lounge or café to encourage a community of practitioners; and
- providing a clear and direct syllabus that permits assignment alternatives students can choose and ensures a match between objectives, strategies and assessment.

Levin and Waugh (1998) investigated "teleapprenticeships" as interaction frameworks that support learning in the online context. Through a case comparison technique, five kinds of teaching apprenticeships were studied: question answering and asking, collaboration, student publishing, web-weaving, and project generation and coordination. They concluded that the integration of these apprenticeship frameworks into supportive institutional structures with new mediator roles are important for the successful online learning.

Lourdusamy, Khine, and Sipusic (2002) explored the impact of a tool that allows users to engage in collaborative discussion based on viewing authentic video footage (e.g., classroom teaching episodes) in teacher education. By rating students' participation and the quality of their comments, the authors concluded that using authentic cases increases the quality and quantity of interaction in online learning situations. In addition, writing comments on authentic cases encouraged students to think and to see the relationship between theory and practice more clearly.

McIsaac, Blocher, Mahes, and Vrasidas (1999) explored the perceived advantages and disadvantages of various types of interaction in an online classroom by analyzing several kinds of statistical data, message archives, and participant interviews. The feeling of isolation and the lack of immediate feedback were identified as main disadvantages. Based on the results, they concluded that instructors should contact students frequently and individually, "show up" online often to actively participate in the discussions, and use collaborative learning strategies in order to improve online interaction.

Northrup (2001, 2002) investigated several types of interactions that students perceived to be important for online learning through the administration of the Online Learning Interaction Inventory. The instrument focused on the four interaction attributes of content interaction, conversation and collaboration, intrapersonal/metacognitive skills, and need for support. As a result, the need for timely responses from peers and instructor, and the need for students to self-monitor their progress were identified as the most important factors in online learning. In addition, she found that students wanted to use some innovative strategies including case studies, debates, role-play, and playing games.

After analyzing the evaluation documents from 154 asynchronous online courses, Rossman (1999) presented several tips for successful teaching in an online environment using an asynchronous discussion forum. Among them, providing specific and prompt feedback, modeling discussion processes, and providing specific course guidelines were representative.

Using an interpretivist approach, Vrasidas and McIsaac (1999) examined the nature of interaction in an online course from both teacher and student perspectives to identify the factors influencing interaction. Data were collected through interviews, observations, and a review of online messages. As a result, four major factors influencing interaction were identified: structure, class size, feedback, and prior experience. Based on the research experience, the authors suggested requiring students to engage in discussion and collaborate on projects; training students early in the course to use emoticons, the conferencing system, and appropriate etiquette; and assigning students to collaborative pairs with a mixed range of skills.

Representative Strategies

On the basis of the review of the preceding studies, five representative strategies to increase the meaningful interaction in WBLEs were identified. They are modeling and

scaffolding, dividing the class into small groups, giving appropriate feedback, encouraging reflection, and using authentic activities.

Modeling and Scaffolding. First of all, instructors can model effective online interactions by demonstrating initiative, moderating discussions, and providing good examples of prior students' work. It is important to provide explicit guidelines about the level of participation expected in online contributions and then to exemplify this level in the instructor's interactions (Rovai, 2001). In particular, in an asynchronous situation, the instructor should model how to contribute to an online discussion, how to respond to other people's postings, and how to use emoticons and netiquette appropriately. An instructor can actively participate in the discussion, show higher order thinking in postings, and acknowledge or constructively critique remarks that other students have posted. Instructors also may choose to provide prior student contributions as a means of modeling expectations, lowering student anxiety and increasing other students' self-efficacy (Vrasidas & McIsaac, 1999; Bonk, 2000). In this way, instructors and peers serve as models for increasing participation and contribution within a new educational context (Johnson & Aragon, 2003).

Instructors can also model how to humanize the online learning environment (Bonk, 2000; Vrasidas and McIsaac, 1999). That is, they should play a key role in setting the emotional tone for their asynchronous online interactions (Muirhead, 2002). Emotional tone can be shown through the use of "emoticons" made by combinations of punctuation marks (Collison, Elbaum, Haavind & Tinker, 2000). Used appropriately, emoticons make it possible to express learners' attitudes toward the topic being communicated and to describe vivid and dynamic feelings (Gunawardena & Zittle, 1997; Liu, Ginther, & Zelhart, 2001). Most emoticons are composed of keyboard symbols. Some are simple and others are complex. The University of Illinois has

provided a collection of emoticons to help their online learners (see http://www.ion.uillinois.edu/resources/tutorials/ communication/index.asp). Figure 3.1 below illustrates some of the common emoticons used in online discussions.

Figure 3.1

After modeling, the instructor can scaffold the interaction by providing guidance and supporting materials (Berling, 1999). Admitting and supporting the naturally occurring role of "lurker," i.e., someone who reads the messages of an interaction but does not contribute in online interactions (Williams, 1995), is a challenge not to be ignored. Novice learners can observe netiquette and ways of particular interaction by lurking (Levin & Waugh, 1998). In this way, the shy or "laid back" learners can vicariously experience meaningful interaction (Berling, 1999), and hopefully, later engage in these kinds of interactions themselves.

Dividing Class into Small Groups. Building collaborative components into an asynchronous online learning environment can foster interaction (Levitch & Milheim, 2003; McIsaac et. al., 1999). Through a literature review, Tu and Corry (2003) concluded "studies have shown that small-group instruction positively impacts student achievement, persistence, attitude, modeling, cognitive disequilibrium, cognitive development and social skills" (p.53). Small groups with regular online interaction can increase the effectiveness of online learning (Levin & Waugh, 1998; McIsaac et al., 1999; Stacy, 1999). In order to achieve these benefits of small groups, instructors' careful planning and oversight are required. The literature provides several suggestions: try to limit a group size to no more than 15 students with eight to ten being best (Educational Technology Development Group in The University of Washington, 2002); set up student to student interaction through introductory activities and biographical posts (Collison et al., 2000; Conrad & Donaldson, 2003; Lapadat, 2000; Muirhead, 2002); provide an 'ice-breaker'

to introduce the students to each other and to the tutor, in order to get the ball rolling and to humanize the process (Milheim, 1996); assign students to groups and assign roles for discussions (Conrad & Donaldson, 2003; Salmon, 2000); encourage commenting on each other's writing (Salmon, 2000); require each student or group to be a tutor or guru for a particular concept area (Conrad & Donaldson, 2003); respect and highlight individual group members' abilities and contributions (Tu & Corry, 2003). However it is accomplished, engaging small teams in online discussions enriches learning interaction and enhances the likelihood that individuals will be responsible contributors (Tu & Corry, 2003).

Giving Appropriate Feedback. Until students receive a reply or response on what they posted to an online discussion, they typically experience discomfort followed by frustration. Teacher and peer feedback are necessary for encouraging meaningful interaction (Johnson & Aragon, 2003; McIsaac et al., 1999; Nothrup, 2001, 2002; Rossman, 1999). An important job of the instructor is to interact with the learners to help bridge the gaps between the learners' understanding and the content. The instructor should also provide appropriate feedback concerning social interactions (Berge, 2002). The social comments of the instructor and students often motivate other students to participate in online discussions and promote interest in each other's posting (Bonk, 2000). In WBLEs, giving appropriate feedback and providing positive affirmation of student work are essential components of interaction (Muirhead, 2002; Sims, 2003). Although it can be a daunting tasks with large numbers of students, online instructors can monitor student progress by reviewing chat room transcripts, emails, threaded discussions, and presentation spaces. Based on these reviews, instructors will have a better basis for providing feedback that will help learners engage in interactions that are more than superficial. Allan (2004) describes an innovative approach for providing instructors with visualizations of

instances of meaning construction and knowledge advancement within online discussion forums. Such a visual approach is especially important in situations where the number of students in a online discussion group is larger than recommended (Educational Technology Development Group in The University of Washington, 2002).

Encouraging Reflection. Vygotsky proposed two levels of interaction. One is on the interpersonal level between individuals, and the other is on the intrapersonal level within the individual (Vygotsky, 1978). Intrapersonal interaction means reflection. Reflection is "the learner's cognitive activity of looking back at relevant social interactions and their own or group learning activities and also looking forward in hopes of shaping and improving future learning interactions and activities" (Berge, 2002, p.183). The instructor can encourage such reflection by asking students to keep a journal of what they do and experience, draw a concept map of their understanding of a process or idea, or maintain a database related to their new knowledge (Bannan-Ritland et al., in press; Northrup, 2001, 2002; Prestera & Moller, 2002). Through the journaling process, learners can reflect on their participation in the interaction process. Of course, instructors should provide several good journal examples and demonstrate how to write a reflective journal.

Concept maps and database tools may also be helpful in supporting reflection. Drawing concept maps allows students to show the structure and interrelationships of the learning interactions. Building a database can serve a similar function. Other researchers have suggested their own strategies for encouraging reflection such as providing pause time between major interactions for recapping what has gone before, the use of debates, role-plays, online diaries, one-minute papers and modeling of reflective thinking (Johnson & Aragon, 2003; Maor, 2003). In addition, Johnson and Argon (2003) recommended that posting an agenda of "the upcoming

week serves as an advanced organizer and allows students to come to class better prepared for interaction" (p. 39). Through these pedagogical strategies, learners are able to reflect better and more actively participate in the online interaction process.

Using Authentic Activities. Perhaps the most powerful instructional strategy involves using case studies or critical incidents wherever possible to apply learning to real world situations as discussion topics or project topics (Bannan-Ritland et al., in press; Northrup, 2001, 2002). What people perceive, think, and do develops in a fundamentally social context regardless of whether it is the real world or a virtual one. Brown, Collins, and Duguid (1989) stated that knowledge and skills cannot be separated from the context and community where they are used and that gaining knowledge always involves practical activity. Therefore learners should be engaged in authentic activities whenever feasible (Collins, Brown, & Newman, 1989; Herrington et al., 2006; Herrington, Reeves, Oliver, & Woo, 2004). Lebow (1993) describes authentic activity as "experiences of personal relevance that permit learners to practice skills in environments similar to those in which the skills will be used" (p. 9). Brown et al. (1989) describe authentic activities as "ordinary practices of the culture" (p. 34), and Newmann and Wehlage (1993) describe authentic activities as real world tasks that a person can expect to encounter in everyday life. Studies have shown that the structure of using authentic activities in WBLEs can increase the quality of online interaction (Herrington et al., 2004, 2006; Johnson & Aragon, 2003; Lourdusamy et al., 2002). Because authentic activities mirror real world tasks, they require students to cooperate, to communicate, to respect each other's views, and to use diverse skills to complete the task successfully (Perreault, 1999). Herrington and Oliver (2000) describe a framework for designing authentic learning tasks for interactive learning environments.

Through the process of accomplishing authentic activities, meaningful interaction defined as exchanging intellectual ideas with one another is a necessity. In other words, collaborating students in an online learning environment would simply be unable to complete authentic tasks without meaningful interaction just as teams of people working in the real world are unable to complete authentic activities without substantive interaction. Research in Australia and elsewhere indicates the value of engaging in these authentic activities in Web-based learning environments. Herrington and Oliver (2000), the foremost researchers in this area of study, concluded that "the collaboration and problem solving in the authentic activities or projects provide interactivity in a far more authentic and context-specific manner than is possible with predetermined responses and feedback" (p.43). Table 3.2 below summarizes the guiding strategies and specific techniques mentioned above.

Table 3.2

Discussion

Even though, as detailed above, the literature has provided a number of idealized instructional strategies for enhancing online interaction, they are not sufficient for college instructors or instructional designers in real practice. Instructors and instructional designers cannot be expected to know how to apply the idealized strategies to their own online courses without considerable support. Instructors and instructional designers need clearer guidelines, practical examples, and especially, field related information from other instructors regarding how they have supported meaningful interaction (Hillman, 1999). Important questions must be addressed:

- How can those strategies be designed and implemented in real online classes?

- How can learners be motivated to interact with one another in a reflective, engaged manner?
- How can instructors support meaningful interaction through feasible strategies that won't unrealistically increase their workload?
- What kinds of interaction are most meaningful for students' learning online in different fields of study, e.g., medical education or teacher preparation?

Many online instructors seek answers to these kinds of questions. Accordingly, more and better research that reveals the design strategies underlying successful asynchronous online learning cases and analyzes the reasons for the effectiveness of the strategies is needed. It is also necessary to investigate the learners' and instructors' perceptions of interaction in asynchronous web-based learning, and, on the basis of their perceptions, to develop more effective strategies for designing meaningful interaction activities in web-based learning environments. By applying such research results, instructors and instructional designers may begin to have a clearer picture of successful online interaction and learning can be designed, implemented, evaluated, and redesigned for increased effectiveness.

Conclusion

Although the World Wide Web and other Internet technologies are becoming so commonplace that participating in and contributing to asynchronous web-based learning have become required activities for many students, there is considerable room for improvement in the design and utilization of these interactive learning environments (Maeroff, 2003). Despite its strong potential, many academics remain unconvinced of the effectiveness of asynchronous online learning. Therefore, increasing the quality of asynchronous Web-based learning remains an important and unmet challenge. One of the key components of good teaching and learning is

interaction. Indeed, it can be argued that the success or failure of online learning depends on the level of interaction. However, meaningful interaction that actually contributes to student growth and learning does not occur by itself. It requires careful planning on the part of the instructor and the implementation of multiple strategies for improving the interaction.

This paper has presented pragmatic strategies for improving meaningful interaction in WBLEs on the basis of a review of published research. Such strategies include modeling and scaffolding, dividing the class into small groups, giving appropriate feedback, encouraging intrapersonal interaction, and using authentic activities. However, for successful web-based interaction, further research is needed to show successful asynchronous online learning cases, to investigate the learners' and instructors' perceptions of interaction in web-based learning, and to develop more effective strategies for designing meaningful interaction activities in web-based learning environments.

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Table 3.1

Research related to guiding strategies

Researchers	Research supported strategies
Bannan-Ritland, Bragg, and Collins (in press)	Encouraging reflection Making a community of practitioners Applying project-based learning
Levin and Waugh (1998)	Question answering and question asking Collaborating Student publishing Web weaving Project generating and coordinating
Lourdusamy, Khine, and Sipusic (2002)	Using authentic cases
McIsaac, Blocher, Mahes, and Vrasidas (1999)	Providing immediate feedback Encouraging the discussion Assigning pairs for moderating online discussion Using collaborative learning strategies (group project, group debate)
Northrup (2001, 2002)	Using innovative strategies including case studies, debates, role plays, and gaming. Requiring timely responses from peers and from instructor Providing an opportunity to self-monitor learners' own progress
Rossman (1999)	Posting a weekly summary of the online discussion Monitoring the quality and regularity of learner posting
Vrasidas and McIsaac (1999)	Training students to use emoticons, to use the conferencing syst em, and to employ appropriate etiquette Assigning student pairs with a mixed range of skills

Table 3.2

Guiding strategies and specific techniques

Guiding Strategies	Techniques
Modeling and Scaffolding	- Demonstrating initiative - Providing good examples of prior students' work - Providing explicit guidelines about the level of participation expected - Showing how to respond to other people's posting - Showing how to use emoticons and netiquette - Admitting and supporting role of lurker
Dividing class into small groups	- Including introductory activities and biographical posts - Assigning roles for discussion - Requiring each student or group to be a tutor or guru for a particular concept area - Posting upcoming agenda as an advanced organizer
Giving appropriate feedback	- Monitoring students progress by reviewing threaded discussion and chat room - Providing positive affirmation of student work - Providing social comments
Encouraging reflection	- Asking students to keep a journal - Encouraging to draw a concept map - Providing pause time between major interaction for recap
Using authentic activities	- Designing and managing a course following guidelines of authentic activities

Figure 3.1

Common emoticons used in online discussions (by The University of Illinois)

Emoticon	Meaning	Emoticon	Meaning
:@ or :-@	Angry or screaming	>:-(	Angry, annoyed
|-I	Asleep	:/	somewhat unhappy/discontent
:|	serious	:o or :-o	Bored
:\/	big mouth	:'(or :'-)	Crying/sad
:D or :-D	Grinning	{ }	Hug
:*) or :-*)	Kiss	:-D	Laughing
:X or :-X	Mute	:l or :-I	Not talking
:< or :-<	Sad	:> or:->	Sarcastic
B) or B-)	Shades	=:) or =:-)	Shocked
:Z or :-Z	Sleeping	:) or :-)	Smiling
:O or :-O	Surprised	:() or :-()	Talking

CHAPTER 4

MEANINGFUL ONLINE LEARNING: EXPLORING INTERACTION IN A WEB-BASED LEARNING ENVIRONMENT USING AUTHENTIC TASKS[3] (CASE STUDY)

[3] Woo, Y., & Reeves, T. C. To be submitted to *Educational Technology Research and Development Journal*

Abstract

This paper reports the findings of an in-depth exploration of a Web-based learning environment which was designed using authentic tasks and based on social constructivism. Specifically, this case study focused on developing a deeper understanding of meaningful interaction within a web-based learning environment (WBLE) through the lens of social constructivism. The case was a master's level course offered online by a university in Australia and the participants in this study consisted of the students and instructor in the course. This case study sought to identify the nature and process of interaction occurring in a WBLE using authentic tasks. In addition, the perspectives of students were reviewed in the relationship between the interaction experiences and learning. The case study revealed what meaningful interaction looks like in a WBLE and clearly showed using that the inclusion of authentic tasks in a WBLE led to meaningful interaction that directly influenced students' learning growth. The ultimate goal of the study was to identify effective strategies for the design of meaningful online interaction, and thus the study concludes with recommendations for the design and implementation of WBLEs.

Introduction

Web-based learning is a unique instructional delivery system with which educators have been experimenting for more than a decade (Khan, 1998). The potential for change and innovation in instructional delivery approaches is still expanding, and there is little reason to think that the growth of technological innovation in this area will be slowed (Collis, 1996; Shank, 2002).

Because of its perceived advantages and the seemingly relentless promotion of Web-based learning by commercial interests as well as by educational technologists, knowing how to develop and deliver Web-based learning will probably not be a choice for most educators and trainers in the future, but a necessity. Unfortunately, given the history with older technologies in education, it is likely that most instructors will use the new Web-based technologies to replicate what they have done with traditional educational and training methods (Cuban, 1986; Reeves, 2003). However, a simple transfer of traditional instructional methods from one technology to another is unlikely to result in high quality learning experiences. Therefore, increasing the quality and effectiveness of Web-based learning is an important and necessary challenge.

Regardless of whether a course is face-to-face in a classroom or online in a virtual Web-based learning environment, one of the key components of good teaching and learning is interaction. No one doubts interaction is a necessary and fundamental process for learning both cognitive knowledge and physical skills (Baker, 1994). Gunawardena (1995) even concluded that learning is impossible without interaction. Thus, increasing interaction and enhancing its quality have long been important research goals for Instructional Technology researchers and developers (Hannafin, 1989). Instructional technologists believe the opportunities for high quality interaction can be improved by the integration of innovative pedagogy and advanced

technology, a belief that has grown with the development of the Internet. Within the context of Web-based learning, email, chat, online discussion forums, blogs, wikis, and other interactive communication programs are allowing people to interact with other people of greater variety more frequently than humans have ever interacted with before. Although interactions online may have both positive and negative consequences, they have become a significant part of day-to-day life for many people around the globe.

Literature Review

Meaningful Interaction in Learning Theory

However, not all interaction is meaningful for students' learning. It might be said that when interaction influences learners' intellectual growth and increases beneficial learning outcomes, then we can say the interaction is meaningful. But that does not tell us much. Another way to think of the meaningfulness of interaction is with respect to how learning is defined within the learning theories underlying the design of particular learning environments (Deubel, 2003; Hannafin, 1989; Vrasidas, 2000). In the behaviorist learning theory called operant conditioning (Skinner, 1954), learning is defined as a change in observable behavior. If the interactions in a learning environment primarily involve exposure to a stimulus (e.g., a multiple-choice question in a computer-based drill-and-practice program) and a learner response (e.g., selecting the correct response from the multiple choices) followed by reinforcement (e.g., a smiley face appearing on the screen and an audio clip saying "You are correct."), then the interactions are meaningful according to the principles of behaviorist learning theory and within context of the computer-based program that has been designed on the basis of the theory of operant conditioning.

Constructivist learning theory, while it has many variants (Fosnot, 1996), generally shares the perspective that learning is defined as meaning making. This differs significantly from the behavioral change requirement in behaviorist learning theory. In other words, according to constructivists, learning requires the personal interpretation or reinterpretation of phenomena. Within constructivist theory, meaning making can take many forms such as the construction of a mental model representing complex phenomena such as plate tectonics. Therefore, when interactions in a learning environment are designed to enhance meaning making, then those interactions are meaningful according to the principles of the constructivist learning theory and within context of a computer-based learning environment that has been designed on the basis of the theory of constructivism (Gergen, 1999).

Authentic Tasks and Meaningful Interaction in Social Constructivism

In particular, social constructivists view meaning making as a social product yielded by the processes of conversation, discussion and negotiation (Confrey, 1995; Ernest, 1995). In addition, social constructivists stress the role of interactions between learners and both experts and the learners' peers as they converse and negotiate meaning (Fosnot, 1996). Social constructivists argue that students can, with help from experts or peers who are more advanced, grasp concepts and ideas that they cannot understand on their own. However, social constructivists do not maintain that all conversations and discussions occurring anywhere at anytime are meaningful for learning. The context for the conversations or discussions is important.

Social constructivists emphasize that learning and thinking usually take place in social contexts. This principle is especially important in what has come to be known as authentic or situated learning, where the student takes part in activities which are directly relevant to his/her

real life and which take place within a context similar to the setting in which new knowledge and skills will eventually be applied (Brown, Collins, & Duguid, 1989). In an online learning environment designed on the principles of social constructivism, meaningful interaction should include responding, negotiating internally and socially, arguing against points, adding to evolving ideas, and offering alternative perspectives while accomplishing some real life related tasks or solving some realistic problems (Jonassen, Davidson, Collins, Campbell, & Haag, 1995; Lapadat, 2002; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978).

The enhancing of meaning making through interaction does not occur by itself. While it is evident that new technologies have expanded the potential for interactions among students and instructors, meaningful interaction that actually contributes to student growth and learning requires careful planning on the part of the instructor (Hackman & Walker, 1990; Hirumi, 2002; Vrasidas & McIsaac, 1999). Two of the most important components of a course that an instructor can plan and put into effect are its structure and its instructional design. The level of interaction among online learners is influenced heavily by the structure of the course as well as by the particular pedagogical dimensions designed into it (Vrasidas & McIsaac, 1999).

In an effort to enhance meaning making in an online learning situation, course designs that employ authentic tasks have become the center of attention for some researchers focused on employing social constructivism as a theoretical foundation for Web-based learning (Herrington, Reeves, Oliver, & Woo, 2004; Lourdusamy, Khine, & Sipusic, 2002). Because authentic activities mirror real world tasks, they require students to cooperate, communicate, negotiate, respect each other's view, and use other skills to complete the task successfully (Perreault, 1999). Using authentic tasks as the focus for learning is derived from the social constructivist principle of locating learning in as realistic a context as feasible (Stage, Muller, Kinzie, & Simmons,

1998). Through such authentic processes, social constructivists believe that meaning making can be enhanced (Driscoll, 2000; Jonassen et al., 1995; Lave & Wenger, 1991; Vrasidas, 2000). Therefore**,** it seems reasonable to conclude that well-designed and well-implemented courses employing authentic tasks can meet the expectations of meaningful interaction that actually contributes to students' growth and learning.

However, while this sounds good in theory, it must be examined in practice. Hence, the purpose of this study was to explore the interaction that occurs in a Web-based learning environment that uses authentic activities. By exploring the interactions that emerge from learners engaged in authentic activities, a better understanding of the structure and design of effective online learning environments can be reached and a better set of guidelines for improving the quality of online interaction can be derived. Structure refers to the particular arrangement of opportunities to learn within a learning environment (i.e., the specific objectives and content encompassed in a course) whereas instructional design refers to the particular pedagogical dimensions (e.g., the use of authentic tasks rather than academic tasks) included in a course.

The main focus of this study was on describing how the students in a Web-Based Learning Environment (WBLE) interact to accomplish authentic tasks and what meaningful experiences they have in their learning. The specific research questions were:

1. What is the nature of the learner to learner interaction in an online learning environment using authentic activities?
2. What is the process of the learner to learner interaction in an online learning environment using authentic activities?

3. What kinds of strategies are being used by the instructor and other learners to promote better interaction?
4. What are the learners' perceptions of these interaction experiences, especially as related to learning?

Methodology

Research Design

A case study research design was used in this investigation of interaction within a WBLE using authentic activities. According to Yin (1993), when a researcher investigates both a particular phenomenon and the context within which the phenomenon is occurring, case study is the most reasonable research methodology. In this research study, we sought to describe in detail how the process of interaction, especially in a WBLE based upon authentic tasks, is intertwined with the context and with the tools with which learners interact. This study was designed to reveal the nature of the interaction that occurs within a WBLE using authentic tasks and to clarify the context where interaction is occurring as well as the characteristics of the interaction processes.

Merriam (1998) and Patton (2002) maintain that case study is a particularly suitable design for researchers interested in process because identifying process requires detailed descriptions of how people engage with each other. Merriam (1998) further recommends an "emic" perspective for describing the experience of process, which typically varies for different people, and thus their experiences need to be captured in their own words. Describing the process of the interaction as well as the participants' perceptions of the interaction was a key consideration in this study. Clearly, case study was the most suitable research methodology

given the research questions and overall goal of interpreting the interactive experience from the perspective of the learners.

Research Context

For this research, a case was selected purposefully based on the following criteria: the case chosen had to be (1) a web-based course, (2) a course having a task that is well-matched with the guidelines of authentic activities proposed by Herrington, Oliver, and Reeves (2003), and (3) a course in higher education. Rigorous guidelines were used to identify an appropriate case, i.e., a course design that reflected accurately the characteristics of authentic activities explained by social constructivism. In light of the potential of authentic activities for supporting meaningful interaction, several researchers have identified characteristics for its educational application (Herrington, Oliver, &Reeves, 2003; Newmann, Marks, & Gamoran, 1996; Perreault, 1999; Sheurman & Newmann, 1998). Among these efforts, one of the most representative and comprehensive ones was made by Herrington, Oliver, and Reeves (2003). In order to support educational applications of authentic activities within online learning environments, they identified the following ten main characteristics of authentic activities:

1. Authentic activities have real-world relevance.
2. Authentic activities are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity.
3. Authentic activities comprise complex tasks to be investigated by students over a sustained period of time.
4. Authentic activities provide the opportunity for students to examine the task from different perspectives, using a variety of resources.
5. Authentic activities provide the opportunity to collaborate.

6. Authentic activities provide the opportunity to reflect.
7. Authentic activities can be integrated and applied across different subject areas and lead beyond domain-specific outcomes.
8. Authentic activities are seamlessly integrated with assessment.
9. Authentic activities create polished products valuable in their own right rather than as preparation for something else.
10. Authentic activities allow competing solutions and diversity of outcomes.

The ten guidelines not only reflect the principles of authentic activity explained by social constructivism, but the value of these guidelines has been validated by previous research studies (Herrington, Reeves, Oliver, and Woo, 2004). On this basis, the ten guidelines of Herrington et al. (2003) were judged as a valid set of criteria for choosing an appropriate context using authentic activities for this study.

The case in this study was a single graduate level course supported by a Web-based learning system. The learning tasks in the course were designed using the ten guidelines of authentic activities (Herrington et al., 2003). The instructional design of the course was strongly learner-centered, with authentic learning tasks in collaborative settings, using integrated assessment strategies, and with the intended learning scaffolded by both instructor and peer support. The research participants consisted of the instructor and graduate students involved in a master's level course, 'Network based Learning', offered online by a university in Australia. The course took place over a 13-week period. There were 14 adult students who worked in the fields of teaching, instructional design or web development. Among them, 4 students were local to the university where the course originated and 10 students were in remote areas. The Network based

Learning course was designed to provide these students with opportunities to learn professional knowledge and skills related to their careers.

Learning System.

The course was delivered primarily online via the Janison learning management system, an Australian product (http://www.janison.com.au/), accessed through the university website. Interaction among students and instructor primarily took place via synchronous and asynchronous communication through e-mail, chat and discussion tools. Synchronous Web-based communication mainly occurred in chat rooms at the scheduled time for the course every Monday evening during the spring academic semester of 2005. Asynchronous Web-based communication was supported by discussion forums and e-mail systems that allowed participants to discuss various topics throughout the course. Specifically, the discussion forum messages were threaded, which means that they were linked together in a way that permitted the users to visually follow the course of communication. When someone posts a message to a threaded discussion, all responses to that message are listed sequentially below it. When threaded discussions are expanded, all the messages that are related to the initiating thread can be seen at once. When the forum messages are collapsed, only the first message in a thread can be seen. At a glance, a student can see how many messages are contained in the forum as well as the status of each message with respect to being either read or unread.

Web technologies served as critical vehicles for information access and communication in this course. Students were expected to have access to the Internet and to have a competent level of skill in using Web-based technologies. To support these technological requirements, an introductory face-to-face workshop was scheduled on-campus in week 1. However, attendance was not compulsory, so remote students were provided with access to presentation slides and

summary notes concerning the technological aspects of the course. The Web-based learning system provided multiple technological affordances to support students' learning in various ways, but of course, it was the structure and instructional design of the course that most directly afforded learners' opportunities to learn through the process of sharing information, presenting and critiquing each others' work, discussing course related issues, and reflecting on the task solving process.

Task Design.

The goal of the course was to examine the design and research that surrounds the development of flexible learning systems and computer mediated communication using the Internet and other network environments. The overall authentic task in the course challenged students to create a prototype of a network-based educational project in response to a real syllabus statement and client brief. However, students were able to choose projects to suit their own teaching or training needs, focusing on topics and media of interest to them. This instructional design was centered around three main tasks. Task 1 required observing and reporting on a network-based learning environment in which students were actively involved as a learner, a designer, a teacher or a contributor. The report had to include recommendations for improving the system effectiveness and for providing an opportunity to implement different learning activities. Task 2a required students to actually develop a written statement to outline the conceptual design of a three-week learning project in line with a syllabus statement and/or client brief. Task 2b required students to implement a prototype of the three-week network-based learning project according to their design statement and to make allowances for design revisions in the process. This environment was to be developed within Janison Toolbox or another

learning or knowledge management system of their choosing. (Appendix A presents the course syllabus.)

All three tasks were related to one another. The first task allowed the students to explore an existing network based learning environment that they had access to, to ask certain questions and to think about it from a technical and pedagogical perspective, and to prepare a written report of their findings. For the first task, the aim was primarily to get them to explore an online environment. The second task went further in encouraging them to reflect about network based learning in terms of what they have read and also what they have seen so far. To complete the second task, they prepared a design statement in response of a real syllabus and design brief. The third and culminating task was to apply what they had done in their design statement by actually developing the network-based educational project. Thus, once the design statement allowed them to clarify the design principles underlying their project design, the development of the prototype allowed them to actually apply those design principles.

The tasks in this course were well matched with most, but not all, of the 10 guidelines for authentic activities proposed by Herrington et al. (2003). Table 4.1 illustrates the relationship between the ten guidelines and the tasks in this course.

Table 4.1

These three tasks had real world relevance for these students who worked as teachers or instructional designers or web developers. The tasks were also ill-defined so that the students had to spend considerable time defining them. The students collaborated to share their different perspectives on the tasks, and by the end of the thirteen week semester, each learner had developed one product for an actual client.

Data Collection

Two main sources of data were used in this study: the transcripts of the discussion board and chat room, and the transcripts of interviews conducted after the course was over. In order to determine the nature and process of participants' interaction in a Web-based learning environment using authentic tasks, the primary data sources were transcripts of the bulletin board discussion and chat room. The transcripts were gathered as a compiled text file at the end of the course. Students did not know in advance that their discussions and chats were going to be analyzed for this study. Their permission to use the transcripts in this study was obtained on the last class day so as not to interrupt the natural interaction of students.

As noted above, this study also was designed to investigate the perceptions of interaction processes on the Web from the perspectives of the learners themselves, and thus it was deemed important to listen to learners as directly as possible. Patton (2002) writes that the purpose of interviewing is "to allow us to enter into the other person's perspective, to find out what is in and on someone else's mind, and to gather their story" (p.341). Therefore, the other main data collection method in this study was in-depth qualitative interviews.

Patton (2002) describes three approaches to the design of interviews: the informal conversation interview, the general interview guide approach, and the standardized open-ended interview. For this study, the general interview guide approach was chosen, which "involves outlining a set of issues that are to be explored with each respondent before interviewing begins" (p.342). An interview guide or protocol prevents the researcher from losing direction during interviews and enables the researcher to make sure all relevant topics and questions are covered. Appendix B presents the interview protocols used in this study.

Five in-depth interviews with an instructor and four students were conducted. Interviewees were selected based on their willingness to participate in this study. In addition to that, a workshop for class reflection was recorded and transcribed. Demographic information about the participants is presented in Table 4.2

Table 4.2

Data Analysis

To begin the intensive data analysis required for this case study, all the information about the case was brought together in a Word file – interview and workshop transcripts, chat room transcripts, and discussion board transcripts. The research questions guided the analytic process. Focusing on the research questions is a recommended strategy for organizing and managing qualitative research data. This strategy is particularly useful in qualitative studies where data related to a particular research question are not always found packaged together in exactly the same manner across different data sources (Coffey & Atkinson, 1996; Maxwell, 1996). (Appendix C presents the relationship between research questions and research process.)

In addition, the results of the pilot study conducted in a previous semester influenced the data analysis process. Figure 4.1 provides an overview of the procedures for analysis that were explored during a pilot study as well as the methods used during the actual study reported in this paper.

Figure 4.1

As illustrated in Figure 4.1, several content analysis models were first reviewed in the pilot study and two models, Henri's (1992) model and Gunawardena, Low, and Anderson's (1997) model, were applied to analyze the pilot data because those two models had already been used as tools for analysis of online interaction transcripts in previous studies and because they

have relatively detailed guidelines for analysis. However, simply applying pre-established models or codes resulted in only partial success in examining the learning process to a satisfactory degree. Next, a qualitative analysis approach known as discourse analysis (Gill, 2000) was used, and this analysis approach was identified as a more appropriate one for this study because discourse analysis allowed us to go beyond content to see how the communication tools were used flexibly to achieve particular functions and effects (Wood & Kroger, 2000). However, the discourse analysis method comparatively took much more time because there are no clear guidelines or procedures for conducting this type of analysis. (Appendix D presents the Pilot study results.)

For the formal study, several qualitative analysis approaches including discourse analysis were reviewed in more depth. Based on the review, the procedures in the analysis models recommended by LeCompte (2000), Miles and Huberman (1994), and Gill (2000) were synthesized. Table 4.3 illustrates the procedures by which those models informed the data analysis procedures for the study. Even though there is no best way to conduct a qualitative data analysis, to do this as rigorous as possible, the synthesized procedures and guidelines of three models were employed usefully.

Table 4.3

As shown in Table 4.3, the three models include similar procedures, but use different terminology for each procedure. Each model provided comparatively more detailed explanation in a specific procedure. Therefore, by synthesizing the three models, a more in-depth understanding of the data was attained. Using the five procedures of “tidying up,” “preliminary coding,” “creating themes,” “merging themes,” and “conclusion drawing and verifying,” the data analysis was conducted step by step.

Figure 4.2

Figure 4.2 illustrates the analysis process. First, all data was brought together in a Word file. The data was reorganized into columns as shown in figure 4.2 to make the analysis process more convenient. The data were repeatedly read to gain a fuller appreciation of the meaning. Next, individual messages were coded by comparing and contrasting them with other units of meaning (individual messages) across all relevant data. While reading each transcript, the researcher marked each individual message with codes that identified the characteristics of the online interaction. Examples of the codes included tech-help asking/answering, relationship with career/real life, clarifying tasks, sharing thoughts/resources, and so on.

In the next stage, main themes were created across a larger set of codes. All codes were classified according to their own characteristics. For example, if the codes described a capability of application into someone's career, based on the codes, the theme, authenticity, was made. Twelve major themes were created. The themes are "Means to an end," "Authenticity," "Scaffolding," "Getting into tasks," "Defining tasks," "Accomplishing tasks," "Reflecting," "Designing incrementally more challenging tasks," "Providing active facilitation," "High motivation," "Opportunities for reflection," and "Meaningful experiences." Finally, the themes were merged into four categories identified by the characteristics they shared. The four categories were named as "nature," "process," "strategies," and "learning effects" based upon the synthesis of what is in the themes and in alignment with the research questions (Merriam, 1998). Using these categories and themes, how the students interacted to accomplish the authentic tasks and what meaningful experiences they had to support their learning were described. (Appendix E includes examples of detailed data analysis procedures.)

Validity and Reliability

Regarding the validity of qualitative educational research, Merriam (1998) wrote, "To have any effect on either the practice or the theory of education, these studies must be rigorously conducted; they need to present insights and conclusions that ring true to readers, educators, and other researchers" (p. 199). In this vein, several strategies were employed to increase the validity and reliability of this study. The strategies used in this study were drawn from the literature supporting qualitative methodology. Triangulation, member checking, external examination, peer examination, and thick description are recommended as the main strategies for enhancing validity and reliability in qualitative research (Lincoln & Guba, 1985; Merriam, 1998; Miles & Huberman; Patton, 2002).

Specifically, triangulation and peer examination were employed to establish credibility and transferability of this study. For triangulation, multiple participants, multiple data sources, and multiple methods were used. A peer researcher examined the data set including the transcripts of the interviews, chat room and discussion board and reviewed the categories and themes with the primary researcher. The peer reviewer agreed with 70 percent of the categories and themes identified by the primary researcher.

Ethical Consideration

For human subject protection, the research plan was reviewed and approved the Institutional Review Board (IRB) at her home institution. (See Appendix F for IRB permission.) Further approval was obtained from the review board and the Dean of the School of Education at the collaborating university in Australia. (See Appendix G for the invitation letter to come to the university in Australia and Appendix H for ethical permission of the university in Australia.) Most importantly, the participants were given written information about the research goal and

processes in advance with enough time to consider whether or not to consent to the interview. Authorization from the instructor and students to gather bulletin board and chat room transcriptions was also obtained. (See Appendix I for an example of the written consent form.)

Findings

All data analysis procedures were carefully conducted to reveal whether online interaction in a web-based course using authentic tasks were uniquely suited to fostering meaningful interaction and learning from a social constructivist perspective. Discovering how the students interacted to accomplish the authentic tasks and what meaningful experiences they had to support their learning were the main aims of the research.

As noted above, four major categories that directly reflect the research questions were identified about learners' interaction in the WBLE using authentic tasks: the nature of online interaction, the process of the interaction, a strategy for improving the quality of the interaction, and the learning outcomes recognized by students. Each category had more specific themes. Table 4.4 shows the themes.

Table 4.4

The first three categories mainly describe on how the students interacted to accomplish the authentic tasks, and the last category shows what meaningful experiences they had that supported their learning. The analysis of the transcripts of the online discussion forum, chat room, and interviews yielded a detailed picture of the interaction occurring in a WBLE structured around authentic tasks. Each of the main categories and themes are described below.

How the Students Interacted to Accomplish the Authentic Tasks

The Nature of Online Interaction in a WBLE using Authentic Tasks

Three themes emerged from the data analysis related to the nature of online interaction in a WBLE using authentic tasks: means to an end, authenticity, and scaffolding.

Means to an End. The online interaction occurring in the WBLE using authentic tasks was viewed as much more of a 'means to an end' rather than 'an end in themselves'. That is, the interaction usually helped and supported students to complete a major authentic task or other activities related to a task rather than just being carried out for the sake of discussing something online. In short, the interaction was very task focused. The interaction related to greetings or social interaction was extremely brief, and the students quickly changed the topic to the related task like this "*It's nice to work with you! When will we start?*"

As mentioned in the research context section, students were challenged with the authentic task of developing a prototype of the three-week network-based learning project according to each client's brief. They had a common goal, developing a network-based learning project even though the specific topics were different based on each student's interest, career, and client. Therefore, their interaction was primarily focused on how to complete the task well. At the beginning, the learners interacted mainly to figure out what the task was, whether each one's individual understanding was correct, how to complete the task, what approach others were taking, and so on. In search of clarification and to accomplish the task more effectively, students listened to others' experiences and exchanged resources and information with one another. They used the interaction opportunities as an important channel to gather various resources and check whether they were going in the right direction or not. They interacted to define the overall task and various sub-tasks. Given this task orientation, students participated actively in the online

interaction even without the instructor's prodding. In addition, they did not care about who participated more in the process than others. Because the interaction was not an object or a product to be evaluated but a means to an end, whoever needed resources or support went online and asked other students and the instructor for help, and for the most part whoever could give some resources or help to other students also went online and shared them. For example:

> Peter> *Travis, feel free to do anything that will be useful to me in teaching IST yr 9 and 10 new computing studies course as it may save me some work*
>
> Travis> *Peter - Of course! Will have a look on the syllabus site - may be some overlap who knows! and if yr 9 and 10 need it, then their parents may as well!*

The theme of viewing interaction as a means to an end was not always positive. Sometimes students showed some selfish tendencies in participating in the interaction process. That is, if they thought a student's issue or resource was valuable for their own task and work, they were usually actively involved and showed great enthusiasm. However, if they thought others' postings were not sufficiently related to their own work, they reacted passively and some students concluded that participating in the interaction process was sometime too time consuming. The following statement of Paul indicates that what he interpreted as some selfishness in the online interaction: "*There was participating, they were helping each other out, but there was an element of selfishness, if you know. Is it going to help me? Will I get a better mark for example? That element going on, I found.*" Even though selfishness was occasionally seen, students generally interacted positively to share knowledge and experiences towards the common goal, the various tasks they had to complete.

Authenticity. The interaction occurring in this WBLE using authentic tasks was perceived by the learners as authentic in nature. First of all, the focus of the interaction, network-based

learning, was authentic for this group of learners. As described in the first theme, the interaction was very task focused and directly related to students' own careers. They were all teachers or instructional designers or web developers. They each had some experiences related to network-based learning in their own way, and they already had a great interest in the various issues they discussed. Through the process of the interaction, they tried to figure out how the task could be applied to their work careers and how their prior work experiences could be applied to solving the task. For example, Peter stated: "*I want this course to be useful so I relate it to my work whenever I can*," and Kara also stated: "*I work for a company called LAMS international. It's a new net-based e-learning software. So perfect for this course.*" Peter and Kara exhibited authentic collaboration. Kara gave Peter access to her company server, and from there he just ran with it and produced a piece of work that he could use in his class with his students.

Because of the authentic nature of the interaction, students listened carefully to others' experiences, know-how, and trial and error. Each tried to share real life stories. When one person faced a problem or experienced confusion in accomplishing a task, others actively showed interest and provided their own solutions or thoughts because they also might have similar problems someday. Any challenge or difficulty was not only one person's problem but also everybody's potential problem. The following exemplifies a slice of the authentic interaction:

> Copyright issue - Rainbow - Wed, 7 Sep 2005, 17:22
>
> *Hi, all. I just had a look at past students' prototypes. I found when loading external links, some of them do not use a new window. I am wondering … we should always make it clear it does not belong to our sites…*

re: Copyright issue - Travis - Wed, 14 Sep 2005, 17:47

... In this instance i've tried to link to a page on the external site that references the document (rather than the document itself)…

Re: re: Copyright issue - Anne - Fri, 16 Sep 2005, 14:44

… My first job out of uni was coverting print material (student textbooks etc..) ... It's a dilemma! Here's what the W3C say anyway ;-)

re: Re: re: Copyright issue - Travis - Fri, 16 Sep 2005, 17:01

… It's all about allowing people to make a choice…

re: re: Re: re: Copyright issue - Rainbow - Tue, 20 Sep 2005, 11:57

… So you could do something like …

Not only were the topics authentic, but the interaction itself was an authentic experience for students because they were learning what network-based learning is through direct participation in the 'Network-based Learning' course, that is, learning by doing. This course was a place where people who were involved in an online learning environment got together and learned what good online learning is, what kind of challenges there are, how an online learning environment can be designed and managed well. They personally experienced online learning environment as learners. Travis explained that he got "*… a much deeper understanding by doing it and experiencing the frustrations and the benefits and the group dynamics and everything that happened there than you get just reading 20 papers about it.*" Thus, by participating in this 'Network-based Learning', they were actually situated in a community of practice, and as a result they actually used what they learned from the experience to complete their tasks.

Scaffolding. Another theme that emerged from the analysis of the interaction in the WBLE using authentic tasks was scaffolding. When someone expressed a difficulty or confusion, peers and the instructor tried to help the person by providing resources, information, or examples

until the person had a clearer understanding of how to proceed. Then the support gradually disappeared.

Even though all the interaction resembled a scaffolding process, specific instances of scaffolding occurred with respect to the effective use of the Janison system and the clarification of the tasks. For example, several students were not accustomed to the Janison system even though they had had online learning experiences with other technology such as WebCT and Moodle. The students unfamiliar with Janison could not help encountering some technical problems. Whenever they met a problem or difficulty, they asked for help from their instructor and peers who were very supportive and tried every possible strategy to help them. When nobody knew the exact answer, the instructor looked for a technical expert in the university, and figured out the problem with the expert. In addition, when a student had a specific problem or request and some students already knew the solution, the student who knew the solution suggested individual chatting with the student who had the problem to provide more detailed guidelines. For example, Ying wanted to know how to make a puzzle with an authoring tool and upload it to Janison. Anne knew something about that. She said "*I've recently discovered a program called Hot Potatoes that can be downloaded free. It let you create interactive activities like quizzes, cloze etc. which can then be uploaded onto the Internet. … If you like I'll tell you more about it when I see you tomorrow…*"

In the clarification of the tasks, at the beginning stage, the instructor's scaffolding was more salient than that of the peers. To support the task clarification of students, if students asked a question, the instructor usually responded within a day and she gave them links to things to help them find the solution. She provided what they needed including a resource environment so they could find the information. She also provided prior students' products as a model to give

students a better sense of what the final product would look like. In particular, she scheduled a regular synchronous session for Q&A. During the session, peers and instructor's in-depth coaching and support occurred. The following illustrates a part of the scaffolding:

<Travis> *I'm having a bit of a problem ... how can you measure/test understanding??*

<Instructor> *Ron Oliver would argue … "understanding the basic principles of" should be changed to..."*

<Travis> *so you can "measure" the understanding by the ability to "develop"...?*

<Instructor> *especially for your topic Travis on computer graphics - try and engage ...*

<Travis> *Ok… and then ...*

<Instructor> *Try and frame your content around a task… Within that task, then present the content and sure - you can get them to do exercises and provide them with answers, etc. But the overall issue is giving students a reason why they have to know the content.*

In summary, the nature of the interaction in a WBLE using authentic tasks had several characteristics: a means to accomplish the tasks, an authentic process in which interaction itself was directly related to their own work, and a scaffolding process in which participants (instructor and students) supported one another based on their own prior experiences.

The Process of Online Interaction in a WBLE using Authentic Tasks

The interaction process that was observed in this WBLE using authentic tasks was very similar to the process used in a constructivist problem based approach (e.g., research, integrate information, compromise dissonance, solve problem and create new knowledge). Students interacted with one another in defining the task and in the process of accomplishing the task (e.g., determining what the task is, how to solve it, where to get related resources, how the final product should look, and how to use it for their careers). In the process category, four main

themes were identified: getting into the task, defining the task, accomplishing the task, and reflecting.

Getting Into. This course was an online course and the class members had never met before it began. They began their interaction with short greeting messages. Generally, they started their introduction by describing where they lived and what they did for a living. People showed great interest in each other's work experiences because they all were teachers, instructional designers or web developers and their work was related to the content of the course. For example, the following is Anne's introduction and other students' responses.

> < Anne> *I'm Anne and doing this subject online from South Australia. I work full time as a web developer in Flexible Education at a university and study part time.*
>
> < Rainbow> *Your job surely sounds very professional to me… I am also interested in knowing what software you are using at your job …*
>
> <Ying> *… I think you must have a lot of experience in this area and I want to know more practical things in web design, maybe we could chat more later in some particular topic…*

Sharing their backgrounds helped to establish rapport, which helped open students' minds. They then started sharing some difficulties in their online learning experiences. Interestingly, several students like Rainbow and Travis showed some anxiety about participating in online learning even though they all were working in fields related to online learning. Rainbow mentioned "*I feel much worry about it,*" and Travis said "*This is my first session of the MArts so while I work with the web and computers all the time - this online learning stuff is all a bit new to me.*" After these students expressed their anxiety, other students demonstrated empathy and shared their own experiences and suggested providing individual help whenever needed. For

example, Peter said to Travis "*Online learning is great in that you can learn from home and not disrupt your work. However, ultimately you sometimes feel much on your own in spite of these chat groups.*" In addition, they shared their own technical tips and technology information including new software information and interesting websites. They encouraged one another to have a better online learning experience. The course participants got into the task smoothly through the process of getting to know each other while sharing experiences about their work and online learning.

Defining Task. After sharing their backgrounds and online learning experiences, they started defining the task in a detailed manner. They seriously discussed what the nature of the task was and how it could be accomplished. In particular, students tried to figure out how the task could be connected well with their work context because, as mentioned in the context section, even though they had the same general goal of developing a prototype of the three-week network-based learning, the task was an individual task which would be based upon each student's client and context. Therefore, they wanted to confirm with the instructor and peers whether their idea and context were appropriate for the project or not. Peter's and Maria's statements showed this. Peter mentioned "*I would like to do Task 1 based on the use of the school network where I work for learning. This may be different from others, but more relevant and useful for me,*" and Maria also mentioned "*I have an idea for task 2: I was wondering if I could create something for school of the air, which seems somewhat outdated in this technological era. This way I can combine what I know (Primary teaching) with what we are learning about!*" In this way, the interaction of the first several weeks was primarily focused on defining tasks within each learner's individual context. Generally, the interaction started with Q & A for confirming their own understanding; sometimes a student showed some confusion, and

then instructor and peers provided explanations and guidelines or gave some examples to help her/his understanding. After students shared their understanding, the Q & A re-started.

During the process, students were very flexible and seemed to maintain open minds in accepting other people's ideas and suggestions made by other students. However, sometimes, they experienced conflict or confusion. When this happened, they preferred to ask the instructor rather than to solve it by themselves. For example, Ying and Rainbow engaged in an individual interaction in the chat room to help each other clarify the task. Ying showed some confusion about how she could include the evaluation part in her project, and Rainbow tried to share her own thoughts. However, Rainbow ended the conversation with "*Maybe we can ask the instructor about this tomorrow.*"

Accomplishing Task. Their interaction to solve the task began by sharing individual resources, thoughts and individual task solving strategies. For this, they used the synchronous chat room and the asynchronous discussion board appropriately. In chatting, they wrote shorter and quicker messages when they expected to get a quick response. The Instructor also mentioned the purpose of synchronous chat sessions was to bring the students together to check that everyone was making good progress. In the synchronous interaction, there were 2515 postings with an average of 16 words. In asynchronous discussion, more in-depth interaction occurred such as sharing professional knowledge and discussing specific topics including online copyright issues, the role of a professional web developer, and so on. In the asynchronous interaction, there were 178 postings with an average of 118 words. The instructor was not very involved in the asynchronous discussion. She mainly observed the interaction. In the discussion, when students faced some confusion or conflict, they argued with one another at first and then they tried to

negotiate and persuade to solve the situation. For example, the following shows a part of the in-depth discussion:

<Ying> *I mean many web pages designed by unprofessional people still looks wonderful, so what qualities make a professional designer better than those people…*

< Travis> *I would argue that is the same qualities that make a professional teacher or artist or researcher …*

<Anne> *… Sometimes the best looking sites, also have the worst code (HTML etc..) behind them. Equally, some sites that are not visually well designed can be technically well designed in terms of the code/navigation…*

<Travis> *It make you think doesn't Anne... what is it we do that makes a difference? … I like your "'wholesome' approach to web design …*

In addition, because the students all had some professional background in online learning environments, they asked for other students' help when they experienced some difficulties in finding good resources related to the task. Those who had the resource or their own thoughts about that willingly shared them. For example, Anne suggested that students who had trouble finding a project context could use her company programs for their projects: "*I don't know if it's relevant, but I could always see if any of our academics (F Uni) in A city would allow a UOW to audit their topic site. Would this help anyone who is having trouble finding something?*"

In addition, the students also kept each other up to date about their rate of progress as well as they shared resources and thoughts about their task. Because they worked individually on their tasks, they wanted to check and often asked about each other's progress, and tuned their own progress in accord with the others. They encouraged and pushed one another to accomplish tasks effectively. In this way, the shared interaction helped students to stay on task, and they

participated actively and regularly in the interaction process even without the instructor's direction or a required number of postings. Supported by the sharing, they developed their own final products individually. (See Appendix J for examples of students' products.)

Reflecting. The interaction that occurred after accomplishing the task mainly related to their reflection on the experiences of the task accomplishment and online learning. In addition, they also shared plans for how they could apply the product to their own work environment.

During their reflection on task accomplishment, the learners exchanged gave feedback on others' work as well as their own task solving stories. Because of the authentic nature of the tasks, the feedback was very useful and practical. For example, Hong's product was about Math for year 8 students. After finding out about her product, Peter suggested he could review her product because even though he was high school math teacher, he had a son in year 8. This is Peter's suggestion: "*Can I help in any way with ideas for your prototype, I am familiar one because I have a son doing yr 8… The students at my school like to do maths problems on the computer like maths circus…*" Obviously, this kind of feedback was authentic in nature.

In particular, in the last chat session, students shared their reflection on learning gained through the experience of accomplishing the task. Students thought it was a valuable opportunity; they could listen to various perspectives and experiences, and they could develop an applicable product. The following is a part of the last chat:

Ying> *it is a kind of help, it is an opportunity to learn*

Travis> *... that's generally my approach as well - just interested in everyone's viewpoint.*

Rainbow> … *when we were discussing tasks, chat/forum helped clarify my thoughts.*

The instructor also shared her reflection on participating in and observing the whole interaction process. She appreciated the students' active contribution in the interaction, and she

thought they learned a lot from each other as well as from accomplishing the task: "*I've been very impressed by the way in which you have all shown collegiality - by helping each other…my experience in this class is that all of you have such a rich contribution to make because of your vast experience - we all have much to learn from each other.*"

In the final analysis, students did not just see accomplishing the task as an academic class activity. Instead, students expanded their interest by trying to apply their learning to their own products and their experiences to their careers. Several students also shared their application plans:

Peter> *When I am finished my task I will try it out straight away with my students to see whether it is any good. They will be a critical review group.*

Rainbow> *Peter, I am actually design a course for my "future" students. I will use it when I go back to teach in 2 years. I had my students on my mind when I was doing it -- their English level, interest, etc.*

Helen> *Based on the experience what I had in this course, I'm designing a course that would have filled a gap in a curriculum I taught last year.*

Throughout the whole interaction processes, the students were directly experiencing what online learning is, they were meeting other people who were also interested in online learning, they were sharing their own stories and know-how, and they were striving to improve their work based on the experience. It is not surprising that the students reflected that the course was a very useful and meaningful experience. The learning effect is described in a more detailed manner later.

Figure 4.3

As mentioned above, the interaction process appeared to be very similar to a problem solving process. Figure 4.3 illustrates the interaction process observed in this course. The figure shows how the 14 students engaged with each other and the instructor in an online learning environment to learn about network-based learning. They interacted actively with the instructor's facilitation to accomplish tasks that were directly related to their careers. They supported one another; they shared resources, thoughts, experiences, and reflection together. During the process, they mainly used the chat room for quick Q & A, the discussion board for in-depth discussion, and email for scheduling and individual issues. In the relationship with their own careers, they clarified and accomplished the task with the scaffolding of their peers and instructor and based on their own experiences. Throughout this process, sharing individual work experience and resources played a major role. After solving the tasks, they exchanged feedback on others' work, and they also shared their plans for applying the product to their own work environment. In this way, the interaction started from their career interests, and the results of the interaction also directly fed back into their careers as well as task accomplishment in a meaningful way.

Strategies Used to Improve the Interaction

Various strategies to improve quality of interaction in the WBLE using authentic tasks were used by the instructor and students. Two representative strategies were designing tasks that were incrementally more challenging and providing active facilitation.

Designing incrementally more challenging tasks. The tasks in this course were designed so that each task was related to next task, and the level of difficulty gradually increased from task 1 to task 2b. Task 1 required observing and writing a report about a network-based learning environment and Task 2a required students to develop a written statement outlining the conceptual design of a three-week learning project aligned with a syllabus statement and/or

client brief. Task 2b required students to develop a prototype of the three-week network-based learning project in accord with their design statement. Task 1 got students thinking about network-based learning, task 2a got to them to further explore network-based learning, and task 2b let them to develop their own product. This graduated design helped improve students' interaction. As task 1 was the easiest one and had less impact on their grade, students could easily get into the tasks and become comfortable in the online learning environment. The experience with task 1 gave them a feeling of confidence and achievement as well as giving them the opportunity to get familiar with the online interaction mode. During task 1, students observed others' way of interacting, the instructor's model, and the etiquette they should follow for better interaction as well as learn to use the interface of the technology system. Travis described the experience in this way: "*The first couple of sessions were more about a chat about chat, to get people to get used to the idea … the first task was not important to the mark, but it was important to building a relationship with other students and cleaning up the interface, maybe.*" In addition, through completing task 1, all students had a similar experience and developed a feel for the pace of the course. This shared experience prevented them from losing focus in their interaction. It also made possible more in-depth and meaningful interaction focused on accomplishing tasks 2a and 2b.

Providing Active Facilitation. As you can see in the following excerpts from Carrie and Paul, good facilitating was a very important factor in this successful example of online learning.

> Carrie> *I think that the worst thing in online learning is having, would be my number 1 is having facilitators who don't know how to support the system and interaction. Absolute number 1 worst thing.*

Paul> *I suppose what defines good online courses and bad online courses, I suppose is to a certain extent, the facilitator. What role do they play?*

In this course, the instructor showed active facilitation by building ground rules with the students and providing modeling and encouragement. First of all, the instructor built some ground rules together with students to bring about more effective interaction. They decided how they would use synchronous and asynchronous interaction communication modes appropriately. They decided to employ the synchronous mode for quick Q&A and the asynchronous mode for more in-depth discussion and information sharing. Perhaps because they all had some previous experiences in online learning, these students knew that sometimes chaos can occur in synchronous interaction mode. Several students may show up at once and start talking about their own issues simultaneously. In such as situation, students experience confusion about what message is for whom. To avoid such confusion in this course, the students promised one another that they would start to address people by their first names, so that they could target who they wanted to answer something within the myriad of messages. That is, the message started like: "Gregory> *Angela - what type of school do you work at…*"

The instructor also played an active role as a model in showing how to interact in the online learning environment. She took the lead in following the ground rules and actively participated in the interaction process. She showed great interest in every student's thoughts and encouraged them to share their thoughts and resources. Even though, at the beginning stage, students experienced some confusion in using the instructor not as the final decision maker but as a resource or supporter, they became easily accustomed to the new role as a result of the instructor's good facilitation. Paul shared his thoughts about the instructor's facilitation:

I think she is a very, very good online facilitator because she was always involved in discussions and all online activities; however, she didn't really direct the learning. The learning and the direction of the learning was dependent on the learners. But she was always there to guide us and, in most cases, offer moral support.

The instructor's active and supportive participation seemed to give students much more motivation. The enthusiasm the instructor showed in participating in the online interaction process and sharing her thoughts seemed to help students understand how important their own participation was, and it gradually led to more and better interaction on the part of virtually everyone.

What Meaningful Experiences Students Had in Their Learning

During the interviews which were conducted by the researcher to help her better understand students' perspectives about the whole experience of being in a WBLE using authentic tasks, students were encouraged to reflect on their experiences in the course in which they had directly participated. The analysis of the interview transcripts yielded a category called the Learning Effect.

The Learning Effect of Online Interaction in a WBLE using Authentic Tasks

All four of the student interviewees agreed that this WBLE provided a really good opportunity for them to apply and reflect on their reading and work experiences related to online learning through accomplishing tasks based on online interaction with peers and the instructor. They also agreed the process was not easy. They said that it was more challenging than other normal classes that were primarily lectures, reading and exams. However, despite its demands, this online course also gave them worthwhile feelings of real learning and achievement. Three

themes emerged related to the main learning effects in the WBLE using authentic tasks: high motivation, opportunities for reflection, and meaningful experiences.

High Motivation. The experiences of participating in the interaction process in the WBLE using authentic tasks increased students' motivation. First of all, the topic and tasks of this course were very authentic and well matched with students' learning interests. The four interviewees all emphasized how the course was deeply related to their careers and learning interests. For example, Paul, a teacher in the computer field, had been interested in applying online based activities to his own class, but he did not know how to do so, as he explained: "*I knew what I wanted to do but I couldn't do it because I didn't know the strategy, the correct strategy to do that.*" That was why he chose this course, and he participated very actively in all the course activities to find the strategies he needed. Carrie who taught children believed that children love that the Internet and they should have a lot more time to use it productively. Therefore, she wanted to make an online learning community for her students. This was her plan:

> *I think that the way I would like to do it is to sort of have some kind of database where people that are studying in the same area, where in this case would be all of the stage 3 students from across the whole province or state can go to some reservoir and chat to each other at certain times, or can post to discussion boards and you can communicate with people. Like, I guess, it's like creating this community of practice kind of idea where you just like . . . I'd love for all the kids to sort of being able to post their ideas and hear from kids from other schools.*

Ying was also a teacher, but she hoped to be an instructional designer in the near future. Therefore, she thought it was important to experience what online learning is and to design some learning programs by herself: "*This is my future job. If I haven't experienced a very typical*

online learning, I think I can not design a good online course." Travis also had his own learning goals. He was a computer programmer, and planned to build an educational website, something which he had never tried before. Therefore, he wanted to experience what an educational online program looks like and how it operated. As shown in the following excerpt, through the experience, he thought he could make a more useable program from the viewpoint of a learner: *"And so doing this course has exposed me to what it's like to be using those resources. And so, from a … well, I can then use that experience to then structure things that I might then deliver to other people and be much more empathetic … have much more empathy with the user, the learner."* It is evident that because the topic and tasks were closely related to their learning interests, the students could participate in the course with high motivation from the beginning.

However, not all students could maintain their motivation throughout the whole thirteen-week period. The motivation decreased sometimes, especially when students thought they were already competent with respect to a certain task or knowledgeable about a particular interaction topic. The following excerpt shows this tendency:

> Paul> *In task 1, I remember helping other people, but personally, I didn't really need much help, I suppose because a lot of students were having trouble with technology more than with the theory … educational theory part of it. Because they couldn't do this … they wanted to insert a picture and they couldn't insert a picture and things like that. In my case, because I've a technology background I'm quite comfortable with those things.*
>
> Carrie> …*because I was more confident and I felt like I knew what I was doing, So, do my work and get it done and you know. I did not want to spend too much time… Whereas, this time around I set it up so I could support other people.*

As result of their previous experience and expertise, these two students did not demonstrate much motivation during the interaction related to Task 1 which was designed to provide an orientation to the nature of network-based learning and how technological systems could be used for learning. These two students had substantial previous experiences learning online and had already used several technology systems including Janison. Nonetheless, they did not totally distance themselves from the interaction process in Task 1. Instead, they tried to use their experience and knowledge to help other students who were comparatively new to the learning situation.

In any case, both students recovered their initial high motivation when faced with the second task. As Tasks 2a and 2b were related to designing and developing a network-based learning program, these challenges were not simple even for students previously experienced in learning online. To accomplish these tasks, students needed to clarify the tasks, confirm their own understanding, and get some resources and support through the interaction with peers and with the instructor. Specifically, Paul was very interested in getting feedback on his work because he was not confident about whether he was doing it right or not. Therefore, he actively interacted with others and generated online discussion: "*For the second and the third tasks, I did use the interaction and I generated online discussions and tried to bring in the feedback that we got there into our assignments. It generated a lot more interest a lot more posts, a lot more excitement*" Carrie also realized she could not finish the tasks by herself without sharing others' experiences and support. It led her to more active participation in the interaction process: "*For clarification of either a task or something I read or something like that ... I had to post a message on the discussion board for anyone ... saying "Does anyone know about this?" or " I found this out, what do you think?*"

It can be concluded that the characteristics of the tasks, including the fact that the tasks were well matched with students' learning interests and could not be solved without others' support, naturally motivated most of the students at the onset of the course and maintained the motivation of all students throughout most of the whole course period.

Opportunity for Reflection. Students could reflect on their learning and their own past working styles (e.g., teaching style) through the process of accomplishing the task and through the opportunity of sharing others' experiences and thoughts. As Travis explained: "*the tasks allowed us to reflect on what we experienced and actually applied it to design, the online design that we made.*" Students had opportunities for thinking deeply about what network-based learning is through directly participating in the network-based learning course and developing a network-based learning prototype by themselves based on their experience. For designing and developing their own products, they had to reflect on their personal experience in the network-based learning course: what difficulties they experienced interacting with other students and the instructor, what positive or negative aspects were there, and how the experience influenced their learning.

In order to make a good product, Carrie said that she tried to think how her previous experiences, including the way she was taught, the way she interacted with others, and the knowledge she got from individual readings, could be applied to her product. Such reflections enhanced students' learning process as well as helped them to make better products. Paul mentioned the most important thing that he realized through the whole experience, was the fact that learning could occur in an online environment. The following is exactly what he said:

> *We realized that so much learning could occur. We created a learning environment and structure, facilitated it, and moderated the learning environments. Probably, so, I mean,*

the most important thing or the most important thing that came out of it is the fact that learning can occur in a networked based environment.

As mentioned before, the students were all teachers, instructional designers, or web developers, and they had professional knowledge and experience in their own field. In addition, they all had great interest in using an online environment for their own classes or work. Therefore, they could influence one another: they listened to others' experiences and tried to learn something from others. In this way, students could reflect on their individual work and work style. Because of this fact, Ying said, as the session went on, the online interaction became more and more about asking questions not necessarily to the instructor but to the other students, and that this type of peer to peer interaction was very useful for her task accomplishment.

Paul also mentioned the responses he got from others were insightful because they all had some related work experiences: "*we were all working and learning about education and we were able to go back and read about the effects of those sorts of things. So, we got a lot of responses and a lot of insightful responses…*" In Travis's case, he put more emphasis on giving and taking support. He had comparatively less background in the education field than a lot of the other students who were teachers. However, he had a technical background, so he knew technology better than others. Therefore, he shared his technology expertise with others, and others helped him with the aspects of educational terminology and learning theory. He claimed he could learn better through those processes.

Meaningful Experience. As described in the process section, the process of task accomplishment was not easy, especially with respect to tasks 2a and 2b. Students experienced difficulty in clarifying the tasks and developing a real program based on the client's brief. However, students thought that the challenge involved in these tasks was meaningful. The

experience gave students a real sense of achievement. Students acknowledged feelings of success and a deep understanding in the topic area through making an applicable product after overcoming the difficulties faced in the accomplishment process.

Travis said he got a much deeper understanding of what network-based learning is through directly participating in network-based learning course; in other words, learning by doing. He could directly experience the dynamics and challenges that occurred in network-based learning and could apply the experience to his product: "*I learned from that experience is about the experience. That was actually doing it… a much deeper understanding by doing it and experiencing the frustrations and the benefits and the group dynamics and everything that happened there than you get just reading 20 papers about it.*" In Ying's case, she had a hard time at the beginning because she had to adjust to the technology system as well as to the new learning style, the task-solving approach. However, in the end, she felt proud and successful: "*at the beginning to learn how to use the tools, learn how to ... everything. The first month or even longer is massive, really hard…but I did feel like I did learn a lot and I feel proud. I accomplished something. So, I mean ... I'm happy I learned something but it was hard work.*" Carrie thought participating in this course was an unforgettable learning experience. This is what she said:

> *Like, it's not something, where other times in undergraduate, or whatever, well, here's your exam. Well, you just read it, memorize it, go in write it, get a good grade. And, you know, it's forgotten. You could ask me two hours later or a day later and I don't know anything. With this, I feel like I have a pretty in depth understanding of it. Like I don't think it's something I'll forget. I might forget the name of the person or something. But the ideas behind it, I don't think it's something I'll forget probably ever. It's something I've*

learned.

The instructor also observed students' achievement through the assignments and the reflection she got from students: "*…the assignment, the reflection I got from students, about how they found it was so hard and then they went through…then I thought these students have really had a very, very positive experience.*"

Moreover, students had not only a feeling of achievement, but also a real applicable product, a network-based learning prototype. This tangible, useable product made the students think that all the interaction processes that occurred throughout the course were meaningful. What is more, the usefulness of the product did not end with the end of the course. As Carrie's noted, they wanted and tried to use their products: "*I try to use it in my teaching at school…I'm trying to think about the kinds of designs I've done and think about how I've used the tools within them*."

Paul shared his application plan on how he would use the product and learning experiences for his own class in a more detailed manner. Paul planned to incorporate the product and his learning from this course into his IT course. He had students from New Zealand, Sydney, and Wollongong. The students would be working together using WebCT based on the project which he made in the Network-based course. He would divide students into small groups based on their diverse geographical locations. He wanted to mix the locations evenly because he thought when students could not see one another face to face, online collaboration could be more valuable to them. He was also considering students' technology skills. He said he had realized in any group of students, there was always one or two who were very knowledgeable about technology; therefore, he would try to allocate them appropriately to help other students with

their technological problems. In their groups, students would research e-commerce and e-business together.

In summary, these students thought accomplishing authentic tasks through online interaction with peers and instructor was valuable for their learning. They were able to maintain high motivation, have various opportunities for reflection, and have meaningful experience directly applicable to their individual careers.

Discussion

This study of a WBLE using authentic tasks has yielded a deeper understanding of meaningful interaction through the lens of social constructivism. Social constructivists argue that meaningful interaction occurs while students engage in authentic learning tasks with various people including peers and experts (Jonassen et al, 1995; Lapadat, 2002; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978). While accomplishing authentic tasks, learners engage in defining the task, generating ideas, sharing resources and perspectives, negotiating, synthesizing individual thoughts with those of others, completing the task, and refining it on the basis of further sharing of insights and critiques. Proponents of authentic task-based learning maintain this approach stimulates meaningful interaction processes that directly influence learner's intellectual growth.

However, while this sounds good in theory, a real practical case to better understand the implications of interaction was needed and this study meets that need to an important degree. Using a case study method, the nature and process of interaction that occurred in a WBLE using authentic tasks were identified as well as several strategies for the design of meaningful online interaction. In addition, the perspectives of students were analyzed to reveal the relationship

between the interaction experiences and learning. Four major categories emerged from the analysis: nature, process, strategy, and effects.

Nature

First of all, the nature of the interaction was characterized as a means to an end, had real authenticity, and required scaffolding. The interaction was very task focused and students actively shared their own thoughts and resources to accomplish the tasks and to support their peers. Therefore, interaction was very meaningful and useful to them. The nature of the interaction was driven by the task-based approach, especially using authentic tasks that directly related to students' careers. The task-based approach was effective in terms of making students think about network based learning and the complex issues involved in it. The participants agreed that this was more effective than having the instructor present content on a weekly basis. Because they could make and own a product that could be used for their work, they could engage much more authentically through the interaction process. Network-based learning, the topic of this course, is a practical field. The results of this study show that authentic task-based learning is effective not only in terms of what the literature says and what people believe is good pedagogy, but also in terms of how it works within a real context. In this context, the task based approach where the tasks were open-ended and authentic clearly allowed students to explore the issues more deeply than any alternative approach that would have involved just presenting specific issues, assigning some readings, and discussing some general questions on a weekly basis.

However, because students thought that the most important thing was to complete their own task, a few students showed some selfish tendencies in participating in the interaction process. In a few instances, if students thought another student's issue or resource was valuable for their own task and work, they were usually actively involved and showed great enthusiasm.

However, if these students thought others' postings were not quite related to their own work, they reacted passively and some students even thought participating in the process was too time consuming. According to social constructivism, deep collaboration with peers is one of most important factors of meaningful interaction for learning (Jonassen, 1999). Collaboration is defined as a coordinated, synchronous activity that is the result of continued attempts to construct and maintain a shared conception of a problem (Dillenbourg, Baker, Blaye & O'Malley, 1996). In this sense, real collaboration did not always occur in the interaction in the WBLE using authentic tasks even though students actively supported one another and shared their own know-how and resources willingly. This weakness may be attributed to the nature of the task which did not require group work but was primarily focused on individual work. To accomplish the tasks, the students needed one another's support and resources, but they did not have to construct something together. The results of this study may have been different if the task had been the kind that required group construction of a product.

Process

Second, according to analysis of the chat room and discussion board data, the process of interaction in a WBLE using authentic tasks took the form of a problem solving process. Through interacting to find solutions to tasks, designing plans, gathering information, drawing conclusions and communicating findings to others, students were engaged in an authentic problem-solving process requiring a variety of skills. During the process, learners engaged in defining the task, generating ideas, sharing resources and perspectives, negotiating, and synthesizing individual's thoughts. When they faced confusion or conflict, they argued with one another at first and then they tried to negotiate to solve the situation. In social constructivism learning theory, when learners engage in social and internal negotiation focused on a real task or

complex problem, the interaction is meaningful (Jonassen et al, 1995; Lave & Wenger, 1991; Vrasidas, 2000; Vygotsky, 1978). Clearly, the interaction that occurred in a WBLE using authentic tasks was meaningful in this course.

However, a bothersome question remains: Was it meaningful enough? The interaction was primarily focused on the task per se rather than the learning the task was intended to foster. In such an authentic task context, meaningful interaction should include responding to questions, thinking deeply, arguing against points, adding to evolving ideas, and offering alternative perspectives with one another (Driscoll, 2000; Jonassen et al., 1995; Lapadat, 2002; Lave &Wenger, 1991). The analysis revealed that these higher level cognitive interactions were minimally present in this part of the course because students were focused on getting the task done in the most efficient manner rather than in engaging in deep levels of argument and reflection about the content of the task, i.e., learning theories, instructional design models based upon the theories, their relative advantages and disadvantages, and so forth. They used the online interaction as a tool to get or share resources and support in order to accomplish the tasks.

In spite of the finding that the students seemed more focused on the utilitarian aspects of the tasks, the interview data conducted to understand learners' perspectives about their participation in this experience showed there was a significant learning effect according to both the students' and the instructor's perspective. Most of the learners mentioned that the course left them with feelings of real learning and achievement. Therefore, we can assume valuable learning occurred while individually accomplishing the tasks even though the observed interaction process may not have influenced the individual learning process as much as social constructivism suggests it should. Nonetheless, the authentic nature of the tasks seemed to lead

students to engage in a spontaneous individual learning process as well as in a mutually supportive interaction process with others.

Strategy

Third, this study demonstrates that designing incrementally more challenging tasks and providing active facilitation are effective strategies for improving the quality of online interaction in a WBLE using authentic tasks. Meaningful interaction that actually contributes to student growth and learning requires careful planning on the part of the instructor. Social constructivists, drawing on the work of Vygotsky (1978), have suggested that learning environments should involve 'guided interaction,' emphasizing the role of the instructor for providing the necessary guidance (Berge, 2002). The interaction among online learners is influenced heavily by the structure of the course (Vrasidas & McIsaac, 1999), which in turn is driven by the pedagogical strategies employed by the instructor (Bannan-Ritland, Bragg, & Collins, 2001; Eastmond, 1992; Hackman & Walker, 1990). In this context, the instructor of this course tried to guide students through designing incrementally more challenging tasks, making ground rules with students, and playing a role as a model. As described in the findings section, those strategies helped to increase both the quality and the quantity of the students' interaction.

Learning Effect

Lastly, through the interviews and through students' reflections in the chat room and discussion board, it was evident that students thought that the interaction that occurred in the WBLE using authentic tasks was meaningful and valuable for their learning. In particular, students thought that because of the authenticity of the tasks, they experienced high motivation, took advantage of various opportunities for reflection, and were meaningfully engaged during the process of interacting to accomplish the tasks. They recognized that the experiences directly

influenced their intellectual growth and learning. According to Mehlinger (1995), the true power of learning using authentic activities is the ability to actively involve students and arouse their intrinsic motivation. Moreover, if students derive a sense of accomplishment and satisfaction from authentic learning situations, they are likely to want to continue and to put forth greater effort not only to complete the course but also to excel. The students interviewed for this study also mentioned a sense of accomplishment and satisfaction as well as the desire to apply their experiences and products to their careers. This and other evidence support the premise that online interaction grounded in authentic activities has many advantages in learning. Through such experiences, students can construct their own meaningful knowledge and truly enjoy the learning processes.

However, as two interviewees mentioned, the challenge level of the tasks affected students' motivation and participation. When a task was at a lower level than students expected and they thought they could solve the task without others' support, students lost interest in participating in the interaction process. Therefore, even if the task is authentic in nature, the challenge level is important. Of course, different students will experience different challenge levels based upon their previous experience and expertise. It is almost impossible to design a task that takes into account all those differences. As communicated in the interviews, students who have more experience and confidence in a specific task can play a role as a mentor or helper in the task. Therefore, the instructor should understand the background and ability level of each individual student, and encourage students to play an appropriate role as a mentor or mentee in respect to their ability. These mentoring relationships should not be fixed; they can change according to characteristics of the tasks and the capacities of the students to accomplish any specific task.

Limitations and Future Research

Through this study, the process and nature of the interaction occurring in a WBLE using authentic tasks were identified as well as several strategies for the design of meaningful online interaction. However, to have a more informed appreciation of the implications of this study, it is important to recognize its limitations and to identify strategies that could be employed in future research to overcome some of these limitations.

Limitations

Potential limitations of the study are associated with a methodological issue. As online learning continues to gain popularity and acceptance in higher education, many researchers are turning their attention to the search for evidence of learning (Garrison, Anderson, & Archer, 2001; Gunawardena, Low, & Anderson, 1997; Kanuka & Anderson, 1998). However, there remain major concerns about the focus of the methods developed to analyze networked interaction (Campos, 2004). A common method for interpreting the data culled from asynchronous forums, which is usually a transcript of the discourse, is the quantitative process of counting and coding messages, sentences, or conversation threads, and scrutinizing these units of analysis for emerging discourse patterns (Hara, Bonk, & Angeli, 2000). However, to date, there are few notable studies that indicate the capacity of these methods to demonstrate a relationship between online communication and learning. As discovered in the pilot study leading up in this study, simply applying pre-established models or codes may result in only partial success, failing to reveal the nature of the learning process sufficiently.

In recognition of this methodological limitation, an in-depth qualitative research methodology was applied in this study to better understand the complexities and meaningfulness of the interaction of online communities of practice. Data analysis procedures were decided by

scrupulously comparing and synthesizing several qualitative analysis procedures. Nonetheless, all the procedures depended on the researcher's individual interpretation. Other researchers may have used different approaches and obtained somewhat different findings.

After all, in qualitative research, the main instrument is the researcher him/herself and everything depends on the researcher (Merriam, 1998; Patton, 2002). Analyzing transcripts of online interaction occurring in chat rooms and discussion boards is a challenging task. The interaction that took place in the chat room and discussion board included actions such as forwarding resources and inviting someone to individual chatting as well as conversation and narration. The complexity of the exchanges during synchronous interactions was challenging to interpret because everything occurred simultaneously in the online space and the online dialog often consisted of abbreviated words. Therefore, more specific guidelines based on research experiences are needed to conduct more rigorous data analysis. The fact that most of the students in this online course were native English speakers whereas the researcher learned English as a second language may have also added to the challenge of the interpretive process, and this can be viewed as a limitation to this study.

Opportunities for Future Research

This study revealed that using authentic tasks in a WBLE to increase the quality of online interaction yielded positive results in students' learning. This study identified how the students interacted to accomplish the authentic tasks, and what meaningful experiences they had in their learning. However, to understand how the interaction influenced the individual learner's intellectual growth, we need to observe and listen to learners' individual learning experiences in more depth through using other kinds of ethnographic methods. Perhaps the students were

engaged in a deeper level of cognition about the content of the task, but simply did not express these reflections in the online spaces.

As described above, several good strategies for improving learners' online interaction were made a little clearer through this study. In the process of supporting the interaction in the WBLE using authentic tasks, the instructor used incrementally more challenging tasks and active facilitation through making ground rules together and modeling. These practices helped to increase and improve learners' online interaction. However, if these strategies are to be used in other courses, more detailed guidelines and research studies that analyze their effectiveness of the strategies are needed.

Conclusion

The aim of this study was to explore the interactions that emerge from learners engaged in authentic activities in order to provide deeper understanding of meaningful interaction through the lens of social constructivism. In particular, this study identified the nature, process and learning effects of interaction that occurred in a WBLE using authentic tasks and described several strategies for the design of meaningful online interaction. The identification process clearly showed using authentic tasks in a WBLE led to meaningful interaction that directly influenced students' learning growth. However, further research is needed to understand how the interaction influences individual learners' intellectual growth. Other kinds of ethnographic methods could be useful to reach this deeper level of understanding.

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Table 4.1

The relationship between the ten guidelines and the task in this course

10 guidelines of authentic activities proposed by Herrington et al. (2003)	The primary task of 'Network-based Learning' course (Creating a prototype of a network-based educational project in response to a real syllabus statement and client brief)
1. Authentic activities have real-world relevance	The task had real world relevance for students working as teachers or instructional designers or web developers.
2. Authentic activities are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity.	The task was ill-defined and open-ended so that students had to choose their own context and clarify the sub-tasks based on their own understanding
3. Authentic activities comprise complex tasks to be investigated by students over a sustained period of time.	Students had to spend thirteen weeks to clarify and accomplish the task.
4. Authentic activities provide the opportunity for students to examine the task from different perspectives, using a variety of resources.	Students could not solve the task without the support of peers and the instructor. They actively interacted with one another to get others' thoughts and resources.
5. Authentic activities provide the opportunity to collaborate	Students collaborated to solve their own tasks.
6. Authentic activities provide the opportunity to reflect.	Students had various opportunities to reflect throughout the process of accomplishing the task and sharing each other's experiences.
7. Authentic activities can be integrated and applied across different subject areas and lead beyond domain-specific outcomes.	N/A
8. Authentic activities are seamlessly integrated with assessment.	The assessment conducted based on the quality of the product which reflected students' whole experiences and understanding gained through the 13-week task solving process
9. Authentic activities create polished products valuable in their own right rather than as preparation for something else.	After thirteen weeks, each learner developed one product for their client.
10. Authentic activities allow competing solutions and diversity of outcomes.	N/A

Table 4.2

Demographic information of participants

Participant (Pseudonym)	Gender	Approx Age	Current Job	Study status	Living Area	Interview status
Anne	Female	30-35	Web Developer	Part-Time	Remote	No
Carrie	Female	30-35	Teacher & Instructional Designer	Part-time	Remote	Yes
Greg	Male	40-45	Teacher	Part-Time	Remote	No
Hong	Female	30-35	Teacher(English)	Part-Time	Local	No
Kara	Female	30-35	Instructional Designer	Part-Time	Remote	No
Laura	Female	30-35	Teacher	Part-Time	Remote	No
Maria	Female	25-30	Trainer(Air school)	Part-Time	Remote	No
Paul	Male	30-35	Teacher(Computer)	Part-Time	Local	Yes
Peter	Male	40-45	Teacher(Math)	Part-Time	Remote	No
Rainbow	Female	35-40	Teacher(English)	Part-Time	Local	No
Susan	Female	35-40	Instructor		Local	Yes
Travis	Male	35-40	Computer Programmer	Part-time	Remote	Yes
Ying	Female	25-30	Teacher(Science-be laid off)	Full-time	Local	Yes

(There were two other females in this course, but they did not provide their information from any source including face to face workshop meeting and chat & discussion board)

Table 4.3

Data analysis procedure of this study

LeCompte (2000)	Miles & Huberman (1994)	Gill (2000)	Data Analysis procedure
Tidying up: Arranging data in neat boxes and files is the first step. The files to be created depend completely on what is reasonable and necessary, given the research questions.		**Tidying up:** Formulate initial research questions. Choose the texts to be analyzed. **Transcribing:** Transcribe the texts in detail	***Tidying up:*** Arranging data in file folders in computer Review and confirm research questions
Finding Items: Items are the specific things in the data set that researchers code, count, and assemble into research results. Concentrating these items in data involves systematic processes of looking for frequency, omission, and declaration.	**Data reduction:** Transcripts are read to determine relevant and superfluous data Those that are not relevant are discarded Condensing the data in this way requires preliminary sorting and organizing	**Coding:** Read and interrogate the text Code- as inclusively as possible	***Preliminary Coding:*** Transcripts are repeatedly read to gain an appreciation of the meaning. Units of meaning are coded by comparing and contrasting them with other units of meaning across all relevant data.
Creating stable sets of items: Researchers must organize the initial items into groups or categories by comparing and contrasting items (Glaser & Strauss, 1967). **Creating Patterns:** Patterns are made up of taxonomies that seem to fit together or be related to one another.	**Data display:** Data is organized, compressed and displayed in a form that permits conclusion drawing and action (e.g., graphs, charts and networks)	**Analyze:** Examining regularity and variability in the data. Forming tentative hypotheses.	***Creating Themes:*** The classification of these units of meaning is based on a combination of ideas that came from the data, related literature, research purpose, and the study's theoretical framework. These structures are labeled as themes.

Assembling structures: Once patterns have been identified, group of them are then assembled into structures, or groups of related or linked patterns that are taken together.			***Merging Themes:*** The themes are redefined and merged into categories The categories reflect the research questions.
	Conclusion drawing and verification: Decisions are made as to what the data means. The emergence of patterns, regularities, causal flow and propositions enables the researcher to draw possible conclusions.	**Verification:** Check reliability and validity	***Conclusion drawing and verifying:*** Conclusions are drawn in relation to the appropriate research questions. Check reliability and validity through peer examination and triangulation

Table 4.4

Emerging themes of interaction in a WBLE using authentic tasks

Category		Themes	Indicators
How	Nature	◦ Means to an ends	▫ Q & A to clarify task ▫ Give & take focused on sharing resources and information related to solving the task
		◦ Authenticity	▫ Meaningfulness for students' work ▫ Capability of applying into own career ▫ Practical & hands on type of subjects
		◦ Scaffolding	▫ Getting support from instructor ▫ Getting support from peers' experiences
	Process	◦ Getting into tasks	▫ Sharing backgrounds ▫ Give & take regarding technical help
		◦ Defining task	▫ What is the task? ▫ How can it be accomplished (structure, direction)?
		◦ Accomplishing task	▫ Introducing related work experiences ▫ Exchanging useful information ▫ Making final product
		◦ Reflecting	▫ Sharing task solving experiences ▫ Sharing own application plan ▫ Sharing own learning experiences
	Strategy	◦ Designing incrementally more challenging tasks	▫ Proving an opportunity for building ideas ▫ Considering how task influence one another ▫ Considering authenticity
		◦ Providing active Facilitation	▫ Building ground rules together ▫ Providing instructor's modeling ▫ Providing encouragement
What	Learning effect	◦ High motivation	▫ Matching well with students' learning interests ▫ Changing difficulty level of tasks
		◦ Opportunities for reflection	▫ Reflecting through task accomplishing process ▫ Reflecting through others' experiences
		◦ Meaningful experiences	▫ Understanding in in-depth manner ▫ Having applicable products

Figure 4.1

The process followed to identify an appropriate data analysis procedure for this study

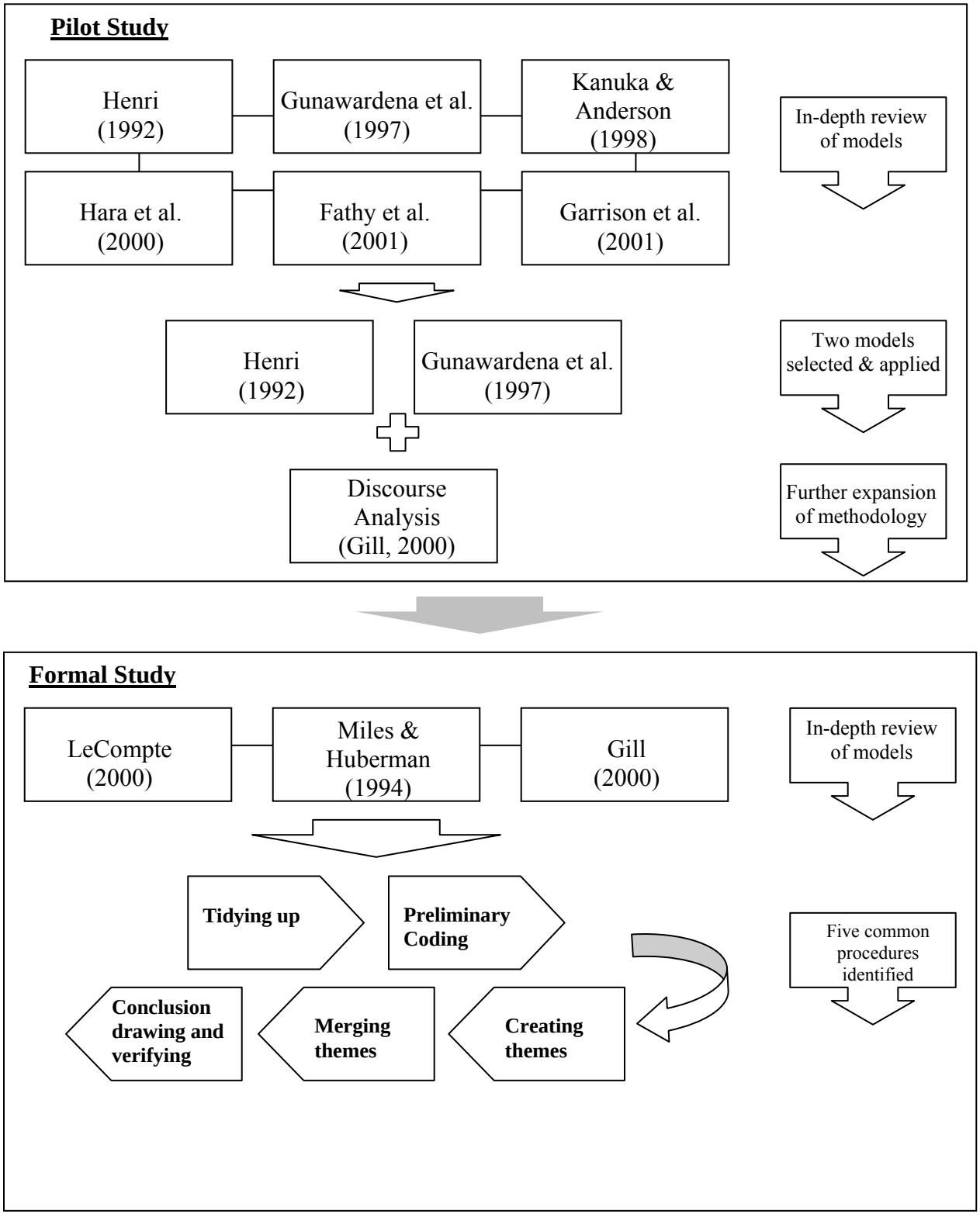


Figure 4.2

An example of data analysis processes

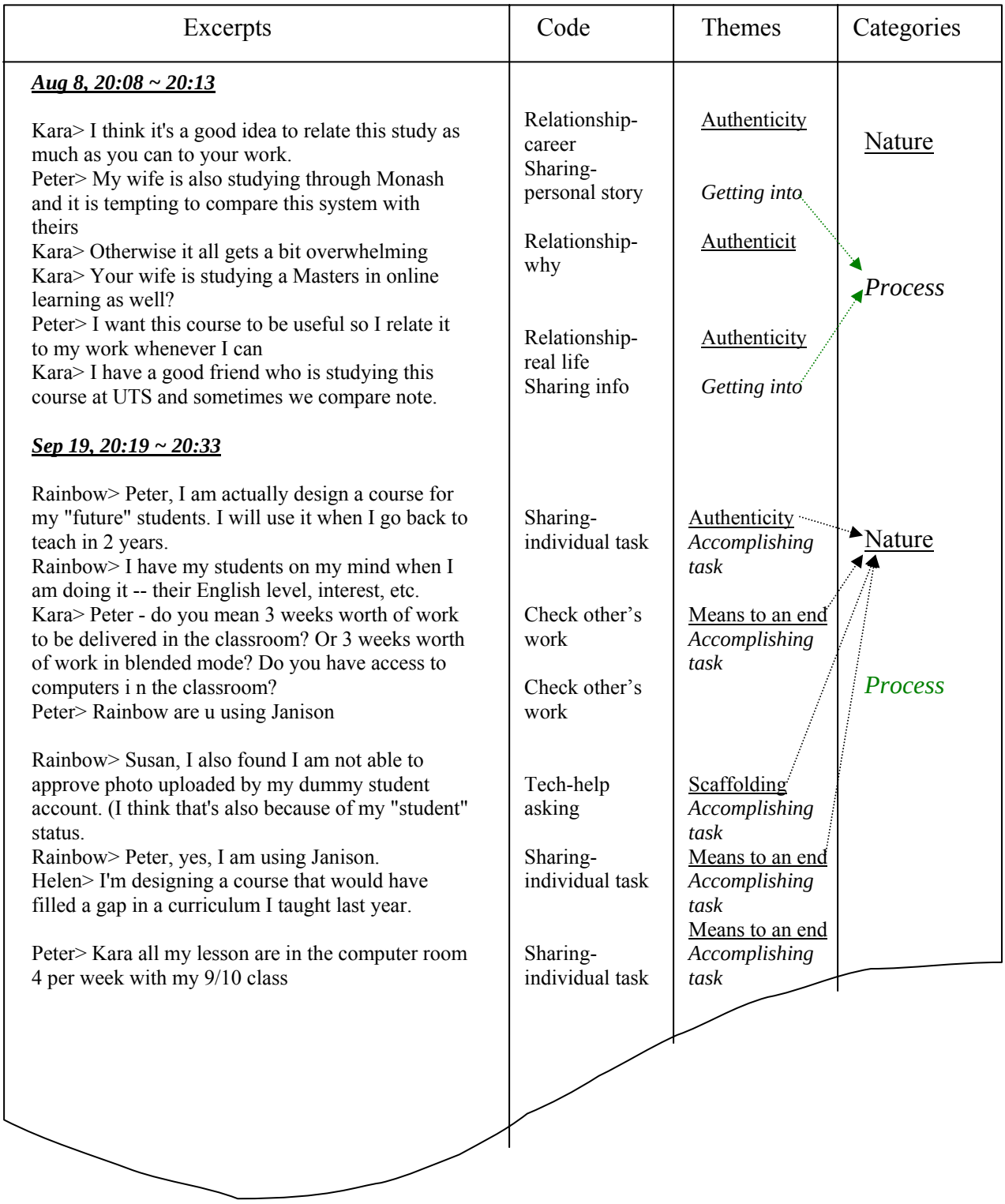
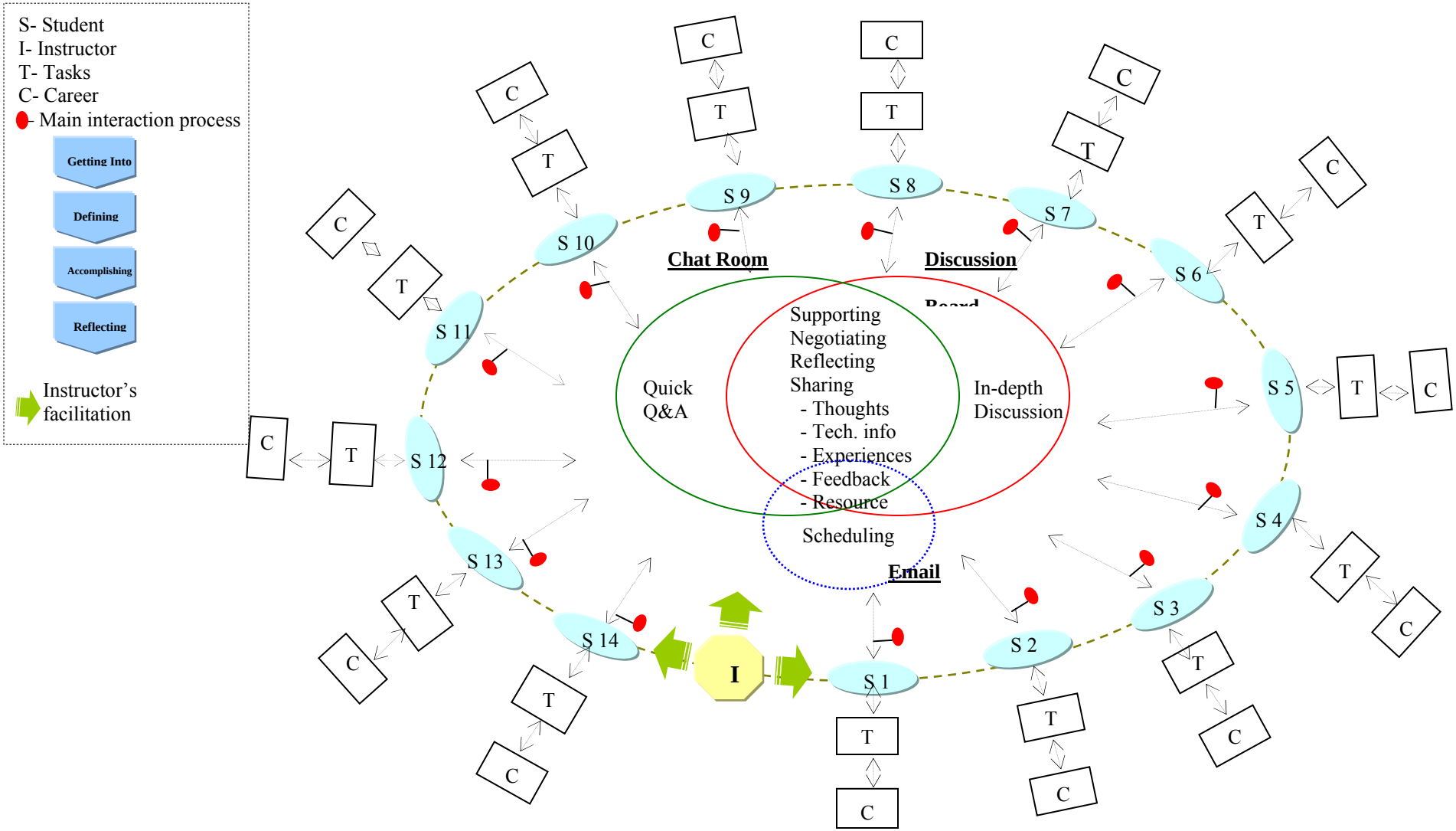


Figure 4.3

The process of online interaction in a WBLE using authentic tasks



CHAPTER 5

GUIDELINES FOR IMPLEMENTING AUTHENTIC TASKS TO INCREASE MEANINGFUL INTERACTION IN WEB-BASED LEARNING ENVIRONMENTS[4]

[4] Woo, Y., & Reeves, T. C. To be submitted to *EDUCAUSE Quarterly Journal*

Abstract

The purpose of this paper is to provide practical guidelines to practitioners including instructors or instructional designers who want to learn about and use authentic activities to improve the quality of interaction and learning in their online classrooms. To this end, this paper delineates the design, implementation, and results of two higher education course that used authentic tasks as a way for students to increase meaningful interaction in their Web Based Learning Environments (WBLEs). The descriptions center around the task design, the process of facilitating the tasks, and the learning outcomes. In addition, several suggestions related to task design, course management, and facilitation in a WBLE using authentic tasks are provided from the perspectives of the instructors who designed and operated the two courses described in the paper.

Introduction

> Students are sitting in front of computers studying global warming. The computer screens are showing a simulation of global warming. Students exchange their own thoughts and make some plans. On the basis of the plans, some students change the amount of greenhouse gases coming from vehicles and from factories. Other students manipulate the amount of green plants. Students can see that as they add trees to the environment, global warming becomes less of a problem (Jackson, Taylor, & Winn, 1999).

This example describes students interacting and collaborating with one another to solve an authentic task, reducing global warming. Under the influence of social constructivist learning theories, many educators have become interested in students' active construction of meaning grounded in their own experience (Newmann, Marks, & Gamoran, 1996). To support the construction of meaning, students need to interact with one another through accomplishing authentic activities in social contexts similar to those in which these activities will be used (Collins, Brown, & Newman, 1989). Through meaningful interaction processes, the construction of meaning can be enhanced and the intellectual growth of students can be also advanced (Driscoll, 2000; Jonassen, Davidson, Collins, Campbell, & Haag, 1995; Lave & Wenger, 1991; Vrasidas, 2000).

Innovative instructors have implemented authentic activities in physical classrooms for decades, but advances in web technology make the use of authentic activities in fully online or blended courses more feasible by enhancing access to experts and real time data as well as by enabling multiple forms of communication among collaborative teams of learners (Herrington & Oliver, 2000). As a result, there is the possibility of many more higher education instructors (as well as K-12 teachers) becoming interested in using authentic activities in their teaching. But

before, they can implement authentic activities, web-based or otherwise, educators need to develop confidence in the efficacy of the approach. They may even need to develop new mental models of what it means to teach. This starts by formulating individual answers to fundamental questions, such as what is authentic activity?

Authentic Activity? What Is It?

Definition

The term, authentic is defined as genuine and real (The Merriam-Webster Dictionary, 1997). Lebow (1993) describes authentic activity as "experiences of personal relevance that permit learners to practice skills in environments similar to those in which the skills will be used" (p. 9), and Brown, Collins, and Duguid (1989) describe authentic activities as the "ordinary practices of the culture" (p. 34). According to Newmann and Wehlage (1993), authentic activities are real world tasks that a person can expect to encounter on the job, in the home, or in other social contexts.

An important implication of these definitions is that authentic activities have the potential to foster intellectual accomplishment that is worthwhile and meaningful (Newmann et al., 1996). Moreover, authentic activities offer a potentially more motivating way for students to learn, because, as we can see in the definitions, learning activities that are authentic in nature are directly related to their real life experiences (Perreault, 1999). Students at every level commonly complain that they do not perceive the relevance of the academic learning tasks assigned to them (Herrington & Oliver, 2000). If the learning tasks are more authentic, then students could be engaged in genuine learning problems that foster the opportunity for them to make direct connections between the new material that is being learned and their prior experience, and to

apply the new learning on the basis of the connections to their current practice and future activities at work, home, or elsewhere.

The Characteristics of Authentic Activity

Because authentic activities mirror real world tasks, they require students to cooperate, to communicate, to respect each other's view, and to use other skills to complete the task successfully (Perreault, 1999). In describing the characteristics of authentic activities, Newmann et al. (1993) outlined five standards for authentic activities: (a) higher order thinking; (b) depth of knowledge; (c) connectedness to the world; (d) substantive conversation; and (e) social support for students. Sheurman and Newmann (1998) provided three criteria of authenticity such as construction of knowledge, disciplined inquiry, and value beyond school. According to Perreault (1999), authentic activities typically require more class time than do traditional workbook exercises or simple abstract academic tasks. Authentic activities require the application of a range of skills, and therefore assessment must account for all the important components of the skills involved. Perreault recommended portfolios and scoring guides or rubrics as effective means of assessing the outcomes of authentic activities, and suggested that students may also be involved in the creation of the scoring guide or rubric.

Different scholars have described the characteristics of authentic activities in different ways, and thus, there is a need to organize the divergent guidelines and scattered characteristics promoted across different scholarly interpretations. To meet this need, Herrington, Oliver, and Reeves (2003) conducted a rigorous literature review related to these characteristics, and in the end they identified ten main characteristics of authentic activities:

1. Authentic activities have real-world relevance.

2. Authentic activities are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity.
3. Authentic activities comprise complex tasks to be investigated by students over a sustained period of time.
4. Authentic activities provide the opportunity for students to examine the task from different perspectives, using a variety of resources.
5. Authentic activities provide the opportunity to collaborate.
6. Authentic activities provide the opportunity to reflect.
7. Authentic activities can be integrated and applied across different subject areas and lead beyond domain-specific outcomes.
8. Authentic activities are seamlessly integrated with assessment.
9. Authentic activities create polished products valuable in their own right rather than as preparation for something else.
10. Authentic activities allow competing solutions and diversity of outcomes.

Authentic activities that encompass these ten characteristics are naturally conducive to group work. Within a learning environment built around authentic activities, students each have their own role similar to those found in a real world team at work, play, or other collaborative social context, and the instructor acts as a coach and facilitator, supporting students to accomplish the authentic tasks.

Authentic Activity and Web Technology

Technology has been utilized to support both learning and teaching for a long time, albeit with limited success (Cuban, 1986). Despite a less than stellar history of effective usage in education, technology appears to have great potential to support student performance of authentic tasks and

resultant learning (Herrington, Reeves, Oliver, & Woo, 2004). Before the development of computers, especially of Web technology, it was much more difficult and in some situations even impossible for instructors or instructional designers to use authentic activities in real life settings because of the limitations of the subject matter, time and finances, and practical constraints such as physically moving students to fields of practice, not to mention the risks of real world authentic activities (Herrington et al., 2004). However, with the development of Web technology, such limitations have been decreasing. A Web Based Learning Environment (WBLE), if used effectively, allows, enables, and promotes constructivist learning using authentic activities (Herrington & Oliver, 2000; Herrington et al., 2004). The Web offers access to an enormous amount and variety of information including dynamic data and visualizations of complex phenomena. Instructors can provide students with access to information about research results, practical simulations of complex phenomena, and other forms of real world or simulated data. The information can be presented in almost any form such as text, graphics, audio, video, and any combination of these.

Of course, the provision of information is not sufficient for learning. Students must be challenged with authentic tasks that drive the need to use, transform, apply, and reinterpret that information. With the information and the authentic tasks, students can conduct exercises, play instructional games, and engage in high fidelity simulations or other forms of virtual reality experiences on the web. The learning path and order depend on the choices students make themselves, although constrained by the complexity of the problem to be solved or tasks to be completed. Through transforming information and engaging in collaborative experiences, students are enabled to construct their own meaning and develop robust skills related to solving complex ill-structured problems.

As noted above, most authentic learning tasks encompass team work. Fortunately, communication programs, such as e-mail, bulletin boards and the other interactive tools found in common course management systems such as WebCT or Blackboard allow learners to discuss problems and debate with one another as well as to exchange information regarding task completion and related activities. In asynchronous situations, especially, the time limits of traditional classroom meetings are reduced, and students have more opportunities for reflection and exploration of issues before they respond to a comment or query. Also, the instructor can provide individual or group guidance, advice, coaching, and feedback through the various communication tools (Hong, Lai, & Holton, 2001).

A few notable WBLEs using authentic tasks have been developed and conducted. According to Winn's (2002) review, science related programs and research projects lend themselves particularly well to integrating authentic web-based activities in areas such as "astronomy (Barab et al., 2000), meteorology (Hay, 1999), physical oceanography (Winn & Windschitl, 2001), maintenance of nuclear reactors (Kashiwa et al., 1995), subatomic chemistry (Byrne, 1996), and global warming (Jackson, 2000)" (p. 337). In these WBLEs, students participated in scientific experiments online conducted jointly with other students and experts. In the field of education, a *Graduate Certificate in Online Teaching and Learning* has been developed using the characteristics of authentic activity described above at a university in Western Australia (Herrington et al. 2004).

Authentic Activity and Meaningful Interaction

One of the key components of any sound approach to teaching and learning is interaction. Moreover, it has been argued that the success or failure of online learning depends on the level of interaction occurring within a learning environment (Merriam & Caffarella, 1999). However, not

all interaction is meaningful for students' learning. We can say that interaction is meaningful when it influences students' learning and increases learning effects. But this does not tell us much about how to implement meaningful interactions for learning. This is where authentic activities come to the forefront in the design and implementation of effective learning environments.

Using authentic tasks is derived from the social constructivist principle of locating learning in the context of reality (Stage, Muller, Kinzie, & Simmons, 1998). The use of authentic tasks is also advocated to foster learning transfer in the belief that collaboration among students not only helps them learn the concepts under discussion but also exemplifies how these concepts are used in the workplace or other real world contexts (Jaworski, 1994). To achieve a challenging authentic task, students must interact through sharing what they are thinking, relating their ideas to past experiences, collaborating with their peers, actively constructing their own meaning, and incorporating the diverse perspectives of others (Barr & Tagg, 1995). Through these types of interaction processes, social constructivists believe learning can be enhanced (Driscoll, 2000; Jonassen et al., 1995; Lave et al., 1991; Vrasidas, 2000).

According to the theoretical principles of social constructivism, well-designed and operated courses focused on authentic activities should meet the expectations of meaningful interaction that actually contributes to student growth and learning (Herrington et al. 2004; Lourdusamy, Khine, & Sipusic, 2002). However, even though this sounds good in theory, instructors who want to use authentic tasks for their own courses may still ask themselves, "How can we design an authentic task in my subject area? How can we facilitate the process of task accomplishment? What kind of challenges will I face when using authentic activities? or How are other instructors using authentic tasks?" Most instructors need some field related information

and a clear picture of how to design and use authentic tasks in real courses. In an effort to provide such a picture, the following section introduces two similar web-based learning cases using authentic tasks. In addition, for people who want to use the authentic tasks for their own courses, several suggestions are offered from the perspective of the instructors who designed and managed these two courses. The descriptions and suggestions presented in the following section are based on an analysis of the transcripts of the discussion board and chat room yielded by the two courses as well as on in-depth interviews with the two instructors and several students who participated in the courses.

Case I: Instructional Design Course

This course was a Master's level course offered online by a university in Australia. The course was held for 14 weeks from February to May in 2005. Twelve adult part-time students who were working as either teachers or instructional designers were enrolled in the course. The course was delivered principally online via the Janison learning management system, an Australian product (http://www.janison.com.au/), accessed through the university website. This online course was a totally asynchronous. Figure 5.1 illustrates the course website.

Figure 5.1

Task Design

The Instructional Design course was designed to provide students with opportunities to learn professional knowledge and skills related to instructional design, especially in the context of designing online learning environments. The structure of the course afforded students ample opportunities to share information, present and critique each others' work, discuss course related issues, design their own products, and reflect on the instructional design process. The course design was centered on three main tasks. Task 1 required exploring learning and instruction

individually. For this, students choose a movie or television program that was set in a school/university and incorporated classroom scenes. They analyzed the assumptions the teacher in the film or TV show made about how students learn, and how the instruction depicted reflected those assumptions. Task 2 required students to actually engage in instructional design to create a product that could be used for teaching or learning instructional design. For this second task, small groups of students collaboratively designed and produced a website, a presentation or a booklet for teachers and others who want to find out what instructional design is. Based on their interests, four groups with three members in each were formed. Each group developed a product that introduced and explained a little of the history of at least three different ID models, and provided an example of a lesson plan or learning environment that exemplifies each model based on their own experiences and research. In Task 3, each student individually designed and produced a web-based learning environment on a topic relevant to their current teaching or interest. This latter task could be characterized as the most authentic of the three tasks because it cast the students in the roles of instructional designers in a manner similar to that which they would later pursue in their careers. On the other hand, because it was an individual assignment, it did not involve the collaborative aspects of the most effective authentic activities. Task 2, on the other hand, was perhaps more authentic in that it did require collaboration.

Strategies Used to Support Students' Online Interaction

Sharing Group Responsibilities. To accomplish the tasks more effectively, the group members divided the responsibilities with one another. Because they had the same objectives and agreed to complete the tasks with shared responsibilities, the learners had to check and often ask about each other's progress and thoughts, tune their own work in harmony with the work done by others, and share their individual research results and resources with one another. This high

degree of shared responsibility helped to improve the quality and quantity of the interaction that occurred while solving the tasks.

Adding Complementary Communication Channels. While accomplishing the tasks, students used not only the main communication channel, the asynchronous discussion forum, but also some complementary communication channels including e-mail, MSN chatting, and face-to-face meetings. This made the interactions more timely and made up for the weaknesses of asynchronous interaction. Online discussion forums are useful for fostering reflective argument and debate about complex subject matter, but they are not useful for establishing clear cut decisions about who should do what, when, and how. It is not uncommon for online learners to seek alternative "real time" communication strategies within an online course (Palloff & Pratt, 2004).

Process of Task Accomplishment: Mainly in Task 2

The following description is focused on one group among the four groups for Task 2. The group selected was based on the amount of data provided by the group making it an 'information-rich case' (Patton, 2002). This course was a totally asynchronous one, and synchronous chat was not used as a primary communication channel. Students mainly met in the discussion forum in order to accomplish the task.

First of all, the students "met" online within their own group, which the instructor had already created based on the students' interests. After short greetings, they tried to select one task among task options based on their interests and abilities. Then, they started defining the task in a detailed manner. They seriously discussed what the task was and how it could be accomplished. Based on their understanding of the task, they divided the responsibilities considering each person's experiences and interests. To collaborate effectively and clarify their individual

responsibilities, they also made a timeline together. Because they were part-time students with fulltime jobs, they were careful in arranging schedules so as not to interfere with their work schedules. The work to accomplish the task in earnest was begun by sharing individual resources and individual research results. Sometimes, they disagreed or argued about how to put together the individual research results for the final product. When this happened, they tried to solve it through clarifying the original task again. However, when they met a similar situation again, they asked the instructor what direction was better for their work. After solving the discord with the instructor's support, they made the final product, and shared it with the other groups.

Learning Outcomes

Learners' Perspectives. All three students in the group admitted that although it was hard to accomplish authentic tasks through online collaboration, it was valuable. In particular, one of the students reflected at length on the experience: she felt this type of learning really suited her after she became more confident in this new learning environment. She expressed the belief that the learning that occurred in this authentic learning environment permanently impacted the way she learns and how she feels about teaching and learning. She also suggested that while difficulties in applying authentic learning exist, students who apply themselves and overcome these difficulties would find authentic learning to be a rewarding experience.

Instructor's Perspective. The instructor had no doubt that the students achieved an enormous amount by accomplishing the tasks through online collaboration. In particular, three groups among the four did wonderful work, which was both usable and impressive. She concluded that the students had been challenged by the demands of the online course, but they had learned a lot within it. Discord among the members of one of the four groups did not allow them to achieve the collaborative tasks.

Case II: Network-based Learning Course

Network-based Learning also was a Master's level course offered online by a university in Australia. The course was held for 13 weeks from July to October in 2005 with 14 adult part-time students also working as teachers, instructional designers or web developers. Interaction among students and instructor primarily took place via synchronous and asynchronous communication utilizing e-mail, chat and discussion tools. Synchronous Web-based communication mainly occurred in the chat room at the scheduled time every Monday evening. Asynchronous Web-based communication was supported by discussion forums and e-mail systems that allowed participants to discuss various topics throughout the course. Figure 5.2 illustrates the course website.

Figure 5.2

Task Design

The content of the course focused on the design principles and research underlying the development of flexible learning systems and computer mediated communication using the Internet and other network environments. Students were required to create a prototype of a network-based educational project in response to a real syllabus statement and client brief. The course structure was centered on three sub-tasks needed to fulfill the overall requirement of creating a prototype network-based learning environment.

Task 1 required observing and reporting a network-based learning environment in which each student was actively involved as a learner, a designer, a teacher, or a contributor. The report had to include recommendations for improving the system effectiveness and for increasing the opportunity to implement different learning activities. Task 2a required students to develop a written statement outlining the conceptual design of a three-week learning project in line with an

actual syllabus statement and/or client brief. Task 2b required students to implement a prototype of the three-week network-based learning project based upon their design statement developed in Task 2a, but allowing for design revisions in the process. This environment was developed within Janison Toolbox or another learning or knowledge management environment of their choosing.

All three tasks were interrelated. The first task allowed the students to explore an existing network-based learning environment that they had access to, to ask certain questions, to think about it from a technical and pedagogical perspective, and to synthesize their reflections in a report. The second task was more authentic in that it required the students to think about network based learning in terms of what they had read and also what they had seen and to represent their new knowledge in a design statement. The third task was the most authentic in that it required the learners to put their design statement into practice by actually building and developing a network-based learning project. In other words, the design statement allowed them to describe design principles, the actual creation of the prototype allowed them to actually apply those design principles.

Strategies Used to Support Online Interaction

Designing Incrementally More Challenging Tasks. The tasks in this course were designed so that each task was related to the next task, and the level of difficulty gradually increased from task 1 to task 2b. As you can see above, task 1 got students thinking about network-based learning, task 2a got to them to further explore network-based learning, and task 2b got them to develop their own product. This incremental design helped make the students' interaction both manageable and increasingly authentic.

Providing Active Facilitation. The instructor provided active facilitation by building ground rules with students and modeling positive feedback and active engagement. The enthusiasm of the instructor, shown through her active participation in various online interaction processes, seemed to encourage students think about how important their own participation was, and it gradually led more and better interaction.

Process of Task Accomplishment

Students started the interaction with short greeting messages. The greeting included their introduction in describing where they are living and what they are doing for living. People showed great interest in others' work experiences. They then started sharing some difficulties in their online learning experiences. Through this sharing, they could decrease their own online anxiety. After sharing their backgrounds and online learning experiences, students tried to figure out how the task could be connected as well as possible to their work contexts because even though they had the same general goal of developing a prototype of a three-week network-based learning environment, each task was an individual one in that each student selected his or her own client and context. However, to accomplish the tasks, the learners had to share individual resources, thoughts and task solving processes.

During the course, the students tended to use the chat room for quick Q&A, and the discussion board for more in-depth discussion. They frequently shared their progress status. Because they worked individually on their tasks, they wanted to know others' pace to check whether they were falling behind or not. Through sharing and mutual support, they developed their own final products. The interaction that occurred after accomplishing the task mainly related to their reflection on the experiences of the task accomplishment and online learning.

Learning Outcomes

Learners' Perspectives. All four students who participated in the interviews stated that the tasks in this online course were more demanding than other normal class activities such as lectures, reading and exams. However, the authentic tasks also fostered feelings of real learning and achievement. One of students said these types of tasks allowed them to reflect on what they were reading and to actually apply the principles they read about to the online design that they made, and it worked. Another student said she had a hard time at the beginning because she had to adjust to both the online system, i.e., the Janison software, and a new learning style, i.e., the task-solving approach. However, in the end, she felt proud and successful. Moreover, students not only felt a feeling of achievement but they also created a real, applicable product—a network-based learning prototype. This tangible and useable product made the students think that all the interaction processes that occurred in the whole course were meaningful.

Instructor's Perspective. The instructor mentioned she had been very impressed with the quality of students' work. Students showed motivation, dedication and high quality of work. She thought that the task-based approach was more effective in terms of making students think about network based learning and the issues rather than having instructor present content on a weekly basis. She concluded that the students came to own the products they created and that through this ownership, they became much more engaged with the content than they would have in a more teacher-centered course.

The Instructors' Suggestions

For practitioners who want to use an authentic task for their own course, the two instructors who designed and operated the two courses described above provided several suggestions based on their experiences. The instructor of the 'Instructional Design' course has

designed and operated several courses with authentic tasks in WBLEs and has conducted considerable research focused on authentic tasks. For the instructor of the 'Network-based Learning' course, the course was only the second one in which she had used authentic tasks online, but she has also carried out some research on online interaction. When they were interviewed, both instructors highlighted the importance of the instructor's philosophy of learning, considerations in task design, the challenges of management in operating such a course, and several tips for facilitation.

The Importance of Instructor's Philosophy on Learning

> *"For me to do it any other way would be not to do, not to live up to my beliefs about the way people learn"*

Both instructors emphasized that all task design and teaching strategies start from the instructor's beliefs about learning. Therefore, first of all, instructors considering integration of authentic tasks in their teaching should reflect on their own philosophy of learning. If they believe that their students can learn best from the experience of solving a real life related task, then they should exemplify how they feel and believe people learn best in their course design. The knowledge and skills inherent in instructional design and network based learning, the subject matter of the two courses described in this paper, are complex in nature. No absolutely right or wrong answers to the tasks could be pre-specified in advance. The two instructors expressed the belief that the authentic tasks required their students to think about the complex issues involved in instructional design and network based learning not only in terms of what the literature says, but also in terms of how the design would fit in within their work context and what they believe makes good pedagogy. In addition, the feedback and the reflections they got from the students indicated that the students had found the course exceptionally challenging, yet they had learned

through rising to meet the challenge. The feedback confirmed the instructors' belief in using authentic tasks for their courses.

Considerations in Task Design

"The hardest thing is to design the task. How can you get a task to carry all that learning?"

At first, practitioners might doubt that they can design authentic tasks for their particular courses. The two instructors also admitted the inherent difficulty in designing authentic tasks and suggested using four strategies that they have learned from their own experiences.

First, the importance of continuous reflection and revising were mentioned. In developing a task statement, instructors or designers must constantly ask themselves, "When are students going to use this information, what use is it going to be in any real life situation, and what will they learn from the process of accomplishing these tasks?" Based on the answer to these questions, the task statements must be continuously revised. Interestingly, one of the instructors stated that the task does not always have to be a real case, and she introduced the term "cognitive realism" in which students come to imagine they are in a realistic situation and that they have to act as if the case was real. According to these two instructors, the important thing in designing authentic tasks is to think through how the tasks are going to allow students to learn everything that they want them to learn.

Second, available resources should be considered. Instructors should look for good resources to support the process through which students solve the tasks using online and offline sources. If a specific resource is not electronic, the instructor also needs to convert it into some digital version students can easily access online. Resources need not come just from teacher; they can be from students, too. Students can more actively participate in online interaction by

seeking the resources and information needed to complete their tasks from both the instructor and peers. In this way, working online becomes meaningful; in other words the online interaction serves to help students accomplish tasks rather than being an end in itself. In addition, the two instructors strongly recommended preparing contact lists of available experts in the subject area. This can increase students' motivation as well as the authenticity of the tasks.

Third, designing open-ended tasks is often helpful. Such tasks allow students to come up with their own ideas. Sometimes, students can choose their own context or client. In this case, students can be more engaged in the task solving. They try to figure out how the task could be applied to their work context and how their prior work experiences could be applied to the task solving. However, for this to work well, instructors need to provide some examples that help students understand what is expected lest students experience too much confusion resulting from the open-ended nature of the task. For this purpose, sharing previous students' work or real experts' work can play an important role as models.

Lastly, designing incrementally more challenging tasks is suggested. For example, the first task might just allow students to explore more general issues. It is not difficult but it provides basic background about the task as well as time to grow accustomed to the interface of the technology system which is being used for the course. Then they pick something to explore in more depth and finally, they actually have to build something. Each task increases in complexity and is related to the others. By gradually increasing the complexity and authenticity of the tasks, all students can have a similar experience and pace. It can prevent them from losing focus on their interaction. This incremental design can maintain students' feeling of confidence and achievement.

Challenge management

"It was not surprising but…"

In any course, there are challenges in operating and managing it. To manage a learning environment well is an indispensable skill of a well qualified instructor. In the WBLEs using authentic tasks described above, the two instructors identified several challenges which should be overcome. In particular, they mentioned the difficulty of managing group work, the difficulty of written interaction, and the relatively big workload as challenges.

First, in the Instructional Design course, one group among the four broke up because of disagreements among the group members. The group members were trying to work out on who was doing what, but they couldn't agree on it. The fact they were always very reluctant to say uncomfortable things to each other made it difficult for the students to work out who was actually going to do what for their task. Therefore, they never really got into deep reflection or substantial collaborative learning. There were just a lot of discussion on allocating roles, but the group never worked together. Although this was a negative experience, the instructor also described it as a learning experience for the students: they had to learn how to collaborate at a distance and to negotiate individual roles within the group. Therefore, she suggested instructors should lead students to learn something from any negative experiences that evolve in some circumstances. She also mentioned good support strategies are needed for good group work. For better group work, she recommend putting one person who has experience in online group work as well as experience in the topic area with people who are not so experienced because she thought the experienced one would be able to provide leadership and help the online group work more smoothly.

Second, for these two instructors, written interaction demanded more caution than verbal interaction. The instructors mentioned when they replied to a student online, it took quite a long time. Moreover, because a written record existed, no one could deny what was said. In addition, written interaction can be risky, because instructors can not see students' facial expressions and thus could not know directly how somebody is responding to feedback. Therefore, they had to think really carefully about the words and how the students were going to interpret those words. In this context, they suggested making sure, before clicking the send button, that the content makes sense, that you are sending it the right person, and that you are not copying it to anybody you should not be included if the feedback is somewhat sensitive.

Third, the workload of teaching online is always an issue in an online learning environment (Reeves, 2003). Generally, people think the workload in online courses is high in comparison to traditional face-to-face courses because instructors find that they can never get away from the demands of the online courses. Even when instructors are home at night or over the weekend, if they open their email, there will be always email messages from their online students. In many cases, instructors can easily spend a good half hour, or even an hour writing a response to a single student's query. Thus, to more effectively manage time, the two instructors suggested making a schedule to check students' emails and discussions and trying to follow the schedule. In addition, there is another factor that increases the workload in a WBLE using authentic tasks: preparation. Instructors must spend a lot more time to think and design an appropriate task as well as to collect good resources. However, according to the two instructors' experiences, the more time spent in preparation the more time saved in implementing the course.

Facilitation Tips

"I think facilitation means just provide encouragement, support, and give them scope to think…"

Research shows that one of the worst things for students in online learning is facilitators who do not know how to provide good facilitation (Reeves, 2003). The two instructors offered several tips for better facilitation.

The instructors said that tried to participate regularly in students' interaction processes and to play a role as models of appropriate online interaction. Even though, most students today are very accustomed to Internet technology and online chatting in everyday life, many of them still feel uncomfortable when they use it as a learning tool. In this context, the presence of the instructor can reduce their anxiety because students recognize that there is expert in the online learning environment whom they can ask whatever they need. Also, by modeling their interaction on the instructor's interaction, students came to understand how online interaction leads to learning.

Appropriate use of students' thoughts and resources is very helpful to give students more motivation as well as to save the instructor's time. Students, especially in higher education, usally have valuable experiences and resources including human resources in various areas. Therefore, they can support one another. Peer support can make the course more meaningful and lead to more active interaction among students. The instructors suggested trying to connect one student' thoughts, and interests and beliefs to what other students are saying. If one student's work can serve as a good example for others, instructor should ask the student whether he or she minds sharing the work. Peer examples can be more realistic to other students.

Regular website updating is also a very important factor for successful online learning. Instructors have to get that website up and running, because everything occurs in the website; the website is the meeting point, library and discussion room for online learners, the main place where students go to find out the latest things. Therefore the instructor should regularly post new announcements and resources to the website so that students see the website evolving as a learning environment. This can increase students' interaction as well as their interest in participating in online learning.

Table 5.1 summarizes the suggestions of the two instructors for practitioners who want to use authentic tasks for their own classes.

Table 5.1

Conclusion

Traditional instructional methods often require students to read a textbook, memorize portions of the content, and answer a few questions related to the content on exams. Any knowledge gained is short-term and ultimately inert. Recognizing the weakness of these traditional methods, interest in authentic activities in learning situations is growing (Herrington & Oliver, 2000; Winn, 2002). As mentioned above, many theorists have advocated the positive influences of authentic activities in meaningful learning, and there is growing evidence of successful application of authentic activities in online learning situations (Herrington et al., 2004).

However, some aspects in the practice of using authentic activities are still unclear. There has been a lack of specific guidelines for practitioners to use. Even if practitioners agree with the beneficial effects of authentic activities on learning, they do not all know how to apply and manage such realistic activities effectively. They need examples of successes and failures and

field related information that comes from real cases. Through reviewing such cases, practitioners can get a clearer picture of what is involved in applying authentic tasks to their curriculum, including learning processes and operating techniques. To this end, this paper closely described two courses using authentic tasks as a way for students to increase meaningful interaction in their WBLE. The two courses clearly illustrate how authentic tasks can be designed, how students can accomplish the tasks with peers' and instructor' support, and what desirable learning outcomes can result. In addition, this paper provided several useful suggestions concerning task design, challenge management, and facilitation based on the experiences of the two instructors who designed and operated the two courses.

Hopefully, the two cases and the suggestions provide some practical guidelines to practitioners including instructors and instructional designers who want to learn about and use authentic activities to improve the quality of interaction and learning in their online classrooms. However, more cases including various subject areas are needed to build up an effective online pedagogy with authentic activities. We encourage others who have experience in using authentic activities to share their experiences with the growing community of instructors teaching online.

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Table 5.1

Suggestions of the two instructors

Considerations in task design	▫ continuous reflection and revision ▫ collecting available resources through online and offline sources ▫ designing open-ended tasks ▫ designing incrementally more challenging tasks
Challenge management	▫ the difficulty of managing group work : lead students to learn from the negative experiences : use students who have experiences in online group work to help the group work well ▫ the difficulty of written interaction : always make sure before clicking the send button whether the content makes sense and whether you are sending it the right person ▫ comparatively high workload : make a schedule to check students' emails and discussions and stick to it : the more time spent in preparation the more time saved in operating the course
Facilitation tips	▫ participate regularly in students' interaction process ▫ play a role as a model ▫ use students' thoughts and resources ▫ update website regularly

Figure 5.1

Sample webpage of Instructional Design course

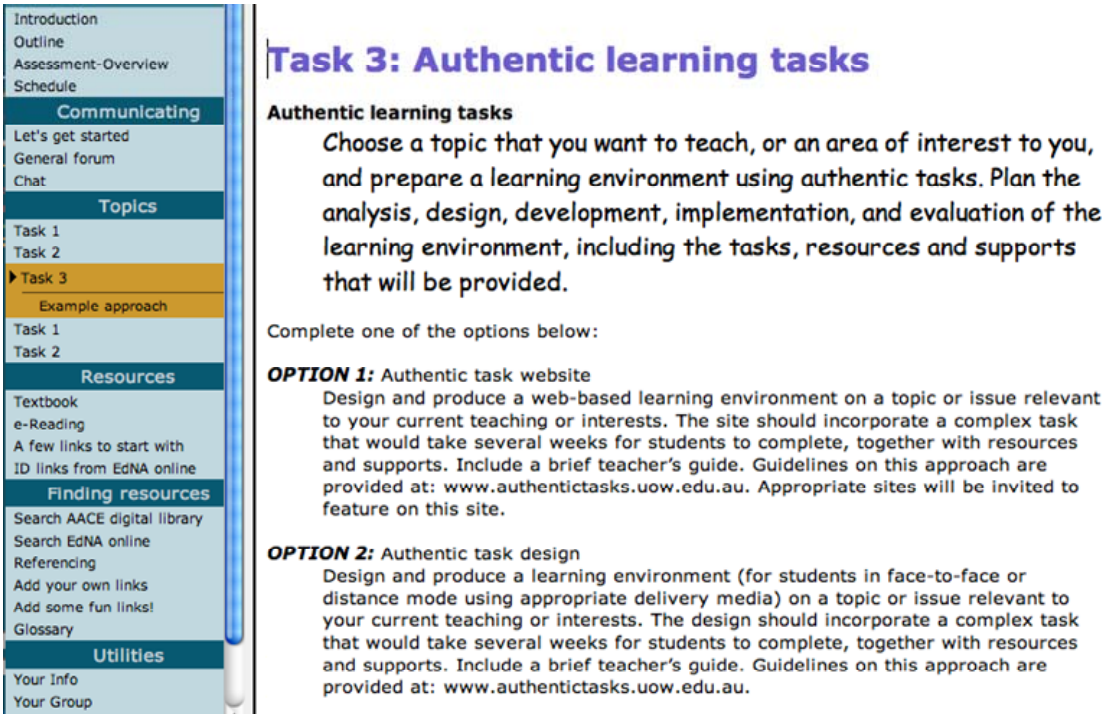
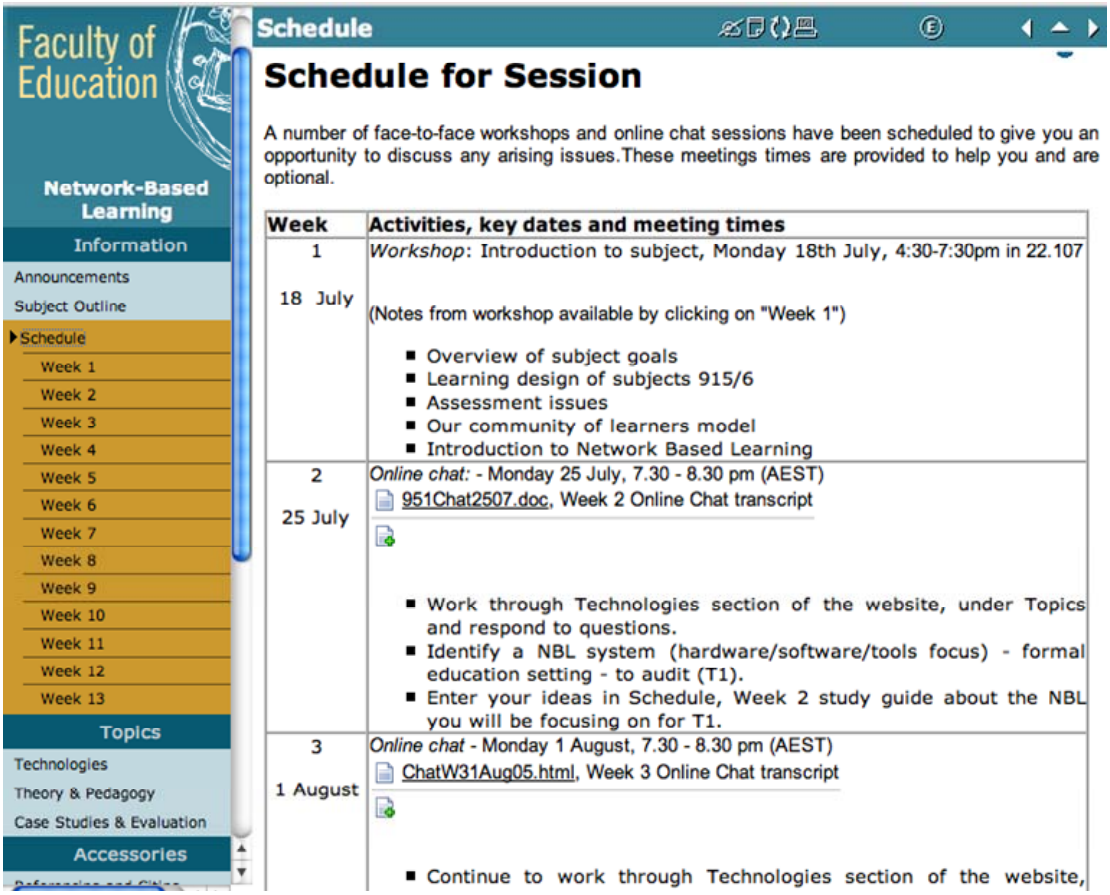


Figure 5.2

Sample webpage of Network-Based Learning course



CHAPTER 6

SUMMARY

During this dissertation study, I have explored a Web-based learning case which was designed using authentic tasks and based on social constructivism to provide a deeper understanding of meaningful interaction through the lens of social constructivism. How the students interacted to accomplish the authentic task in the WBLE and what meaningful experiences they had in their learning were the main focus of this study. A collection of four papers ready for submission to refereed research journals resulted directly from this study, and a fifth related paper was published in collaboration with my mentors at the onset of the research activities (Herrington, Reeves, Oliver, & Woo, 2004).

The first paper, *Meaningful Interaction in Web-Based Learning: A Social Constructivist Interpretation,* presents a conceptual framework for meaningful online interaction. The second paper, *Interaction in Asynchronous Web-Based Learning Environments: Strategies Supported with Educational Research*, reviews research related to the strategies for improving the quality of online learning. The third paper, *Meaningful Online Learning: Exploring Interaction in a Web-Based Learning Environment Using Authentic Tasks*, describes an in-depth analysis of a Web-based learning case which was designed using authentic tasks and based on social constructivism to provide a deeper understanding of meaningful interaction through the lens of social constructivism. The case was a master's level course offered online by a university in Australia and the participants in this study consisted of the postgraduate students and instructor in the course. The fourth paper, *Guidelines for Implementing Authentic Tasks to Increase Meaningful Interaction in Web-Based Learning Environments*, provides practical guidelines to practitioners including instructors or instructional designers who want to learn about and use authentic activities to improve the quality of interaction and learning in their online classrooms.

The target audience for these articles includes researchers and practitioners who are interested in improving the quality of online learning and interaction. It is my fervent hope that my dissertation research can enhance the understanding of meaningful online interaction and help the target audience of instructional designers and instructors in higher education design and apply authentic learning tasks in their own Web-based learning contexts.

At the same time, I acknowledge that as this has been my first endeavor as a researcher, much still remains to be learned about the topic of interaction in online learning. Accordingly, I view this dissertation study as a fledging first step in a long term research agenda during which I will strive to accomplish the twin goals of enhancing practice and refining relevant design principles related to online learning.

References

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APPENDICES

Appendix A

Course Syllabus

Subject Outline

EDGI915 & EDGI916
Network-based Learning
Project for Network-based Learning

Subject Code: EDGI915/6
Subject name:
Network-based Learning (and Project)
Pre-requisites/co-requisites: None
Credit points: 6 + 2
Offered: Session 2, 2005
Mode: Flexible and On-Campus

Teaching Team

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by telephone appointment or email as appropriate.

Flexible & On-Campus, Spring Session, 2005
Faculty of Education

Disclaimer

The University attempts to ensure that the information herein is up to date at the time of production, however we reserve the right to amend without notice in response to changing circumstances.

Subject details

Content
This subject examines the design and research that surrounds the development of flexible learning systems and computer mediated communication using the Internet and other network environments. Topics to be covered include the technology of wired and wireless learning networks, the theoretical and pedagogical underpinnings of network-based learning and the communication models that are utilised in network-based learning.

Objectives
The subject *Network-Based Learning* is designed for students to:

- Consider issues associated with network-based learning through a range of online interactions with lecturer and peers using a number of communication tools.
- Analyse, evaluate and make recommendations for an existing instance of network-based learning.
- Design and produce a network-based educational project for a K-12, tertiary or corporate training environment.
- Conduct some case study research into an existing instance of network-based learning.
- Develop heuristics for the design of effective network-based learning systems.
- Explore, analyse and present a case study of network-based learning.

Assumptions
Internet technologies are critical vehicles for information access and communication in this subject. Students are expected to have a competent level of skill in using these technologies, have access to the Internet and have an email address.

Attendance
While this subject is delivered in flexible format, students are strongly encouraged to attend class meetings where practicable. Attendance has no bearing on a student's assessment.

Hours per week
It is expected that students will spend approximately 2 hours per week for each credit point (EDGI915– 12 hrs/wk, EDGI916 – 4 hrs/wk).

Method of delivery
This subject is delivered predominantly online with some face-to-face workshops. Interaction amongst students and lecturers is to take place via synchronous and asynchronous communication through the Janison subject web site. Communication to the subject coordinator about subject-related matters should be made via email. The subject line of the email message should begin with 915.

Readings and References
There is no major text for this subject. A study guide, readings, and additional resources are available through the subject website.

Subject website
To access the Network-Based Learning website

- Connect to the Internet
- Go to http://uow.janison.com.au/
- Type in your username and password
- Click on the Network-Based Learning link on the left-hand side of the screen

Students are expected to log on to the Network-Based Learning website on a regular basis.

Web browsers

Students working in a Mac OS environment must use Mozilla Firefox (an open-source web browser) and those working in a Windows environment must use Internet Explorer in order to use the Janison Toolbox Editor. Mac users: Download Mozilla: http://www.mozilla.org. Windows users: Download Internet Explorer: http://www.microsoft.com/windows/ie/downloads/default.asp.

Software

Students will require access to web site authoring and related software. DreamweaverMX is supported by the subject resources.

Assessment guidelines

There are two assignments for EDGI915 (the second assignment being comprised of two parts). There are two assignments for EDGI916. The specific assessment criteria for each assignment is outlined in the details for the tasks below. To pass the subject students need to ATTEMPT and PASS (>=50%) ALL components. Marks will not be modified or scaled. Students should refer to the "Guide to Assessment of Written Work" in the Faculty of Education Handbook for general assessment criteria.

Performance grades

HD	High Distinction	85–100%
D	Distinction	75–84%
C	Credit	65–74%
P	Pass	50–64%
F	Fail (unsatisfactory completion)	0–49%

Submission

Unless otherwise arranged, students should submit their assignments via the subject website or the ftp server as specified in the description of the assessment task below. Please ensure you have named your files so that they can easily be identified as your work. Within the document of all submitted assignments the students name and student number should be clearly identified. Students should refer to the Faculty of Education Handbook for specific information on Faxed and Mailed assignments.

Original Work

Assessment work submitted is expected to be original work created specifically for this subject. It is not acceptable to submit previous subject projects as assessment for this one.

Acknowledgment and Plagiarism

In all cases students should appropriately reference source material. Please refer to the Faculty of Education Handbook regarding appropriate acknowledgment of sources. Students also should refer to the University of Wollongong's policy on Plagiarism available in the University Calendar (http://www.uow.edu.au/student/calendar/rules/plagiarism.html). Plagiarism is not acceptable and may result in the imposition of severe penalties.

Due date

The due date is the last date for the University to receive an assignment. All assignments must be submitted by the due dates stated in this Subject Outline.

Late submission

Penalties may be incurred for late submission of assessment tasks. It is the student's responsibility to contact the subject coordinator regarding late submission circumstances and/or extensions.

Extensions

Students may apply to the subject coordinator for an extension to submit an assessment. Applications should be submitted in writing via email BEFORE the due date. Assignments submitted more than four weeks following the last week of this subject will not be accepted without the prior approval of the program coordinator.

Medical certificates
Refer to the Faculty of Education handbook,

Future use of assignment work
Having access to the work of past students and classmates is an important resource in this program. As such we request permission to use your assignments as examples to other students. The assignment will clearly acknowledge you as the author, but all other personal details will be removed. If you wish that your work not be included as an example for future classes, please inform the subject coordinator in writing.

Assessment tasks

EDGI915 Task 1: Network-based Learning System – Technology Assessment

Due date: Week 5 – 15 August 2005
Weighting: 30%
Format and Length: Word processed – approximately 1800-2400 words + images (where appropriate)

Task Description:
Write a report of a network-based learning system that includes:

- An audit of an instance of a network-based learning system in a formal educational setting. The audit should include:
  - A description of the hardware, software and learning tools that make of the system.
  - A description of the types of learning activities that are currently implemented using the hardware/software/tools.
- A review of evaluation research of the learning system in term of effectiveness
- Recommendations to improve the system (in hardware/software/tools terms) effectiveness and/or provide opportunity to implement different learning activities.
- A justification of any recommendations with reference to appropriate research where necessary.

Submit your report via the subject website.

Assessment criteria:

	Pass >>>>>>>>>>>>>>>>Credit>>>>>>>>>>>>>>>>>Distinction>>>>>>>>>>>High Distinction		
Criteria	**1**	**2**	**3**
Knowledge	Basic understanding of major knowledge and concepts.	Beyond basic understanding of major knowledge and concepts. Identification of different theoretical and practical considerations.	Extensive understanding of key knowledge and concepts, theoretical and practical considerations and relationships among issues.
Discrimination, Research & Processing	Discrimination and use of relevant material and information. Consultation of adequate and appropriate sources	Critical analysis of source material and information rather than unquestioning acceptance and description. Use of a wide range of sources.	Capacity to evaluate conflicting interpretation and draw conclusions. High degree of precision and strength in arguments. Reflects wide information retrieval and reading. Inclusion of range of sources appropriately supports ideas and explanations.
Creativity, Initiative, Individuality of Approach	Beginning to show originality of thought and useful insight	Marked degree of originality in thought and organisation.	Creative flair and considerable insightfulness in approach to the complexity and challenge of the task.
Written Presentation, Control of Genre	Relative absence of spelling mistakes and grammatical errors. Legible, word -processed. Appropriate acknowledgment	Absence of spelling mistakes and grammatical errors. Legible, word -processed and attractively presented.	Absence of spelling mistakes and grammatical errors. Correct and consistent grammatical style. Pleasant to read

	and referencing of sources. Recognizes nature of task and responds with appropriate genre(s) (report/exposition)	Appropriate acknowledgment and referencing of sources. Demonstrates control over schematic structure genre and uses language appropriate the task (e.g., terms of technicality, definitions, audience)	Superior presentation. Appropriate acknowledgment and referencing of sources. Confident control of appropriate genre and language.

EDGI915 Task 2: Web-based Learning Activity

Due date: Part A: Design Statement Due Week 8 – 5 September 2005
Part B: Web-based Learning Activity Due Week 11 – 10 October 2005

Weighting: Design Statement - 35%
Web-based Learning Activity - 35%

Format and length:
Design statement: Word-processed document based on design statement template and of approximately 2000-2500 words + images

Project prototype: Web-based learning or knowledge management environment comprising text, images, multimedia and communication tools.

Task Description
Students will design and produce a prototype of a network-based educational project in response to a real syllabus statement and/or client brief.

This project will be developed in the context of either a K-12, tertiary or corporate environment. The project will be implemented in Janison Toolbox - a component-based learning management system - or another appropriate learning or knowledge management environment of the student's choice. For those students who wish to use Janison Toolbox, a Janison Toolbox Guide is available in the Resources/Links section of the subject website.

Part A: Design Statement
Students will develop a written statement to outline the conceptual design of a three-week learning project in line with a syllabus statement and/or client's brief. The design statement will articulate the aims and objectives of the network-based project as well as understand and serve the needs of the target users and facilitators/instructors within the learning environment. This statement will include diagrams, images and links where appropriate in order to best communicate the structure, look, feel and functionality of the system. The design statement will include reference to theoretical and empirical literature where appropriate.

The design statement should be based on the template provided and include:

- A description of the delivery context including target learners and educational or business setting
- A statement regarding the relationship to educational objectives (e.g. link to relevant syllabus statement, client brief etc.)
- An outline of the scope and schedule of the learning program and instructor/learner and learner/learner interactions
- Intended learning outcomes
- An initial site map

Part B: Project Prototype
Students will implement a prototype of the three-week network-based learning project according to their design statement and make allowances for design revisions in the process. This environment will be developed within Janison Toolbox or another learning or knowledge management environment of their choosing. If another system is used, the subject coordinator must be given access for assessment purposes.

The prototype should:

- Provide a range of appropriate activities for the learner to achieve the stated learning outcomes within a limited period of time (e.g., three weeks)
- Be realistic and achievable in view of the client brief and any other hardware or software considerations
- Include appropriate resources and support mechanisms for learners and instructors
- Be visually and pedagogically appropriate to the target learner
- Be logical and easy to navigate
- Provide clear and simple instructions to direct learner behaviour
- Include graphics and images or examples of these type of media where necessary
- Include other types of media or representations of these where necessary

Assessment criteria:
Part A: Design statement (35%)
The design statement will be assessed using the following rubric:

Understanding the Problem (/10)	Shows little insight into the learning problem. Does not describe learning context. Does not clearly define learning goals. Does not define client and stakeholder needs. **0-3.5 Marks**	Some lack of understanding of problem evident. Lacks clear definition of learning context. Learning goals unclear or insufficient. Poor definition of client and stakeholder needs. **4- 5.5 Marks**	Shows understanding of the learning problem. Indicates learning context. Learning goals defined in limited depth. Sufficient reference to client and stakeholder needs. **6-7.5 Marks**	Superior insight into the learning problem. Defines the learning context of the learning problem clearly. Defines the learning goals clearly. Superior understanding of client and stakeholder needs. **8-10 Marks**
Underpinnings of the Solution (/10)	Lacks reference to previous research. Little or no theoretical framework on which to justify the learning solution. Learning solution is illogical. Does not contextualise the project within a broader area of study/research. **0-3.5 Marks**	Some reference to inappropriate learning theory and research Solution is at times inappropriate to the client and problem needs Does not contextualise the project within a broader area of study/research. **4- 5.5 Marks**	Refers to relevant learning theory but perhaps not in great detail Builds a theoretical framework in limited detail Presents a learning solution that mostly flows from the theoretical framework and meets some client needs Evidence of contextualising project. **6-7.5 Marks**	Refers to appropriate learning theory(s). Constructs a learning solution that is the logical consequence of a robust theoretical framework and client needs. Demonstrates an eye to the generalisability of the project. **8-10 Marks**
Creativity of the Approach (/10)	Lacks ability to envision appropriate solutions to problems. Shows little understanding of how to use learning environment. Little or no understanding of the aesthetic needs of the learning design. **0-3.5 Marks**	Some ability to make appropriate solutions to problems. Some inappropriate use of the learning environment. Some misunderstanding of the aesthetic needs of the learning design. Approach is not engaging. **4-5.5 Marks**	Can envision an effective solution to the learning problem. Uses appropriate and effective ideas in exploiting the learning environment. Addresses some aesthetic needs of the learning design. Mostly engaging approach. **6-7.5 Marks**	Superior ability to envision a unique and engaging solution. Superior creative flair in exploiting the learning environment to meet leaning goals. Demonstrates a superior eye to aesthetics. **8-10 Marks**

Written Presentation (/5)		Difficult to understand. Presentation poor. Lacks understanding of genre. Little or no acknowledgement of sources. Many grammatical and spelling mistakes. **0-2 Marks**	Mostly clear. Fairly good presentation. Some lack of control of genre. Some grammatical and spelling errors. Some mistakes in acknowledging sources. **2.5-3.5 Marks**	Clear and articulate. Logical and flows well. Superior control of genre. Superior presentation. Superior attention to detail. Properly referenced. **4-5 Marks**

Part B: Project Prototype (35%)

Understanding & exploitation of the system (/10)	NBL prototype bears little or no relationship to corresponding design statement. NBL prototype does not take advantage of the system tools/features. **0-3.5 Marks**	NBL prototype exemplifies some of the ideas of the corresponding design statement. NBL prototype uses some of the features and tools of the system in a limited way. **4- 5.5 Marks**	NBL prototype exemplifies the ideas of the corresponding design statement. NBL prototype uses a range of the features and tools of the system in a limited way. **6-7.5 Marks**	NBL prototype clearly exemplifies and builds upon the range of ideas in the corresponding design statement. NBL prototype exemplifies best practice in use of system tools and features for content and activities. **8-10 Marks**
Context and content (/10)	Purely factual content included with no context or recognition of perspective or background knowledge of the target learners. Little or no resources included or linked. **0-3.5 Marks**	Content is appropriate to the topic and scope (i.e., 3 weeks) and recognises learners' background knowledge. Resources included or linked and are appropriate to the topic. **4- 5.5 Marks**	Content provides multiple perspectives and/or is linked to learners' real world contexts or issues. Resources included or linked are appropriate and demonstrate good understanding of NBL (e.g., timeliness, richness of media, provide access to information not able to be obtained elsewhere). **6-7.5 Marks**	Content is expressed in a way that is engaging to the learner. Clear, meaningful resources which have explicit relationship to the tasks required of the learners. Every resource carries its weight. **8-10 Marks**
Teaching & learning process (/10)	Explicit teaching and learning activities are not included. No evaluation or assessment criteria are described. **0-3.5 Marks**	A range of learning activities is included and appropriate to the scope (i.e., 3 weeks). Criteria of evaluation or assessment are described generally. **4-5.5 Marks**	Learning activities are relevant to the topic, clearly described, and appropriately sequenced. Criteria of evaluation or assessment are described with some detail. **6-7.5 Marks**	Learning activities allow learners to build their knowledge and contribute their own perspectives. Criteria of evaluation or assessment are described in a detailed rubric with qualitative and quantitative descriptors. **8-10 Marks**
Overall aesthetics (/5)		Look and feel do not relate to topic area. Few or no media elements. Presentation poor. Lacks understanding of genre. Many grammatical and spelling mistakes. **0-2 Marks**	Look and feel appropriate to topic. Some media elements but they do not always contribute to making connections with topic area. Fairly good presentation. Some lack of control of genre. Some grammatical and spelling errors. **2.5-3.5 Marks**	Superior look and feel for topic area. Media elements are appropriate, thematic and contribute to understanding of the topic area. Superior presentation. Superior control of genre. No grammatical or spelling errors. Superior attention to detail. **4-5 Marks**

EDGI916 Task 1: Network Learning Case Study

Due date: Week 13 – 24 October 2005

Weighting: 80%

Format and Length: Web-based case (html format) report of 2000-2400 words + images.

Task Description:
Prepare a case study of a network-based learning environment in which you are actively involved, for example, as a learner, a designer, a teacher/facilitator or a contributor. The environment you choose may involve formal learning as part of a lesson or subject, or informal learning such as a professional community. As part of your data collection you should keep a record of your own observations and experiences as a participant in the context. Analyse and investigate this particular context using the following process:

1. Select an appropriate environment. You may choose this or another subject you are enrolled in as a student, or an application of network-based learning in your professional practice. Your case may be an informal learning setting.
2. Develop a detailed description of the environment based on your own experiences and observations. Clearly describe your own role and your interaction with others. Also describe the features of the learning environment and how it supports learning through materials, activities and tools.
3. Identify a key issue, problem or question arising from the environment as the focus for further investigation. The key issue should take a teaching or learning focus (i.e., not a technical focus). Describe why it is important to this specific learning situation and how it might also be relevant to other network learning contexts.
4. Investigate the issue further by collecting one other source of data (i.e., a source other than your own observations). For example, interview or survey two other participants or analyze the online communications of the environment. Discuss your ideas with your lecturer to ensure that any ethical issues have been addressed.
5. Analyze your data and draw conclusions about the issue in relation to the case you have investigated. Discuss how your findings relate to the broader literature on network-based learning.
6. Prepare your case report. Prepare a report of your findings in which you describe the environment, discuss the issue and its importance in the case context, and consider what you have learnt about network-based learning from investigating this case. Save your report as a Web page or pages. Remember to name your main page index.htm.
7. Upload your case report as a Web page or site. Instructions on how to upload your case report will be provided in the subject web site.

EDGI916 Task 2: Facilitation of Online Discussion

Due date: Week 13 – 24 October 2005

Weighting: 20%

Format and Length: Word processed report of 1200-1600 words.

Task Description:
Facilitate an online discussion over a 1-2 week period with the class based on a key issue that you have identified as the focus for further investigation in your case study (Step 3 in Task 1). (This will serve as an additional source of data for your case study.) Facilitation should include the following process:

1. Inform class participants of the topic, format of the online discussion activity prior and date of the online discussion prior to commencement of the discussion activity.
2. Create a topic using the Forum communication tool in Janison
3. Monitor and facilitate the discussion (use a discussion strategy of your choice, eg., q
4. Conclude the discussion by posting a summary of the issues raised in the discussion.

Prepare a report of your experience in facilitating an online discussion. Include the following:

1. Describe the online discussion strategy you selected and explain why you selected
2. …..

Assessment criteria:

The case report will be assessed on the following rubric:

	High Distinction	Distinction	Credit	Pass	Fail
Clarity and completeness of the description	Sophisticated, well-developed ideas demonstrating an in-depth understanding of the case environment. Information is presented in an effective order. Presentation flows smoothly.	Ideas are clearly developed and the case report demonstrates a good level of knowledge about the context. Information in logical order with appropriate transitions through ideas and concepts.	Ideas are scattered and needs further development to demonstrate an understanding of case. Details and examples are presented, but could be better integrated to improve the flow.	The case report provides an overview that demonstrates a basic understanding of the case context. Details and examples mostly well organised. Enhancements are needed.	The case report is confusing and needs more information. Does not demonstrate a basic understanding of the case. Insufficient detail and examples; Poor flow and organisation.
Depth of analysis of case environment and	In-depth, critical analysis of the case is evident. Relationship to other contexts and/or larger scope of the subject is considered.	The case report goes beyond description, Ideas are clearly exemplified and well supported by appropriate justifications provided.	The case report begins to go beyond description with a satisfactory level of analysis and support.	A basic description that provides an overview of the environment and focus issue, but is lacking in detailed support.	An incomplete description of the case is provided. There is insufficient detail to understand the environment and focus issue.
Quality of the research approach	Data collection and analysis clearly described and justified. All findings are explained in terms of the evidence collected. Conclusions are well supported. Discussion of findings reflects wide reading and relationships drawn to larger scope of subject. Correct acknowledgement of sources.	Data collection and analysis clearly described and justified. All findings are explained in terms of the evidence collected. Conclusions are explained. A range of sources beyond that provided by the case study environment used. Correct acknowledgement of sources with some minor errors.	Data collection and analysis described and justified. Findings are explained in terms of the evidence collected. Sources relevant to the case study environment used to support conclusions. Some sources not cited appropriately.	Data collection and analysis are outlined. Findings generally linked to evidence. Appropriate conclusions are drawn. Discussion draws on a number of relevant resources. Some sources not cited appropriately.	Data collection and analysis is inadequate or not clearly described. Findings are not based on evidence. Conclusions not supported. Insufficient resources are used. Sources not cited appropriately.
Quality of presentation	Confident control of presentation genre and language. Highly effective use of web-based format. No spelling mistakes, grammatical inconsistencies or mistakes. Superior presentation and attention to detail. Functioning web page/site with no errors.	Well-developed written style. Format follows generally accepted web design guidelines. Relative absence of spelling mistakes, grammatical inconsistencies or mistakes. Relatively few errors in web page/site functioning.	Consistent written style or tone. Format appropriate for a web-based presentation. Some spelling mistakes, grammatical inconsistencies or mistakes. Presentation clear and relatively easy to follow. Minor errors in web page/site functioning.	Minor inconsistencies in written style or tone. Some spelling mistakes, grammatical inconsistencies or mistakes. Basic presentation lacking in professional polish and attention to detail. Errors in web page/site functioning.	Inconsistent written style or tone. Many spelling mistakes, grammatical inconsistencies or mistakes. Presentation inappropriate. Major errors in web page/site functioning.

Schedule

Week	Activities and key dates
1 18 July	Introductory workshop to be held in 22.107 on Monday 18th July 4:30-7:30 • Overview of subject goals • Learning design of subjects 915/6 • Assessment issues • Our community of learners model • Introduction to Network Based Learning
2 25 July	• Work through Technologies section of the website, under Topics and respond to questions. • Identify a NBL system (hardware/software/tools focus) - formal education setting - to audit (T1). • Enter your ideas in Schedule, Week 2 study guide about the NBL you will be focusing on for T1.
3 1 August	• Continue to work through Technologies section of the website, under Topics. • Continue to work on Task 1, your chosen NBL system; draft description/analysis and recommendation (T1). • Identify potential case study environment (916) and enter your ideas in Schedule, Week 3.
4 8 August	• Select literature/resources to support your analysis and recommendations and revise your report (T1). • Identify issue, problem or question to explore within your case study environment (916).
5 15 August	**Task 1 - NBL System Report Due 15th August** • Work through Theory/Pedagogy section of the website. • Identify potential client in K-12, tertiary or corporate training environment for whom to design/develop NBL activity (T2a). • Collect and review relevant background documentation (e.g., curriculum, syllabus) for NBL activity design (T2a). • Identify and review literature related to identified issue/problem/question (916).
6 22 August	• Continue to work through Theory/Pedagogy section of the website. • Interview client(s) and draft design statement (T2a). • Identify literature and resources to support design ideas (T2a). • Engage in activities of case study environment (916) and collect relevant data.
7 29 August	• Continue to work through Theory/Pedagogy section of the website. • Finalise design statement (T2a). • Engage in activities of case study environment (916) and collect relevant data. • Reflect on the T1 assessment feedback and comment in chat space on the class assessment summary.
8 5 September	**T2a Design Statement Due 5 September** • Work through Case/Evaluation section of the website. • Develop structure of NBL learning activity (T2b). • Engage in activities of case study environment and collect relevant data (916).
9 12 September	• Work through Case/Evaluation section of the website. • Develop content and activity descriptions/instructions (T2b). • Engage in activities of case study environment and collect relevant data (916). • Reflect on the T2a assessment feedback and comment in chat space on the class assessment summary.
10 19 September	• Work through Case/Evaluation section of the website. • Finalise look and feel and media elements for NBL activity (T2b). • Engage in activities of case study environment (916) and collect relevant data.

Week	Activities and key dates
Recess 26 Sept. to 3 Oct.	• Complete prototype for submission in Week 11.
11 10 October	**T2b - Web-based Learning Activity Due 10th October** • Class workshop- Present prototype to class, 22.107 4:30-7:30 (Note a mechanism for participation by off-site students will be explored) • Analyse case study data (916)
12 17 October	• Draft case study report (916). • Revise supporting literature for case study (916).
13 24 October	**916 Task 1 - Network Learning Case Study Due 24th October** **916 Task 2 - Online Discussion Facilitation Due 24th October** • Workshop, 22.107, 4:30-7:30 - Reflection of NBL, debrief and review of learning outcomes

Appendix B

Interview Protocols

(For learners)

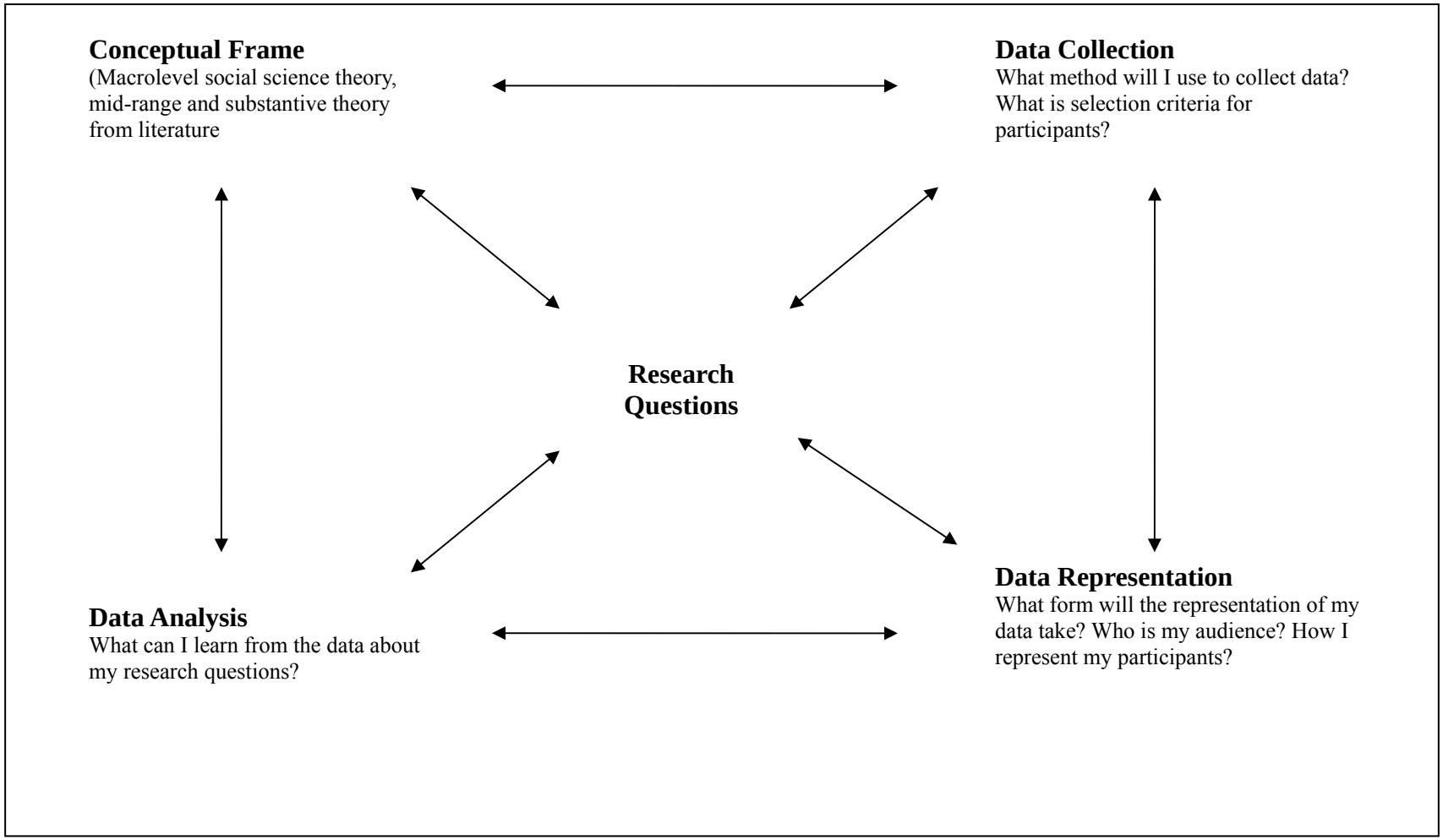
1. Tell me about the interaction experiences that have taken place in the Network-based Learning course. (chatting room & forum). Could you describe the process of interaction you experienced in more detail?
2. How did these types of interaction experiences influence your ability to complete the tasks assigned in this course?
3. What interaction activities did you spend the most time on in the course?
4. What difficulties did you experience in interacting with other learners in the course?
5. What differences have there been between the interaction experiences in this course and in other online courses you have had?
6. How did the interaction experiences influence your learning in this course? What kinds of things did you learn primarily from the interaction experiences rather than from other course activities such as readings.
7. What strategies did the course instructor use to help to make the interaction more meaningful?
8. What was the most positive aspect of the interaction experiences you have had in this course? What was the least positive aspect?
9. If you were to teach online yourself, what would you do to enhance the interaction experiences of the students in your course?
10. Is there anything we haven't talked about that you would like to add?

(For instructor)

1. Tell me about your degree of satisfaction with the learners' interactions that have taken place in the Network-based Learning course. What worked? What disappointed you?
2. Why did you choose a course design using authentic activities? Would you use this authentic approach again? Why or why not?
3. How have the interaction experiences in this course influenced the extent of learning accomplished by the students in this course?
4. What strategies did you use to help to make the interaction more meaningful in this course?
5. If you could give some advice to instructors who want to use authentic activities in their own online course, what is it?
6. What was the workload like in teaching this online course? Was it more or less than when you teach face-to-face?
7. What was the most positive aspect of this course for you as a teacher? What was the least positive aspect?
8. Is there anything we haven't talked about that you would like to add?

Appendix C

Relationship between Research Questions and Research Process



Adapted from Maxwell, J.A. (1996) *Qualitative research design: An integrative approach.* Thousand Oaks, CA: Sage.

Appendix D

Pilot Study Results

Meaningful Online Learning: Exploring Interaction

in a Web-Based Learning Environment Using Authentic Tasks

(Pilot Study)

Younghee Woo

The University of Georgia

Pilot Study

Prior to the formal research study to be conducted in the Fall Semester of 2005, a pilot study was conducted in the 2005 Spring Semester. In the pilot study, the first two research questions (i.e., What is the nature of the learner to learner interaction in an online learning environment using an authentic task?, and What kinds of strategies are being used by the instructor and other learners to promote better interactions?) were investigated. The following sections present the context, methods, analysis, and results of the pilot study.

Research Context for the Pilot Study

For this research, a case was selected purposefully based on the following criteria: the case chosen would be (1) an asynchronous web-based course, (2) a course having a task that is well-matched with the guidelines of authentic activities proposed by Herrington, Reeves, Oliver, and Woo (2004), and (3) a course in higher education. Specifically, the case in this study was a single graduate level course supported by a Web-based learning system. The learning tasks in the course were developed according to the guidelines of authentic activity (Herrington et al., 2004). The design of the course was strongly student-centered, with authentic learning tasks in collaborative settings, using integrated assessment strategies, and with learning scaffolding by instructor support. The participants consisted of instructors and graduate students involved in a master's level course, *Instructional Design,* offered online by a university in Australia. The course was held for 14 weeks and there were 12 adult students with careers as either teachers or instructional designers enrolled in the course. For these students, the Instructional Design was designed to provide them with opportunities to learn professional knowledge and skills related to their careers.

The course was delivered principally online via the Janison learning management system,

an Australian product (http://www.janison.com.au/), accessed through the university website. Interaction among students and instructor primarily took place via synchronous and asynchronous communication through e-mail, chat and discussion tools. Students were expected to access the course website on a regular basis.

The course was mainly delivered online asynchronously. Asynchronous Web-based communication was supported by discussion forums and e-mail systems that allow participants to discuss various topics throughout the course. Specially, the discussion forum messages were threaded, which means that they were linked together in a way that allows the users to follow visually the course of communication. When someone posts a message, all responses to that message are listed sequentially below it. When threaded discussions are expanded, all the messages that are related to the initiating thread can be seen at once. When the forum messages are collapsed, only the first message in a thread can be seen. At a glance, any student can see how many messages are contained in a forum as well as the status of each message with respect to being either read or unread.

Web technologies were critical vehicles for information access and communication in this course. Students were expected to have a competent level of skill in using Web-based technologies and to have access to the Internet. To support these technological requirements, an introductory face-to-face workshop was scheduled on-campus in week 1. However, attendance was not compulsory, and remote students were provided with access to presentation slides and summary notes concerning the technological aspects of the course.

The asynchronous Web-based learning system provided different features to support students learning in various ways, but of course, it was the structure or instructional design of the course that most directly afforded learners opportunities to share information, present and

critique each others' work, discuss course related issues, and reflect on the instructional design process. The goal of the course was to provide an introduction to the process of online learning design within a hands-on context. Students engaged in the design of innovative and authentic learning environments through the application of instructional design principles. Students had the opportunity to create learning environments using a range of different technologies, and to work both individually and collaboratively at a distance. In the course, students were expected to complete a group project, but students were able to choose projects to suit their own teaching or training needs, focusing on topics and media of interest to them.

This course structure was centered around three main tasks. Task 1 required exploring learning and instruction individually. For this, students choose a movie or television program that was set in a school/university and incorporated classroom scenes. They analyzed the assumptions the teacher in the film or TV show made about how students learn, and how the instruction depicted reflected those assumptions. Task 2 required students to actually engage in instructional design to create a product about instructional design. For task 2, students collaboratively designed and produced a website, a presentation or booklet for teachers and others who want to find out what instructional design is. It was a group project. Based on their interests, there were four groups with three members in each. Each group developed a product that introduced and explained a little of the history of at least three different ID models, and provided an example of a lesson plan or learning environment that exemplifies each model based on their own experiences and research. Task 3 was the most authentic learning task in this course. In Task 3, each student individually designed and produced a web-based learning environment on a topic relevant to their current teaching or interest.

For this pilot study, I analyzed six weeks (From Mar 10 to April 20) of transcripts of the

discussion forum on task 2. The analysis was focused on one group among the four groups. Task 2 was selected for three primary reasons. First of all, during task 2, online interaction occurred most actively. All 152 postings were associated with task 2. Among them, 75 postings (12,039 words) of one group were analyzed. The selected discussion group was based on the amount of data provided by the group making it an 'information-rich case' (Patton, 2002). Second, the task was well matched with the following 10 guidelines of authentic activities proposed by Herrington et al. (2004):

1. Authentic tasks must have real-world relevance.
2. Authentic tasks must be ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity.
3. Authentic tasks must comprise complex activities to be investigated by students over a sustained period of time.
4. Authentic tasks must provide the opportunity for students to examine the task from different perspectives, using a variety of resources.
5. Authentic tasks must provide the opportunity to collaborate.
6. Authentic tasks must provide the opportunity to reflect and involve students' beliefs and values.
7. Authentic tasks must be integrated and applied across different subject areas and extend beyond domain-specific outcomes.
8. Authentic tasks must be seamlessly integrated with assessment.
9. Authentic tasks must yield polished products valuable in their own right rather than as preparation for something else.
10. Authentic tasks must allow competing solutions and diversity of outcomes.

Task 2 had real world relevance for students working as teachers or instructional designers. The task was also ill-defined so that students had to spend much time defining the task. Students collaborated with different perspectives, and at last, after six weeks, they developed one product for other teachers and people who are interested in Instructional Design. Third, the group members had both homogeneity (e.g., they have the same need in terms of improving their ability to design and develop effective online learning environments) and diversity (e.g., they have various technology experience, Web-design and development skills, and Web-based learning experience). Both similarities and differences of the participants are important for the process of interaction. At the beginning of the task, group members did not know each other well, but they quickly became intensely engaged in the task and contributed many, lengthy, deeply thoughtful remarks to the discussion.

Data Analysis

In analyzing the pilot data, two different approaches, content analysis and discourse analysis, were employed. In the original intention, content analysis was the main analysis method. However, after reviewing several content analysis models and analyzing the data using two representative models among them, the content analysis approach was found to be not sufficient for exploring the nature of interaction processes in the Web-Based Learning Environment (WBLE) based around the structure of an authentic task. Therefore, to complement the weak points of the content analysis, a discourse analysis approach was applied again. Figure 1 summarizes the two analysis approaches.

Figure 1

Content Analysis Approach. Content analysis is a generic name for a variety of textual analyses that typically involves comparing, contrasting, and categorizing a set of data (Schwandt, 1997). Several researchers have developed models and tools to facilitate this analysis in online

interaction (Bales, 1950; Gunawardena, Lowe, & Anderson, 1997; Henri, 1992; Johnson & Johnson, 1996). To analyze the transcripts of the discussion forum, first of all, several research studies related to different analysis models were examined as shown in Table 1.

Table 1

Henri (1992) proposed a content analysis method to assess learning processes. The unit of analysis is meaning but no clear criteria are presented. A five level analytical model is proposed in which the participative, social, interactive, cognitive and metacognitive dimensions of the learning process are studied. These skills assess the thought process of the individual participant in a computer conference. However, there is a difficulty in differentiating between units of meaning that are coded across the cognitive and metacognitive dimensions.

Gunawardena, Low, and Anderson (1997) introduced a thoughtful model of analysis to assess the social construction of knowledge and collaborative learning. The model is made up of a five phase evolution of negotiation leading to the co-construction of knowledge. In this model, online interaction is understood as the production of new knowledge or the understanding of meaning. The unit of analysis was the message. The model has a more discernible focus on the social aspect of learning. The first three phases - sharing/comparing, dissonance, and negotiating - must take place in a social context. However, the final two stages – testing and application – can certainly occur on an individual level.

Kanuka and Anderson (1998) were interested in understanding and assessing the learning that occurred during an online forum. For this, they undertook a multi-instrument analysis using a survey to assess the perception that students have about their learning, semi-structured telephone interviews to better understand the students' experiences, and transcript analysis using the Gunawardena, Low, and Anderson model. The unit of analysis was message. They also used

grounded theory data analysis methods to study interaction. Based on their analysis results, they concluded that the interaction analysis model developed by Gunawardena et al. used to analyze the data for evidence of knowledge construction was a useful preliminary tool for transcript analysis. However, they also acknowledged that the model needed more explicit boundaries between phases. A limited number of exchanges showed evidence of movement from phase one up through the higher phases.

Hara, Bonk, and Angeli (2000) explored how electronic environments encourage higher-order cognitive and metacognitive processing, using Henri's model. However, because they realized Henri's model is somewhat ambiguous for capturing the richness of online discussion in a clear manner, they added several categories and examples to her framework. In addition to that, they combined Howell-Richardson and Millar's visual representation of message interaction. They created weekly forum activity graphs illustrating the associations between online messages. The unit of analysis was a paragraph or idea. The analyses showed that students' messages were lengthy, cognitively deep, and embedded with peer references. However, they suggested modifications of Henri's model and the application of a qualitative method to better understand the impact of online discourse.

Fathy, Crawford, and Ally (2001) developed a tool, Transcripts Analysis Tool (TAT) to identify the patterns of computer-mediated interaction. The TAT classifies discourse according to the following categories: vertical questioning, horizontal questioning, statements, reflections, and scaffolding.

Garrison, Anderson, and Archer (2001) proposed a practical inquiry model, which focuses on four processes of educational experiences: triggering event, exploration, integration, and resolution. Through the processes, the model reflects the critical thinking process and the

means to create cognitive presence.

Based on the review results, Henri's (1992) model and Gunawardena, Low, and Anderson's (1997) model were applied to analyze the pilot data because those two models have already been established as useful preliminary tools for transcript analysis and they have relatively detailed guidelines to analysis.

Discourse Analysis Approach. However, analyses using the models of Henri (1992) and Gunawardena, Low and Anderson (1997) did not clarify the interaction processes and strategies occurring while using an authentic task, the purpose of this research, in a satisfactory way. Henri's model focuses more on some cognitive characteristics of each specific message rather than the overall process of how interaction occurs related to learning. The model of Gunawardena, Low, and Anderson seems more appropriate in analyzing descriptive knowledge or concepts. But in this forum, much the discussion on problem solving process and methods seemed to have occurred. This led to an expansion of the investigation to include a discourse analysis methodology.

Discourse analysis has an analytic commitment to studying discourse as texts and talk in social practices (Potter, 1997, p.146). Discourse analysis is empirical, that is, it is sequential, distributional, and predictive. It assumes that discourse is interactive, sequentially situated, and is guided by relationship among speaker intentions (Davis & Brewer, 1997). Discourse analysis is interested in content but its aim is to go beyond content to see how it is used flexibly to achieve particular functions and effects (Wood & Kroger, 2000). Discourse analysis differs from content analysis in that content variables are not predetermined and fixed but evolve in iterative readings of the text. The unit of analysis is of variant length spanning sentences, paragraphs, pages, even whole texts (Davis & Brewer, 1997; Potter, 1997). Because discourse analysis involves much

more than coding and the assessment of relationships between coding categories, it can provide a sort of sensitive and penetrating analysis (Wood & Kroger, 2000).

The analysis procedure was guided by Gill's (2000) discourse analysis procedure including reading and interrogating the text, choosing text for in depth analysis, and open coding. In addition to that, I used a constant comparison approach which involved sorting the textual record of online postings into thematic categories and subcategories. Merriam (1998) described the comparison processes:

> The researcher begins with a particular incident from an interview, field notes, or document and compares it with another incident in the same set of data or in another set. These comparisons lead to tentative categories that are then compared to each other and to other instances. Comparisons are constantly made within and between levels of conceptualization until a theory can be formulated (p.159).

Findings

The Findings through Content Analysis

Henri's Model. This part described the application of Henri's model of content analysis (Henri, 1992) to explore the quality of online interaction occurring during the process of solving an authentic task. Henri's model is grounded in a cognitive view of learning focusing on knowledge and skills (McKenzie & Murphy, 2000). In Henri's model, the online interaction can be analyzed according to five dimensions: participative, interactive, social, cognitive and metacognitive (see more details in Appendix I). Because the main focus of this research is to determine how meaningful the online interaction is in student's learning, the analysis was mainly conducted across the cognitive and metacognitive dimensions.

First of all, all postings were divided into a message unit as per an idea. Then each message unit was classified according to the categories defined by Henri (1992). In particular,

the message units defined as relevant to the content of the subject were carefully classified according to the cognitive and metacognitive dimensions.

From 75 postings, a total of 93 message units were defined. Only two messages on the first day were social in nature. Three postings were either questions or answers about the use of technology needed to access the discussion forum. The majority of postings (93%) were related to solving the task.

Table 2.

Table 2 shows a breakdown of these message units into the levels of reasoning skills and information processing categories, expressed as a percentage of the total number of message units. Students were most engaged in proposing or seeking strategies to coordinate actions for solving the task. They also spent much time clarifying and seeking specialized information for defining and accomplishing the task. These results reflect the way in which the students used the online discussion forum to collaborate with one another in accomplishing the task.

Henri (1992) said the learning process is influenced by the level at which information processing occurs. In this authentic task learning context, the deep information processing (62%) occurred more often than the surface processing (29%). Students elaborated their ideas with examples and tried to persuade other students with specialized resources or their own research results. Messages classified as evidence of surface level processing involved mostly scheduling comments.

Table 3

During the discussion, students actively commented on one's manner of accomplishing the task, and tried to set up and regulate the overall process.

The model of Gunawardena, Low and Anderson. This part focuses on understanding and

assessing the learning that occurred in an online forum used to accomplish an authentic task in collaboration using the constructivist interaction analysis model developed by Gunawardena, Low and Anderson (1997). The model describes the construction of knowledge as it moves through five phases: Sharing/comparing information, Discovery and exploration of dissonance among ideas, concepts or statements advanced by different participants, Negotiation of meaning/Co-construction of knowledge, Testing and modification of proposed synthesis, Phrasing of agreement, statement, and application of the newly constructed meaning. Each phase also has its own sub-phases (see more detail in Appendix II).

To make sense of the data, the postings from the online discussion were unitized and categorized. In the unitizing process, all data were reorganized into related topics and responses. To categorize the postings, each posting was analyzed and assessed based on the interaction analysis model and then each posting was placed in one of the phases. I used a message as a unit of analysis (total 99 units). The analysis procedure consisted of reading each message and assigning it to one phase. A message that contained two or more distinct ideas was coded in two or more phases. Frequencies were then calculated for each of the code. After the postings had been categorized, I observed patterns and processes that had emerged in the analysis.

Table 4.

As Table 4 shows, the majority of postings occurred at Phase I. However, it does not mean that the discussion with an authentic task just remained at the lower phase of the interaction analysis model. The types of sharing communications in which the learners engaged seemed necessary to solve the assigned task. To accomplish the task, students exchanged many opinions, and they defined the task and how to solve it through the back and forth procedures of asking and answering. In addition to that, they shared some individual research results with one another. During the process, they showed some disagreement with other people's thoughts. When the

conflict with some thoughts occurred, they tried to negotiate a solution to the disagreement situation. And then, based on the compromised direction, they again shared a lot of ideas and resources. Through several of those processes, at last they accomplished the task and demonstrated phase V at the end of the discussion as you can see in Anne's message: "I was confused about learning theories and ID models at first, but now I find learning theories focus more on learning process, like the function of memory...but ID MODELs are the way you give instructions in task 2..."

The Findings through Discourse Analysis

In the discourse analysis, the research questions guided the analytic process. Research questions are one strategy that can be used to organize and manage research data. This is particularly useful for qualitative research where data related to a particular research question are not always found packaged together in exactly the same manner across different data sources (Coffey & Atkinson, 1996).

Using discourse analysis, I reassessed and then re-categorized the postings to investigate the idea that online interaction in asynchronous web-based course using authentic task may be uniquely suited to fostering meaningful interaction and constructivist learning. I traced how the students interacted to accomplish the authentic task, and what meaningful experiences they had in their learning.

In a preliminary analysis, two major categories were identified about learners' interaction in WBLE using authentic task: the process of online interaction and the strategy for improving the quality of the interaction. And then, each category was divided into more specific themes. Table V shows the themes.

Table 5

As Table 5 shows, the analysis of the transcript of the online discussion forum showed a detailed picture of interaction occurring in a WBLE structured around an authentic task. I explore each of the main categories and themes in the section that follows.

The Process of Interaction.

The interaction process in WBLE using authentic task showed the very same process of constructivism's problem based approach (i.e., research, integrate information, compromise dissonance, solve new problem and create new knowledge). Students interacted with one another more in defining the task, solving the process and the method (i.e., what is the task?, how to solve it?, how to allocate responsibilities?, and what should final product look like?) than in understanding specific concepts. In the process category, the four main themes including getting into the task, defining, accomplishing, and synthesizing were identified.

Getting into the Task. First of all, the students accessed their own group that the instructor had already divided based on the students' interests. This course was a totally online course and the group members had never met before. So, they started the discussion with short greeting messages. Among the messages, there was one interesting question that occurred because of the characteristics of asynchronous online course. Dana asked Terry the following question: "Hey there! sorry to ask, Terry, but I'm not sure if you are male or female from your name (not that it matters- but I was going to write "hey girls" and I realized I wasn't sure!" The message made the atmosphere of the online forum more friendly and they often used 'hey girls' as a starting title after Terry made it clear she is female. However, the message related to the greeting was extremely short (just two sentences), and the students quickly changed the topic to the related task like this "It's nice to work with you! When will we start?"

After short greetings, they tried to select one among three task options based on their

interests and abilities. They preferred option 2 (i.e., PowerPoint presentation as a mode of the final product). But one student didn't know how to use it, so, in this situation, they showed an active mutual cooperation.

> … Are you good at putting together PowerPoint presentations? I'm not too good at it. I'm not even sure whether you can combine 3 different PowerPoint presentations. Do you know?... (Terry) … I would like to work as a PowerPoint maker … (Anne) … I'm happy for you to do the PowerPoint. Will you also research one of the models? Because you'll be doing extra work on the PowerPoint presentation, I'm happy to contribute in a different way. Maybe I could edit our texts in Word … (Terry)

As shown, they got into the task quickly but smoothly.

Defining Task. After deciding the option, they started defining the task in a detailed manner. They seriously discussed on what is the task and how it can be accomplished. Usually, one person posted her own ideas or thoughts first, and then other students added other thoughts or revised the first thought. Through those interactions, they generated their own strategies for defining the task and working out a solution. For example,

> … since there are 3 models so each of us can be responsible for one model, and then if you prefer to edit our texts that will be great! … (Anne) … as a start let's each investigate one model plus some introductory history of ID … (Terry) … I am thinking that it is possible to introduce the three learning theories, as behaviorism, cognitivism, and constructivism, - probably mentioning original theorist, basic principles... then go on to talk about ID theories based on each model? ... (Dana) … I think maybe we should do a chart which compares all three … (Terry)

During the process, students were very flexible and had open minds in accepting other people's

ideas and revision conducted by other students. However, sometimes, they experienced conflict or a confusing situation. When they faced it, they preferred to ask the instructor rather than to solve it by themselves. For example, Terry stated: " That's the area I'm a bit confused by also. I have come across cognitive apprenticeship as being part of a constructivist approach. I don't know what models would be strictly cognitivist. I think it would be good if you put this question in the main task 2 forum so the instructor can answer it."

Based on their understanding of the task, they divided responsibilities considering each person's experiences and interests. For example, Terry mentioned: "My ID work is mostly within the constructivist framework, so I can provide an example of a constructivist learning object." As Masters level students with full time jobs (as a teacher or instructional designer), they all had their own rich experiences from which to draw. Students showed respect for each other's opinions and backgrounds. For example, Dana stated: "Terry, with your background, do you have anything to add in the way of current examples, not necessarily from literature? Do you think we need real life examples (i.e., school currently attempting to maintain a democratic environment for constructivist)?"

To collaborate effectively with each own responsibility, they made a timeline together. Because they are students with fulltime jobs, they were careful in arranging schedules without overlapping their work schedules.

Accomplishing Task. Their interaction to solve the task began by sharing individual resources and individual research results. In posting individual research results, the postings were usually long and in detail. Eleven postings each with average of 700 words among 75 postings were about sharing the individual research results. The content was related to students' summaries of other experts' research studies as they understood them. When a student

experienced some difficulties in finding good resources related to the task, she asked other group members whether or not they had one. If anyone had the resource or her own thoughts about that, she shared it willingly. For example,

> Dana: hey girls, if either of you come upon multiple perspectives relating to behaviorism I would appreciate it if you could pass on the info, ill do the same if I find anything useful for you! Thanks
>
> Terry: Dana, I've only come across multiple perspectives in regard to constructivism. In fact I think it's one of the main differences between constructivism and behaviorism, that behaviorism considers there is one objective truth.

However, they did not exchange any criticism or constructive feedback on other students' research results. They just appreciated and accepted them.

On the other hand, they showed some argumentation and dissonance in how to put together the individual research results for the final product. To compromise, they took two main actions. One was re-clarifying the original task and the other was asking the instructor's opinion.

When they face the situation at first, they tried to solve it through clarifying the original task again. For example, Data stated: "Can I clarify a few things about your opinions of what we should do to meet the criteria in the syllabus..." Based on the clarification, they made a structure for a final product again, and re-organized their work with the structure. However, when they met the similar situation again, they preferred to ask the instructor rather than solve it by themselves as you can see from Anne's message: "today I received a letter from the instructor and she said we should design the teaching plan ourselves so we have to …"

Synthesizing Tasks. After solving the dissonance situation, they started making the final product. As they decided at the beginning stage, one person edited the text, and the other two

students made PowerPoint material. However, I could not see the detailed process on this discussion forum because they mainly communicated through MSN chat or a face-to-face meeting at this point. After the meeting, they shared and confirmed the results with one another on the online forum. This is the message Dana posted after finishing a meeting with Anne: “hey Terry, Anne and I met today for a few hours and talked about our project, we looked at all the material we have and tried to determine a structure to put it all together. Here is our suggestion …”

As you can see in the whole process, the nature of the interaction was totally task focused and active.

Strategies Used to Improve the Interaction

Collaborating with Each Own Role. To accomplish the task more effectively, the group members divided responsibilities with one another, which helped to improve the quality and quantity of the interaction that occurred while solving the task. Because they had the same objective, accomplishing the task, with shared responsibilities, they had to check and often ask about each other’s progress and thoughts, and tune their own work in the way of making a harmony with the work done by others as well as they had to share individual research results and resources with one another. Therefore, they participated actively and regularly in the interaction process even without the instructor’s direction or required posting number. In addition, because the task could not be accomplished alone, they encouraged and pushed one another. For example, the following is an example of Terry’s message sent to Dana

> … My info has not been condensed nearly enough yet. I'd like to see your info and Anne's too, as I think the exchange and collaboration is what the instructor was after, not just sticking together three separate bits of work. I'd like us to chat about all our findings,

so hoping you and Anne can upload or attach yours too and then we could all chat …

Those messages motivated the two other students, and then, they exchanged their own research results and thoughts more actively.

Making Plans. Before starting to work together in earnest after finishing their individual research, the students made a plan including a rough timeline. The following is an example:

> Tuesday 12 Info uploaded by all of us. Wednesday 13 Responses to this info uploaded by all of us. Thursday 14 and Fri 15 Someone (Dana? me?) to compile all info into a word doc and produce rough draft 1. Fri 15 Word doc emailed to everyone or attached here. Sat 16 or Sun 17 Chat at time convenient to everyone about any changes required to word doc. Draft 2 produced and final edit done (by whoever didn't do draft 1)and emailed/attached. Mon 18 and Tues 19 Anne to create Powerpoint presentation from word doc and attach/email. Wed 20 Feedback to Anne from Dana and Terry. Thurs 21 Any required modifications made...

It also helped to improve their interaction. Based on the plan, even though it was not so detailed, they could keep pace with one another, and it could prevent them from losing focus in their interaction. It made possible more in-depth and meaningful interactions focused on the task.

Adding Complementary Communication Channel. While accomplishing the task, they used not only the main communication channel, asynchronous discussion forum, but also some complementary communication channels including e-mail, MSN chatting, and face-to-face meeting. When they had some urgent message, they used the MSN instant messenger. When they had some serious or more in-depth discussion, they met face-to-face. Nobody including the instructor recommended meeting face-to-face or using instant messenger before the class. However, the group members realized that using only asynchronous forum was not good enough

for their in-depth interaction. Fortunately, they all were using MSN instant messenger, and were living in same city. They used the complementary channels appropriately, and it helped timely interactions and made up for the weak points of asynchronous interaction.

Discussion

Through this study, a process of interaction occurred in WBLE using authentic task and several strategies for the design of meaningful online interaction were identified. As a result, implications for improving the quality of online interaction and for further research efforts are evident.

According to the discourse analysis, the process of interaction in WBLE using authentic task took the form of a problem solving process. Through the interaction of pursuing solutions to problems, designing plans, gathering information, drawing conclusions and communicating findings to others, students were engaged in an authentic problem-solving process requiring a variety of skills. During the process, learners engaged in defining the task, generating ideas, sharing resources and perspectives, negotiating, and synthesizing individual's thoughts. When they faced some confusions or conflicts, they argued with one another at first and then they tried to negotiate to solve the situation. In social constructivsm learning theory, when learners engage in social and internal negotiation focused on a real task or complex problem, the interaction is meaningful. Therefore, we can say the interaction occurred in the WBLE using authentic task is meaningful. However, a question remains: Was it meaningful enough? The interaction was primarily focused on the task per se rather than the learning the task was intended to foster.

In such an authentic task context, meaningful interaction should include responding to questions, thinking deeply, arguing against points, adding to evolving ideas, and offering alternative perspectives with one another (Driscoll, 2000; Jonassen et al., 1995; Lapadat, 2002;

Lave &Wenger, 1991). Discourse analysis revealed that these higher level cognitive interactions were minimally present in this part of the course because students were focused on getting the task done in the most efficient manner rather than in engaging in deep levels of argument and reflection about the content of the task, i.e., learning theories, instructional design models based upon the theories, their relative advantages and disadvantages, and so forth.

However, to understand how meaningful the interaction in the individual learner's intellectual growth is, we need to listen to learners' and instructors' thoughts about their experiences in the WBLE using an authentic activity. Perhaps they were engaged in deeper level of cognition about the content of the task, but simply did not express these reflections in the discourse. Accordingly, at the formal research, I will add some in-depth individual interviews. I will ask individual participants questions about their interaction experiences in this course. I will also ask the instructors questions about their teaching activities and their observations of students' interaction.

Social constructivists, drawing on the work of Vygotsky (1978), have suggested that learning environments should involve 'guided interaction' and emphasized the role of the instructor for providing the necessary guidance (Berge, 2002). The level of interaction among online learners is influenced heavily by the structure of the course and strategies employed (Hackman & Walker, 1990; Vrasidas & McIsaac, 1999). Therefore, many research studies have been conducted to find good strategies; however, most of them are focused on instructors or instructional designers' perspectives without including real case studies. Thus, online learning environments and interaction activities are often the creation of instructors' and designers' imaginations (Herrington et al., 2004).

While it is a small step, good strategies to improve learners' online interaction were

made a little clearer through this study. In the process of the interaction in WBLE using authentic task, learners collaborated with divided responsibilities, made plans before action, and used various complementary communication channels. They helped to increase and improve learners' online interaction. Therefore, we can say if those three strategies are used appropriately, the quantity and quality of online interaction can be increased. However, to be used in other courses, more detailed guidelines and research that analyzes the effectiveness of the strategies are needed. Moreover, it is also necessary to investigate the learners' and instructors' perceptions of interaction and good strategies in web-based learning, and on the basis of their perceptions, to develop more effective strategies for designing meaningful interaction activities in web-based learning environments.

By consulting the research results of the formal study, it is hoped that instructors and learners can have a clear picture of successful online interaction and learning. On the basis of their understanding, they may design and operate their own strategies more effectively. As another small step, through the formal research, I will try to capture more detail on how the strategies are used, and what are learners and instructor' perspectives on the effectiveness of the strategies.

As online learning continues to gain popularity and acceptance in higher education, researchers are turning their attention to search for evidence of learning (Garrison, Anderson, & Archer, 2001; Gunawardena, Low, & Anderson, 1997; Kanuka & Anderson, 1998). But there are major concerns about the focus of the methods developed to analyze those networked interaction (Campos, 2004). A common method for interpreting the data culled from asynchronous forums, which is usually a transcript of the discourse, is the quantitative process of counting and coding messages, sentences, or conversation threads, and scrutinizing these units of analysis for

emerging discourse patterns (Hara et al., 2000). To date, there are few notable studies that indicate the ability of these methods to demonstrate a relationship between online communication and learning. As you can see in the data analysis and findings sections, simply applying pre-established models or codes may result in only partial success, failing to examine the learning process extensively. To truly understand the complexities and meaningfulness of the interaction of online communities of practice, we must use in-depth qualitative research methodology as well as content analysis. That's why I additionally applied the discourse analysis method. However, the discourse analysis method comparatively takes much more time because there are no clear guidelines and procedures to consult on conducting analysis. Even though I learned a great deal through the trial and error method during the pilot study, for formal study, more in-depth studies on the analytical method are needed.

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Table 1.

Research related to Content Analysis Models

Researchers	Research Purpose	Unit of Analysis	Analysis Model	Published Journal
Henri (1992)	To propose a content analysis method to assess learning processes	Meaning	Developing a five level analytical model including participative, social, interactive, cognitive and metacognitive dimensions	*Collaborate learning through computer conferencing: The Najaden papers*
Gunawardena, Low, and Anderson (1997)	To introduce a model of analysis to assess the social construction of knowledge and collaborative learning.	Message	Developing a five phase evolution of negotiation leading to the co-construction of knowledge: Sharing/comparing information, Discovery and exploration of dissonance, Negotiation of meaning/Co-construction of knowledge, Testing and modification of proposed synthesis, Phrasing of agreement, statement, and application of the newly constructed meaning	*Journal of Educational Computing Research*
Kanuka and Anderson (1998)	To understand and assess the learning that occurred during an online forum	Message	Using the model of Gunawardena, Low and Anderson complemented with ground theory	*Journal of Distance Education*
Hara, Bonk, and Angeli (2000)	To explore how electronic environments encourage higher-order cognitive and metacognitive processing	Paragraph or idea.	Using a transformed Henri method	*Instructional Science*
Fathy, Crawford, and Ally (2001)	To understand patterns of computer-mediated interaction	Sentence	Developing a tool named TAT (Transcripts Analysis Tool)	*International Review of Research in Open and Distance Learning*
Garrison, Anderson, and Archer (2001)	To introduce a practical approach to assess the nature and quality of critical discourse and thinking in a CMC	Message	Developing an inquiry model, which focuses on cognitive presence	*American Journal of Distance Education*

Table 2.

Cognitive Dimension

Dimension	Category	Level	Message Unit
Cognitive Skill	Reasoning Skills	Elementary clarification	1 (1%)
		In-depth clarification	14 (15%)
		Inference	7 (7.5%)
		Judgment	2 (2%)
		Strategies	24 (26%)
	Level of information processing	Surface	27 (29%)
		Deep	58 (62%)
		Unclassified	8 (9%)

Table 3.

Metacognitive Dimension

Dimension	Category	Level	Message Unit
Metacognitive	Knowledge	Person	1 (1%)
		Task	
		Strategies	1 (1%)
	Skills	Evaluation	11 (12%)
		Planning	2 (2%)
		Regulation	11 (12%)
		Self-awareness	9 (10%)

Table 4.

The results based on the model of Gunawardena, Low and Anderson

Phases	Message unit
Phase I. Sharing/Comparing of information	76 (77%)
a. Observation or opinion	26 (26%)
b. Agreement	8 (8%)
c. Corroborating examples	9 (9%)
d. Asking and answering	20 (20%)
e. Definition, description, or identification of a problem	2 (2%)
f. Unclassified (sharing resource or research results)	11 (11%)
Phase II. Dissonance	9 (9%)
Phase III. Negotiation/Co-construction of knowledge	9 (9%)
Phase IV. Testing tentative construction	0
Phase V. Application of newly-constructed knowledge	5 (5%)

Table 5.

Emerging themes of interaction in WBLE using authentic task

Categories	Themes	Indicators
Process	Getting into task	Greeting Selecting a task option
	Defining	Clarifying the task - What is the task - How can it be accomplished (structure, direction) Allocating responsibilities (based on individual experiences and interests) Scheduling (timeline, how to collaborate)
	Accomplishing	Sharing personal resources Sharing individual research results Tuning dissonance - Re-clarifying the task - Asking instructor's opinion
	Synthesizing	Making final product Sharing final product
Strategy	Collaborating with divided responsibility	Allocating tasks Encouraging and criticizing with one another Giving and taking individual research results and feedback Solving difficulties and confusions together
	Making plans	Making work plan together Deciding and following timeline
	Adding complementary communication channel	MSN chat Email Face-to-face meeting

Figure 1.

The processes of the analysis

Content Analysis	Discourse Analysis
- Reviewing analysis models - Adopting two structured models (Gunawardena et al., Henri) - Tracking the rate of participation - Setting up and archiving thread - Allocating posting into appropriate units based on the models - Calculating - Presenting the findings	- Read and re-read the archived thread - Interrogating the text - Choosing text for in depth analysis - Open coding with a constant comparison approach - Interpretation - Presenting the findings

Pilot- Appendix A

Henri (1992) developed a cognitive analysis model for online interaction. She identified five key dimensions for analysis of online discussion: participation rate, interaction type, social cues, cognitive skills, and metacognitive skills and knowledge.

The Analytical Framework

Dimension	Definition	Indicators
Participative	Compilation of the number of message or statements transmitted by one person or group	Number of messages Number of statements
Social	Statement or part of statement not related to formal content of subject matter	Self-introduction Verbal support 'I'm feeling great…"
Interactive	Chain of connected messages	"In response to Celine…" "As we said earlier…"
Cognitive	Statement exhibiting knowledge and skills related to the learning process	Asking questions Making inferences Formulating hypotheses
Metacognitive	Statement related to general knowledge and skills and showing awareness, self-control, self-regulation of learning	"I understanding …" "I wonder … "

Henri, F. (1992). Computer conferencing and content analysis. In A. Kaye (Ed.), *Collaborate learning through computer conferencing: The Najaden papers* (pp. 117-136). Berlin: Springer-Verlag.

Pilot - Appendix B

Interaction Analysis Model:
Examining Social Construction of Knowledge in Computer Conferencing

Phase I: Sharing/Comparing of Information

a. A statement or observation or opinion
b. A statement of agreement from one or more other participants
c. Corroborating examples provided by one or more participants
d. Asking and answering questions to clarify details of statements
e. Definition, description, or identification of a problem

Phase II: The Discovery and Exploration of Dissonance or Inconsistency among Ideas, Concepts, or Statements

a. Identifying and stating areas of disagreement
b. Asking and answering questions to clarify the source and extent of disagreement
c. Restating the participants' position, and possibly advancing arguments or considerations in its support by references to the participants' experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate point of view

Phase III: Negotiation of Meaning/Co-Construction of Knowledge

a. Negotiation or clarification of the meaning of terms
b. Negotiation of the relative weight to be assigned to types of arguments
c. Identification of areas of agreement or overlap among conflicting concepts
d. Proposal and negotiation of new statements embodying compromise, co-construction
e. Proposal of integrating or accommodating metaphors or analogies

Phase IV: Testing and Modification of Proposed Synthesis or Co-Construction

a. Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture
b. Testing against existing cognitive schema
c. Testing against personal experience
d. Testing against formal data collected
e. Testing against contradictory testimony in the literature

Phase V: Agreement Statement(s)/Applications of Newly-Constructed Meaning

a. Summarization of agreement
b. Applications of new knowledge
c. Metacognitive statements by the participants illustrating their understanding and that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference interaction

Gunawardena, L., Lowe, C., & Anderson, T. (1997). Interaction analysis of a global online debate and the development of a constructivist interaction analysis model for computer conferencing. *Journal of Educational Computing Research, 17*(4), 395-429.

Appendix E

Sample of the Data Analysis

Example of the data analysis in chat room

Excerpts	Code	Themes	Category
Aug 1, 19:36 ~ 19:43			
Susan> Have you noticed that I've placed 3 examples of past students' Task 1 for you to look at in Resources/Links	Providing examples	Scaffolding	Nature
Susan> I hope these are helpful.			
Susan> have you all got a network based learning environment to focus on for Task 1?	Checking learners' status	Scaffolding	
Hong> yes, I read them			
Maria> Hello all, i have posted my ideas for the audit, but i only see my memo. Also i have had trouble adding my definitions to the glossary...	Tech-help asking	Scaffolding	
Peter> Susan, I'll start if you loke. I would like to do Task 1 based on the use of the school network where I work for learning. This may be different from others, but more relevant and useful for me	Clarifying task Relationship-career	*Defining task* Authenticity	*Process*
Kara> I'm starting to work through them.	Clarifying task	*Defining task*	
Susan> Peter - this is great		Means to an end	
Peter> Great that gives me confidence			
Shirley> Maria - I've looked at Week 2 and can't see anyone ideas for their NBL environment	Asking –others' support	Facilitation	Strategy
Hong> Susan, can I write about this class (because all my attempts to audit the other classes fell through.)	Clarifying tasks	*Defining tasks* Means to an end	
Peter> Could a survey of teacher/student use be relevant as part of the audit?	Clarifying task Tech-help asking	Scaffolding	
Hong> Susan, I also posted my idea, but I didn't see anyone else's either	Clarifying task	*Defining task* Means to an end	
Susan> Hong - that would be fine - in fact you can give your perspective of how you are experiencing this subject completely online. The only limitation is that you have only 4 weeks experience of the class to focus on	Clarifying task		
Maria> I thought that i'd like to do 915/916 Janison LMS. I thought i'd like to add an instructors view point on how they percieve the learner learns and on how easy it is to set up etc: Still just thinking, but wouldthis be ok	Tech-help answering	Scaffolding	
Maria> In regards to the memo: I can see mine- but i just posted it before the chat			
Peter> I think that we are all getting used to this system			
Aug 8, 20:08 ~ 20:13			
Kara> I think it's a good idea to relate this study as much as you can to your work.	Relationship-career	Authenticity	Nature
Peter> My wife is also studying through Monash and it is tempting to compare this system with theirs	Sharing-personal story	*Getting into*	

Kara> Otherwise it all gets a bit overwhelming	Relationship-why	Authenticity	
Kara> Your wife is studying a Masters in online learning as well?	Relationship-real life	Authenticity	
Peter> I want this course to be useful so I relate it to my work whenever I can	Sharing	*Getting into*	*Process*
Kara> I have a good friend who is studying this course at UTS and sometimes we compare note.	Sharing		
Peter> Yes, she is doing it flexibly online, but they post out copies of papers to read	Sharing		
Peter> She is doing a masters, but not this course	Sharing-career background		
Peter> What do you do	Relationship-career & task	Authenticity	
Kara> I work for a company called LAMS international.			
Peter> I must have met you in other subjects			
Kara> It's a new net-based e-learning software. So perfect for this course.			
Sep 19, 20:19 ~ 20:33			
Rainbow> Peter, I am actually design a course for my "future" students. I will use it when I go back to teach in 2 years.	Sharing-individual task	Authenticity *Accomplishing task*	Nature
Rainbow> I have my students on my mind when I am doing it -- their English level, interest, etc.			*Process*
Kara> Peter - do you mean 3 weeks worth of work to be delivered in the classroom? Or 3 weeks worth of work in blended mode? Do you have access to computers i n the classroom?	Check other's work	Means to an end	
Peter> Rainbow are u using Janison	Check other's work	*Accomplishing task*	
Rainbow> Susan, I also found I am not able to approve photo uploaded by my dummy student account. (I think that's also because of my "student" status.	Tech-help asking	Scaffolding *Accomplishing task*	
Rainbow> Peter, yes, I am using Janison.	Sharing-individual task	Means to an end *Accomplishing task*	
Helen> I'm designing a course that would have filled a gap in a curriculum I taught last year.			
Peter> Kara all my lesson are in the computer room 4 per week with my 9/10 class	Sharing-individual task	Means to an end *Accomplishing task*	
Rainbow> If I end up not being able to transfer my design to my classroom, at least, I will have all the materials & design. So it won't be difficult to use any other LMS,	Sharing-application plan	*Reflecting* Authenticity	
Susan> Rainbow - I think you have 2 extra questions for Dave :)	Tech-help answering	Scaffolding *Accomplishing task*	
Rainbow> Susan, can I have Dave's email?			
Susan> Dave's email is: Dave Elsner	Check students' status	Facilitation	Strategy
Susan> How are you going Peter? What unit are you planning for your students?	Check other's work	Means to an end	
Kara> Peter - will your unit of work be project - based?		*Accomplishing task*	
Peter> Rainbow when I am finished my task I will try it out straight away with my students to see whether it is any good.	Sharing-application plan	*Reflecting* Authenticity	

They will be a critical review group Peter> I am preparing a meal for my students called 'LAMS and Hot Potatoes' Kara> I love it! Peter> Yes it will be project based as the students respond	Sharing-individual task		

Example of the data analysis in discussion board

Excerpts	Code	Themes	Category
Janison Evaluation Resources - Carrie - Sat, 13 Aug 2005, 16:25 Hey all, I am having trouble locating any websites, journals or even opinions about Janison. I was wondering if anyone could share references which are useful for the section of task on that asks us to "review evaluation research of the learning system in term of effectiveness." I have been unable to locate anything specific to Janison. If anyone has found anything and would be willing to share the reference I would be very greatful. Thanks, Carrie	Asking resource	Means to an end *Accomplishing task*	Nature *Process*
PS. This is a link to a paper co- authored by Wayne Houlden, Director, Janison Solutions. It may be useful to anyone who is auditing Janison. Distributed Learning Solutions for Enterprise Wide e-Learning http://ausweb.scu.edu.au/aw01/papers/edited/parsons/	Sharing resource	Means to an end *Accomplishing task*	
re: Janison Evaluation Resources - Travis - Sun, 14 Aug 2005, 12:02 Hi Carrie, I haven't looked for evaluation information yet... but I have got some info back from Janison about the technical aspects of the system. I will post a summary in the next day or so.	Sharing experiences		
Re: re: Janison Evaluation Resources - Travis - Mon, 15 Aug 2005, 17:39 Attached is a response from Janison re Hardware Configuration etc. - sorry for the late response as I know the assignment is due tonight. But I hope it may be useful. Travis.	Sharing resource	Means to an end *Accomplishing task*	
Re: re: Janison Evaluation Resources - Carrie - Sun, 14 Aug 2005, 14:23 This might help everyone, it is a website that compare different LMS. The info on Janison is availible here. http://www.edutools.info/course/productinfo/detail.jsp?id=151 Hope this helps	Sharing resource	Means to an end *Accomplishing task*	
re: Janison Evaluation Resources - Ying - Sat, 13 Aug 2005, 17:22 though it is said " a review of evaluation' on the outline paper but susan said if we have trouble to find existing evaluation work, we are allowed to make an evaluation to the web learning environment ourselves. janison is not as a big work as webct or blackboard, so i don't think there are too much comment on it.	Clarifying task again	*Accomplishing task*	
re: re: Janison Evaluation Resources - Rainbow - Sat, 13 Aug 2005, 19:09 I decide to focus on the uses of technology, so the references I am using are all from evaluation or learning theories. I am not	Sharing resource	Means to an end *Accomplishing*	

sure if they will be useful for the focus you choose, but I'll still put a couple of them here. -- Rainbow Book: Reeves, T. & Hedberg, J. (2003). Interactive Learning Systems Evaluation. Englewood Cliffs, NJ: Educational Technology Publications. Webpage: Reeves, T. (1994). Evaluating what really matters in computer-based education. http://www.educationau.edu.au/archives/cp/reeves.htm Journal articles: Scardamalia, M. & Bereiter, C (1993). Technologies for knowledge-building discourse. Communications of the ACM, 36(5), 37-41. Boud, D. & Prosser, M. (2002). Appraising new technologies for learning: a framework for development. Educational Media International, 39(3/4), 237-245.	 Sharing resource	*task*	
What make a professional web designer different from unprofessional people - Ying - Wed, 3 Aug 2005, 12:25 mean many web pages designed by unprofessional people still looks wonderful, so what qualities make a professional designer better than those people.for example: when we do the instructional design for some course what make us better than the shoool teachers who are also able to deal with some relevant software to make there courseware. thank you in advance! **Re: what make a professional web designer different from unprofessional people** - Travis - Thu, 4 Aug 2005, 22:55 Hi Ying - I would argue that is the same qualities that make a professional teacher or artist or researcher (or whatever) better than a talented amateur or someone who just happens to get it right. Yes, "many web pages designed by unprofessional people still look wonderful" and some designed by "professionals" look bloody awful (very bad) as well. However you can generally trust a "professional" to have considered all (or most) of the aspects that will make a web site/design successful - and that does not necessarily mean "look good" to everyone. This is more than a paragraph answer... will come back to it later. Travis :) **Re: what make a professional web designer different from unprofessional people** - Anne - Mon, 8 Aug 2005, 20:48 Great question Ying... Sometimes the best looking sites, also have the worst code (HTML etc..) behind them. Equally, some sites that are not visually well designed can be technically well designed in terms of the code/navigation. Being able to strike that balance is probably what I would see as the main challenge of a professional. Web sites that blend reasonable design and reasonable code are probably more professional than sites that fall into either of the above extremes. I don't know whether this 'wholesome' approach to web design is something profesionals do because they are taught to or if it's just	Initiating discussion Career related topic Asking others' thought Sharing own thought Sharing own thought	Authenticity *Accomplishing task* *Accomplishing task* *Accomplishing task*	Nature *Process*

something intuitive that makes the difference between an amateur and a professional. I really have no idea, it's almost a philosophical discussion.			
Re: what make a professional web designer different from unprofessional people - Travis - Thu, 11 Aug 2005, 17:36 It make you think doesn't Anne... what is it we do that makes a difference?? I like your "'wholesome' approach to web design is something profesionals do because they are taught to or if it's just something intuitive that makes the difference between an amateur and a professional." though as you point out, I know a few professional sites with really bad code (I'll have to check my sites now before I tell you all!!). ...and agree that it is almost a philosophical question.	Sharing own thought Argue Agree	Authenticity *Accomplishing task*	Nature *Process*
Re: what make a professional web designer different from unprofessional people - Peter - Thu, 11 Aug 2005, 21:25 Maybe because they are paid to do it. It must be like everything else, if you do it a lot generally people learn little tricks and do it better	Sharing own thought		
re: Re: what make a professional web designer different from unprofessional people - Rainbow - Fri, 12 Aug 2005, 18:13 I evaluate a site by (1) content (2) usability, and then (3) how it looks. But as a school teacher (i.e. non-professional web designer), I found I had to spend much more time making a page the professional people takes 2 seconds to make. So my point is - I think professional designers are better than non-professionals because they do it with ease, and more skillfully. Basically, it is just more cost-effective to let them do it. Unless a teacher is interested in designing and have time to do it, templates designed by professionals should be enough. Teachers (i.e. content experts) should invest their time developing materials. Speaking of this, I think a lot of templates designed by professionals are too fancy to use. Does anyone know any simple and user-friendly ones?	Sharing own experience & thought Asking resource	Authenticity *Accomplishing task*	
Re: re: Re: what make a professional web designer different from unprofessional - Peter - Fri, 12 Aug 2005, 22:08 Maybe.....but any clothes will cover your body, but nice clothes will make you feel good about yourself. In the same way, if you like the appearance of your work it will inspire you to do a better job. If you want people to use your site appearance cannot be separated from content. Anyway, you have to be happy with what you have made.	Sharing own thought	Authenticity *Accomplishing task*	
re: Re: re: Re: what make a professional web designer different from unprofessional - Rainbow- Sat, 13 Aug 2005, 19:17 Hi Peter, Sure, that's why I am willing to spend time making my own website.	Sharing own thought		
re: Re: what make a professional web designer different from unprofessional people - Ying - Mon, 8 Aug 2005, 21:55 thank you angela and tony, you explained it from different aspects so they are very helpful to me.	Appreciation		

Example of the data analysis in interview transcriptions

Excerpts	Code	Themes	Category
From Paul's interview			
Well, I suppose I must give you a little bit of background about why I'm studying … because I've been a teacher for a very long time. I teach computing and technology based courses, but I don't have educational background. And I've been interested in online-based activities. Not necessarily learning, but I have sort of developed an interest in learning online network (?) based learning, that type of things. It sort of interests me and fascinates me a little bit because here's a fantastic medium, not just for e-learning, for e-commerce, e-business and all sorts of things, but particularly for e-learning because it then allows … gives people the opportunity to pursue a formal education. For example, without … being restricted by geographical distances, for example, which was in some cases a big restriction for some people. So, that is .. I mean, I am interested in that. So, I started in this particular course and then this particular subject, network based learning that we obviously used a lot of online interaction. However, I've found that there's a lot of superficial interactions amongst members and I … I mean, I'm a very big supporter of communication and collaborative learning and I use that in my classroom without technology. And I get students to sit around and work out solutions for themselves. Sometimes it works and sometimes it doesn't. And, especially in online learning, network based learning, I think that is very, very important for learning. And in computing and computer science that also creates authentic forums as well. But, it's .. I mean, in formal setting. Certainly in our case, I did not think that it was natural for people to participate. There was participating, they were helping each other out, but there was an element of selfishness, if you know. Is it going to help me? Will I get a better mark for example? That element going on, I found. I don't know whether, I haven't really gone ahead and researched any further with that one. But that was how I felt about it and that for me is restrictive a little bit for learning. …… The interaction experience ..[what kinds of things did you learn primarily from this interaction rather than from other place, people just reading or some lecture, maybe, you learn different thing …] Well, as I said, personally for the first two tasks that we did and because the subject is like a problem based learning type of things, all the learning that we did primarily was from what activities that we are doing and the resources that we had to read for those tasks, I suppose. For the first two tasks, honestly, I didn't really get any … much help from the interactions. It was primarily designed and created by me based on the research that I had done with very little interaction input into it. The third and the fourth tasks were, I did learn a quite a fair bit about network based learning by facilitating online interactions. As I mentioned, I am a big supporter of collaborative learning and I, actually, got to try it out online. And I had the opportunity to generate a discussion in this	Learning interest Relationship with career Advantage of online learning Learning by doing Problem of online interaction Reason of the selfishness Character of the tasks Challenging levels of the tasks	Motivation Meaningful experience Authenticity Meaningful experiences Means to an end Means to an end Motivation	Learning effect Nature

formal setting. The same discussion, I actually have another discussion group with a different group of people actually from Yahoo groups and I run that discussion group. It's an informal discussion group with people located in U.S., Canada, England, and places like that. And the same topic, I posted there, as well, to see what is going on. It is very interesting comparison, because [very interesting] it really was very interesting and I brought that into my task as well. I reflected on why there could be this difference. In this formal setting when we were all talking about communities of practice, online learning and things like that, I did get quite a lot of response and very insightful responses, for example. Because we were all learning about education and we were able to go back and read about the effects of those sort of things. So, we got a lot of responses and a lot of insightful responses	Making relation between personal interest and class task Expansion of class work Quality of online interaction Influence of others' thought	Motivation Authenticity Meaningful experiences Authenticity Reflecting through others' experiences	

Appendix F

IRB Permission

The University of Georgia

Office of The Vice President for Research
DHHS Assurance ID No. : FWA00003901

Institutional Review Board
Human Subjects Office
612 Boyd GSRC
Athens, Georgia 30602-7411
(706) 542-3199
Fax: (706) 542-5638
www.ovpr.uga.edu/hso

APPROVAL FORM

Date Proposal Received: 2005-02-08 **Project Number:** 2005-10511-0

Name	Title	Dept/Phone	Address	Email
Ms. Younghee Woo	PI	Intructional Technology 604 Aderhold Hall	706-639-1379	yhwoo@uga.edu
Dr. Thomas C. Reeves	CO	Instructional Technology 603 Aderhold Hall +7144 542-3849		treeves@coe.uga.edu

Title of Study: Meaningful Online Interaction: Exploring the Interaction Process in an Authentic Web-based Learning Environment.

45 CFR 46 Category: Administrative 2
Parameters:
Approved for University of Wollongong, Australia

Change(s) Required for Approval and Date Completed: 2005-03-08
Revised Application;
Revised Consent Document(s);

Approved : 2005-03-09 Begin date : 2005-03-09 Expiration date : 2006-03-08

NOTE: Any research conducted before the approval date or after the end data collection date shown above is not covered by IRB approval, and cannot be retroactively approved.

Number Assigned by Sponsored Programs:

Funding Agency:

Form 310 Provided: No

Your human subjects study has been approved.

Please be aware that it is your responsibility to inform the IRB:
. . . of any adverse events or unanticipated risks to the subjects or others within 24 to 72 hours;
. . . of any significant changes or additions to your study and obtain approval of them before they are put into effect;
. . . that you need to extend the approval period beyond the expiration date shown above;
. . . that you have completed your data collection as approved, within the approval period shown above, so that your file may be closed.

For additional information regarding your responsibilities as an investigtor refer to the IRB Guidelines.
Use the attached Researcher Request Form for requesting renewals, changes, or closures.
Keep this original approval form for your records.

Chairperson, Institutional Review Board

Appendix G

Invitation Letter from the University of Wollongong

University of Wollongong

30 March 2005

Younghee Woo
C/- Department of Educational Psychology & Instructional Technology
College of Education
The University of Georgia
614 Aderhold Hall
Athens GA 30602-7144
USA

Dear Younghee

I am pleased to invite you to accept an invitation as Visiting Fellow at the University of Wollongong from 15 March 2005 to 30 December 2005.

The position is initially located in the Faculty of Education. The University however, retains the right to vary its academic structures and staffing arrangements at any time. The main location for this appointment is at the Wollongong campus.

You would enjoy the normal privileges of an academic member of staff. You will be both eligible and encouraged to apply, in collaboration with a full-time member of the University staff, for intramural research grants within the Research Program structure of the University and for external research grants.

The appointment will be on the basis of a pre-determined, continuing commitment although in an unpaid capacity. You will report to Associate Professor Jan Herrington, Faculty of Education. Your duties would include collaborative research. Your actual involvement would be as mutually agreed with the Head of Department.

It will be necessary for you to obtain a Visiting Academic Visa (Class 419) to enter Australia and you should include a copy of this letter in support of your Visa application. **You are required to provide the University with proof of this visa prior to the commencement of your appointment.**

Information about Visiting Academic Visa's (Class 419) can be found at:
http://www.immi.gov.au/allforms/temp_res.htm#educational Please note that this visa does not enable you to undertake paid employment in Australia in any capacity.

As you would be in Australia on a Visiting Academic Visa, you would not be covered for medical/hospital expenses by Medicare, the Government Medical Scheme. This scheme provides free basic medical and hospital cover. It does not cover dental, optical and some other circumstances. You should explore your existing medical cover to see if it will extend to you during your time in Australia.

The following document is attached and forms part of this offer:

- Appointment of Fellows (2 copies).

The following policy documents are relevant to your appointment; copies of these documents are available on the University's Web site - http://www.uow.edu.au

- Policies in relation to Research at the University of Wollongong – http://www.uow.edu.au/research/

If it is your intention to accept, will you please

- sign and return the enclosed copy of this letter;
- sign and return one copy of the Appointment of Fellows document;
- sign and return the enclosed Registration Form; and
- provide evidence of your Visiting Academic Visa.

Personnel & Financial Services University of Wollongong NSW 2522 Australia
Telephone: +61 2 4221 5902 **Facsimile:** +61 2 4221 3700
www.uow.edu.au
CRICOS Provider No. 00102E

I hope that you will be able to accept this invitation and join the University. If you have any questions relating to this invitation would you please raise them with Anna Kouzan, on telephone +61 2 4221 5948, fax +61 2 4221 3700, or e-mail akouzan@uow.edu.au

Yours sincerely

Adeline Ong
Manager, Recruitment
Personnel and Financial Services

cc: *Associate Professor Jan Herrington*
Professor Barry Harper

I have read and understood the terms and conditions of the above letter of offer and hereby accept the invitation for the position of Visiting Fellow. I confirm that my start date will be

Oct. 21, 2005.

Signature - Younghee Woo

04/25/2005
Date

Appendix H

Ethical Permission of the University of Wollongong

University of Wollongong

INITIAL APPLICATION APPROVAL
In reply please quote: HE05/118
Further Enquiries Phone: 4221 4457

13 May 2005

Ms Younghee Woo
Instructional Technology
College of Education
The University of Georgia
614 Aderhold Hall
Athens, GA 30602-7144 USA

Dear Ms Woo

I am pleased to advise that the Human Research Ethics application referred to below has been **approved subject to** the following.

(i) Please note the approval is given subject to the whole class being aware that the research is occurring, and the opportunity given for any individual to express concern, should this be an issue. However, the Committee recognises this is unlikely to be necessary given the nature of the research.

Ethics Number:	HE05/118
Project Title:	Meaningful OnlineInteraction: Exploring the Interaction Process in an Authentic Web-based Learning Environment
Name of Researchers:	Ms Younghee Woo
Approval Date:	5 May 2005
Expiry Date:	4 May 2005

This certificate relates to the research protocol submitted in your original application as modified in your letter of **03/05/05**. As a condition of approval, the Human Research Ethics Committee requires that researchers immediately report:

- proposed changes to the protocol including changes to investigators involved
- serious or unexpected adverse effects on participants
- unforseen events that might affect continued ethical acceptability of the project.

You are also required to complete monitoring reports annually and at the end of your project. These reports are sent out approximately 6 weeks prior to the date your ethics approval expires. The reports must be completed, signed by the appropriate Head of School, and returned to the Research Services Office prior to the expiry date.

Yours Sincerely,

Associate Professor Rod Nillsen
Chairperson
Human Research Ethics Committee

cc: Dr Thomas C Reeves, Dept Instructional Technology, University of Georgia

Research Services Office University of Wollongong NSW 2522 Australia
Telephone: +61 2 4221 3386 **Facsimile:** +61 2 4221 4338
research_services@uow.edu.au www.uow.edu.au/research
CRICOS Provider No: 00102E

Appendix I

Written Consent Forms

CONSENT FORM (for using archive file)

I, _____, agree to participate in a research study titled " Meaningful Online Learning: Exploring Interaction in a Web-based Learning Environment using Authentic Tasks" conducted by Younghee Woo from the Department of Instructional Technology at the University of Georgia (1-706-542-4508) under the direction of Dr. Thomas C. Reeves, Department of Instructional Technology, University of Georgia (1-706-542-3849).

I understand that my participation is voluntary. I can stop taking part without giving any reason, and without penalty. I can ask to have all of the information about me removed from the research records, or destroyed. The purpose of this research is to identify the interaction processes and strategies in a Web-based learning environment that uses authentic activities. The research has ethics approval from the University of Georgia, and the ethics have been reviewed and approved by the University of Wollongong Ethics Committee.

For this research, the researcher will see and analyze the archive data of the discussion boards of the 'Network-based Learning' course. All information obtained will be treated confidentially.

No risk is expected, but if I feel any discomfort about the researcher analyzing my online interactions, I can ask for my contributions to be withdrawn from the research study.

I will not benefit from participation in this research study, but the researcher wishes to assure me that I am contributing to improving the quality of Web-Based Learning Environments.

Any information that is obtained in connection with this study and that can be identified with me will remain confidential unless required by law. My real name will not be used on the research paper, and the subject code and session will not be revealed. The researcher will give each participant a pseudo name, which will be used in the thesis.

The researcher will answer any further questions about the research, now or during the course of the project.

Phone: 1-706-542-4508 Mailing address: Younghee Woo email: yhwoo@uga.edu
Instructional Technology
College of Education
The University of Georgia
614 Aderhold Hall
Athens, GA 30602-7144 USA

I understand that I am agreeing by my signature on this form to take part in this research project and understand that I will receive a signed copy of this consent form for my records.

_____	_____	_____
Name of Researcher	Signature	Date
_____	_____	_____
Name of Participant	Signature	Date

Please sign both copies, keep one and return one to the researcher.

Additional questions or problems regarding your rights as a research participant should be addressed to The Chairperson, Institutional Review Board, University of Georgia, 612A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-3199; E-Mail Address IRB@uga.edu

CONSENT FORM (for Interview)

I, _____, agree to participate in a research study titled " Meaningful Online Learning: Exploring Interaction in a Web-based Learning Environment using Authentic Tasks" conducted by Younghee Woo from the Department of Instructional Technology at the University of Georgia (1-706-542-4508) under the direction of Dr. Thomas C. Reeves, Department of Instructional Technology, University of Georgia (1-706-542-3849). I understand that my participation is voluntary. I can stop taking part without giving any reason, and without penalty. I can ask to have all of the information about me returned to me, removed from the research records, or destroyed.

The reason for this study is to understand learners' perceptions of interaction on the web and identify strategies and methods that promote learner interaction in web-based learning environments.
If I volunteer to take part in this study, I will be asked to do the following things:

1. Participate in an audio-taped interview regarding my online experiences and interactions, and my thoughts on web-based learning.
2. The interview will take approximately one hour. If needed, follow up interview will be conducted through telephone or email. It will take about 30 minutes.
3. All information that could be used to identify me, including recordings of interviews, will be kept in a secure location for four years and then destroyed (03/01/2009).

No risk is expected, but I may feel some discomfort when asked to explain all of my online interactions, including in private contexts. The researcher will try to make the mood of the interview casual and I may choose to skip any questions that I do not feel comfortable answering.
The benefits of participation are that I will be able to reflect upon my own online interaction process and learning strategies, and through this I may improve my learning.

Any information that is obtained in connection with this study and that can be identified with me will remain confidential unless required by law. My real name will not be used on the research paper. Researcher will give each participant a pseudo name, which will be used on the paper.
The researcher will answer any further questions about the research, now or during the course of the project.

Phone: 1-706-542-4508 Mailing address: Younghee Woo email:yhwoo@uga.edu
Instructional Technology
College of Education
The University of Georgia
614 Aderhold Hall
Athens, GA 30602-7144 USA

I understand that I am agreeing by my signature on this form to take part in this research project and understand that I will receive a signed copy of this consent form for my records.

_____	_____	_____
Name of Researcher	Signature	Date
_____	_____	_____
Name of Participant	Signature	Date

Please sign both copies, keep one and return one to the researcher.

Additional questions or problems regarding your rights as a research participant should be addressed to The Chairperson, Institutional Review Board, University of Georgia, 612A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-3199; E-Mail Address IRB@uga.edu

Appendix J

An Example of Students Products

Task2 NBL–Design Statement (Kara)

LAMS Sequences for NCELTR

1. Background

LAMS International was approached by staff within The National Centre for English Language Teaching and Research (NCELTR) about the possibility of using LAMS sequences within both;

- their commercial online IELTS (International English Language Testing System) program,
- the English language programs taught at Macquarie University

Key Stakeholders

NCELTR Staff and Students

There are many different types of English language programs offered by NCELTR. (Please see http://www.nceltr.mq.edu.au/elp/programs.html for a full range.) For the purposes of this task I will focus on The Direct Entry Programs, business in particular and Academic English. As a result of this project, LAMS International may also have work with the online IELTS program.

BPP – Business Preparation Program. Students who successfully complete this 10 week course gain direct entry to Business, Commerce or Finance degrees at Macquarie University. By completing this course, students also bypass sitting the IELTS test. This course has the biggest student enrollment at NCLETR.

Academic English – An academic English class aims to prepare students for study at undergraduate and post graduate level. Classes run for 5 week terms and students typically go on to study in the Direct Entry Programs when their IELTS score is high enough.

IELTS program – NCELTR is a major Australian centre for IELTS testing and preparation. They offer f2f preparation courses, IELTS online, books and other materials. The IELTS test is used as an indicator of English language proficiency for entry to universities, TAFE and secondary colleges in many countries.

In order to meet VISA requirements, all students studying at NECLTR are legally required to study 20 hours of classroom learning and 5 hours of independent study in the ILC (Independent Learning Centre). The ILC has many resources including a teacher, computers, books and other media.

MELCOE (Macquarie E-Learning Centre of Excellence)

MELCOE is currently running the 'LAMS @ Macquarie University Implementation Project' in order to promote and support the educationally sound use of LAMS at Macquarie University. The project is funded through the Vice-Chancellor's development fund for 12 months from July 2005 to June 2006. During the project LAMS will be integrated into the Macquarie University Online Teaching Facility (MUOTF) and linked to the Student Information System, along with WebCT, iLecture etc. There is an education and staff support program to help staff learn about LAMS and how to implement it in their teaching. For the duration of this trial, all classes using LAMS will be fully supported by MELCOE. It therefore makes good sense for all parties that NCELTR take advantage of this support while trialing LAMS.

LAMS International

LAMS International is managed by Macquarie University and offers commercial services to assist with implementation and technical support for LAMS. I work for LAMS International but my role in this project is initially only based on my vocational experience as an ESL teacher. I would be involved in the development of sequences for the commercial online IELTS program if this project develops along those lines.

Project Schedule

Date	Action
23/08/05	Karen Baskett (LAMS International), Robyn Phillip (MELCOE) Lisa Barrett (NECLTR) met to discuss overall needs of NCELTR in regards to using LAMS and how best to help (ie. through LAMS or MELCOE). It was decided that I would develop 3 sequences to demonstrate how LAMS can be used in their context.
26/08/05	I met with two NCELTR teachers to get relevant materials in order to develop sequences.
19-23/09/05	Sequences will be developed and I am to meet with relevant teachers again to show sequences and ask for specific feedback.
28/09/05	MELCOE and LAMS presentation to approx 40 NCELTR staff. Will use the developed sequences in order to give a more relevant demonstration.
Early October	MELCOE to train NCELTR staff (including writers of the online IELTS course) as part of Macquarie rollout of LAMS
October - November	Possible development of sequences as part of online IELTS package that NCELTR currently markets.

Currently NCELTR are looking at different online solutions to use with their students. They are not currently using WebCT but would like to by the end of this year. As LAMS is also starting to be used at Macquarie University, NCELTR are looking at using both of these online solutions. They feel that the students in their Direct Entry programs would particularly benefit from familiarization with both of these environments if they are to go on use these programs as undergraduates/ postgraduates of their chosen courses. NCELTR have tried using MSN groups but were unhappy with some aspects of this environment including the need for students to have a hotmail account and a poor monitoring environment for teachers. Because of the student requirement to study for 5 hours per week in the ILC, NCELTR staff are also interested in the potential of LAMS for flexible study options for students.

Briefly then, it was agreed after the first meeting on 23/05/08 that I would create 3 sequences to demonstrate various possibilities for how LAMS could fit their learning environment. The three learning sequences will be

a) BPP - this sequence will be designed for use in a 1 – 1.5 hour computer laboratory situation as part of a 10 week program. The BPP program has the highest student intake and it is hoped that through viewing the sequence at the presentation on the 28 September, a number of teachers will be interested in using LAMS.
b) Academic English – once again a short sequence that can be used in a laboratory situation, but this time with a focus on listening skills. NCELTR staff expressed interest in the inclusion of Mp3s within the course.

c) Academic English – a sequence based around a project, lasting 3 weeks. Students would be required to work on the project autonomously, in groups and would also be given time in class to work on specific skills.

For the purposes of this assignment I will describe the two Academic English sequences.

2. The NBL Project Concept and it's Underpinnings

My initial overall goal for the project is to create a set of example sequences that demonstrate a clear relevance and usefulness of LAMS to the NCLETR teaching environment. In order to do this I will have to demonstrate that LAMS;

- is flexible enough to match NCELTR teaching styles,
- enhances learning outcomes for students,
- provides students with flexible learning opportunities,
- provides opportunities for collaborative learning,
- provides opportunities to develop the four main language learning skills (listening, writing, speaking, reading – though not necessarily all in one sequence).

Specific learning outcomes for each sequence for students will be discussed in the next section.

Specific learning strategies and corresponding tools are discussed in more detail in section 4 and 5. Broadly speaking, some of the strategies I will use in my learning design to achieve my aims are:

Providing a learning environment that is activity based vs content based.
Sandy Britain (2004) in his review of currently available software tools related to learning design, notes three principle ideas behind learning design:

1. A focus on activity – people learn better when actively involved in doing something (are engaged in a learning activity).
2. Workflow – learning activities are sequenced carefully and deliberately into a workflow to promote more effective learning
3. Re-use of sequences – It is useful to be able to record learning designs for sharing and re-use in the future.

(Britain, 2004: 2)

Britain believes that traditionally e-learning has tended to focus on content and services at the expense of learning interactions. Britain supports a shift away from the use of "learning objects" as the basis of a course, and shift towards "learning activities". This would mean a change in focus from content delivery to what learners actually do. Content is still a very important part of learning, but so are the tasks and activities learners do, along with the interaction that occur between people and the software environment. The two LAMS sequences I have included in this task aim to represent all three of the above mentioned learning design principles.

Providing a learning environment that is highly collaborative
Social Constructivist theories support full group participation through dialogue and group or individual performances. Goodyear (2005) states that "Human-human interaction, through computer mediated communication or CMC, is an essential part of networked learning." LAMS is highly collaborative and provides plenty of opportunity for group and individual knowledge construction. I have specifically designed communicative activities within the sequences that require collaboration through the use of tools such as chat (small group discussion), the forum (whole class discussion) and the Q&A tool (either).

Many authors (Swan, 2001, Reiser, 2001,) quote Moore's (1989) three levels of interaction

in NBL that effect learning; interaction with content, interaction with instructors and interaction with classmates. English as Second Language (ESL) students often come from cultural backgrounds where learning may be more content centered and teacher lead. These sequences aim to help students develop autonomous learning skills (that will be needed at university) by providing opportunities for and encouraging students to learn from each other (as well as from the teacher and the content). As Roschelle & Pea (2002:6) have written; "transformative learning conversations vs information transmission".

Providing a learning environment that is well scaffolded

In a study looking at student satisfaction with and perceived learning from asynchronous online learning, Swan (2001) concluded that there were three factors that influenced student satisfaction; clarity of design, the level of interaction with instructors and active discussion among course participants. Therefore both students and teachers have an active role in this learning environment, albeit a changed role.

"The potential risks associated with project-based learning stem from requiring learners to learn by doing when they may not know what needs to be done in order to learn" (Oliver & Herrington, 2001: 88)

While these sequences may mean an increase in responsibility for students, this shouldn't correspond to a decrease in support for the student. "Scaffolding is the support and assistance provided by a teacher or peer to help the learner through problem solving and conceptualisation processes that are needed to meet the requirements of the task." (Oliver & Herrington, 2001: 68) As both of these sequences are conducted at least partly in a laboratory, teachers will be able to use many of the traditional f2f scaffolding strategies. For example; orientating students, inviting student participation, verification of student answers, generating questions and answers (McLoughlin, 2002). Additionally teachers will also need to actively participate in all discussion forums and monitor student progress. The teacher should also point students towards supporting documents such as the assessment criteria, the schedule and past examples of student work. Many writers use the metaphor for a teacher's role of the "guide on the side". I like Roschelle & Pea's notion of the "conductor of performances" (Roschelle & Pea, 2002). Students contribute towards a joint performance both verbally and with technology. The teacher "attends primarily to group performance and not to each individual student. Moreover, the teacher, like the conductor, has responsibility for choosing and sequencing the material to be performed (the curricular activities), interpreting the performance and guiding it towards it's desired forms." (Roschelle & Pea, 2002:5)

One tool that particularly helps with both collaboration and scaffolding is the Question and Answer tool. Students type in an answer to a particular question and then can immediately see what every other member of the class or group has written on the same topic. They can also use the progress bar to revisit this activity at a later point. This gives students and teacher immediate feedback on student conceptualization. Students are also able to gauge how their answer compares to others and thus construct knowledge using their classmate's answers. This tool also allows every student to participate simultaneously in a discussion. "They are literally represented in the information structure that supports the instructional discourse, rather than outside of it as an information consumer." (Roschelle & Pea, 2002:5)

3. Information Review

NCELTR have provided the course curriculum for their current f2f classroom models for the creation of both sequences. A large percentage of the content is available in a digital format and can be added

where necessary to the LAMS sequences. The other resources will have to be created.

Sequence 1 – Academic English 3 Evaluating listening comprehension and note-taking skills

During this sequence students will:

- Evaluate listening comprehension skills
- Evaluate note-taking skills
- Learn to recognize various "signposts" in listening
- Compile a list of common abbreviations used in note-taking

Run time 1-1.5 hours in a computer laboratory setting.

In this particular sequence students won't be required to work with materials beyond the scope of this NBL.

Content	Comments
Activity 4 – Noticeboard – Information on abbreviations	NCELTR provided
Activity 6 - Shared resources – Listening part 1	Listening exists – NCELTR to make MP3 and send to me.
Activity 6 – Worksheet for listening	Karen to make electronic version of paper-based copy
Activity 6 – Transcript of the listening	NCELTR need to provide if desired
Activity 8 - Shared resources – Listening part 2	Listening exists – NCELTR to make MP3 and send to me.
Activity 8 – Worksheet for listening	Karen to make electronic version of paper-based copy
Activity 8 – Transcript of the listening	NCELTR need to provide if desired
Activity 11 – Noticeboard – Information on signposting	NCELTR Provided

Sequence 2 – Academic English 3 Tutorial Discussion Project

Leading a tutorial discussion is one of the formally assessed tasks for A3 and is worth 20% of the course mark.

During this sequence students:

- Work in small groups to choose and research the topic for their discussion
- Work collaboratively in an online environment to support and assist each other with their research
- Look at strategies and useful expressions for managing a tutorial discussion
- Analyse the content, structure and language to be used in their tutorial presentation

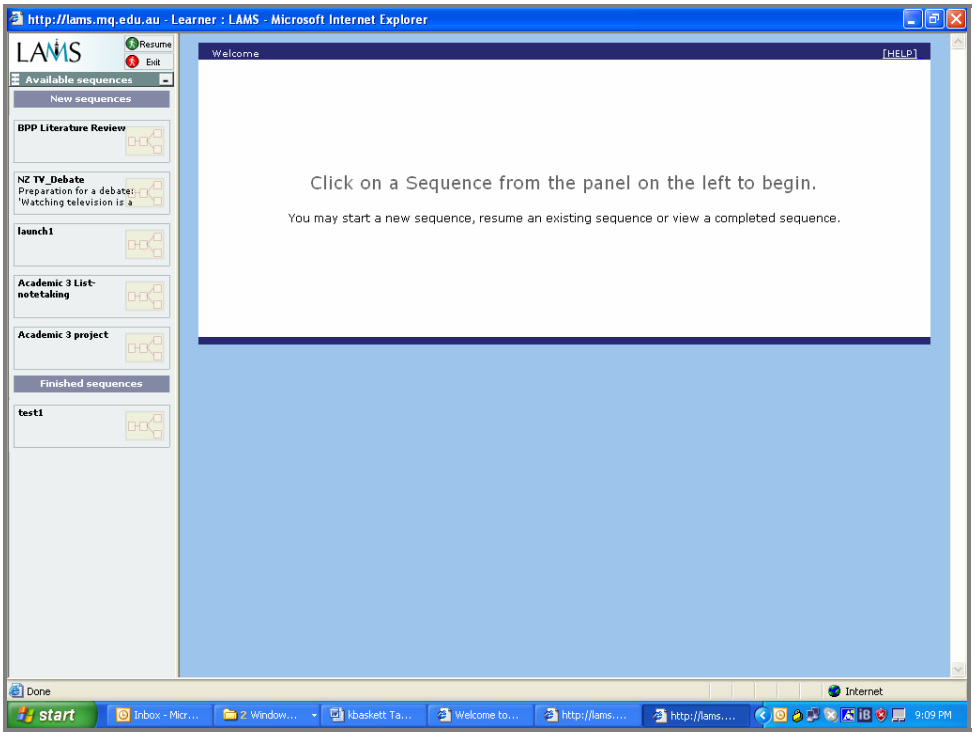
This sequence is designed to run over a period of 2 -3 weeks. The sequence should initially be used for a 1-1.5 hour period in a computer laboratory as an introduction to the sequence. After this students are expected to access their LAMS sequence out of class as they need to. Students will also be given time in a f2f capacity to complete their project. NCELTR teachers want students to be able to choose who is in their groups. As LAMS can only select groups randomly, this sequence will be copy and pasted 5 times and each group will work on parallel sequences. Students will be required to work with a number of materials outside of the NBL system. These could include websites, journal articles and so on. They are required to research widely on a chosen topic.

Content	Comments

Activity 2 – Noticeboard – Project outline and schedule	NCLETR already provided
Support activities – Discussion skills – worksheets	NCELTR will need to provide electronic copy
Support activities – Discussion skills - listening	NCELTR will need to provide MP3
Support activities – The task – Task evaluation/assessment form	NCLETR already provided
Support activities – Previous student examples	I will need to scan examples I have – create electronic resource.

4. Learning Design and Structure

Initially, LAMS as a stand alone LMS will be used to deliver this program. Students will be given a URL and can access their sequence(s) through individual logins and passwords. Eventually when LAMS is integrated into WebCT, students would access their LAMS sequences through the WebCT portal.

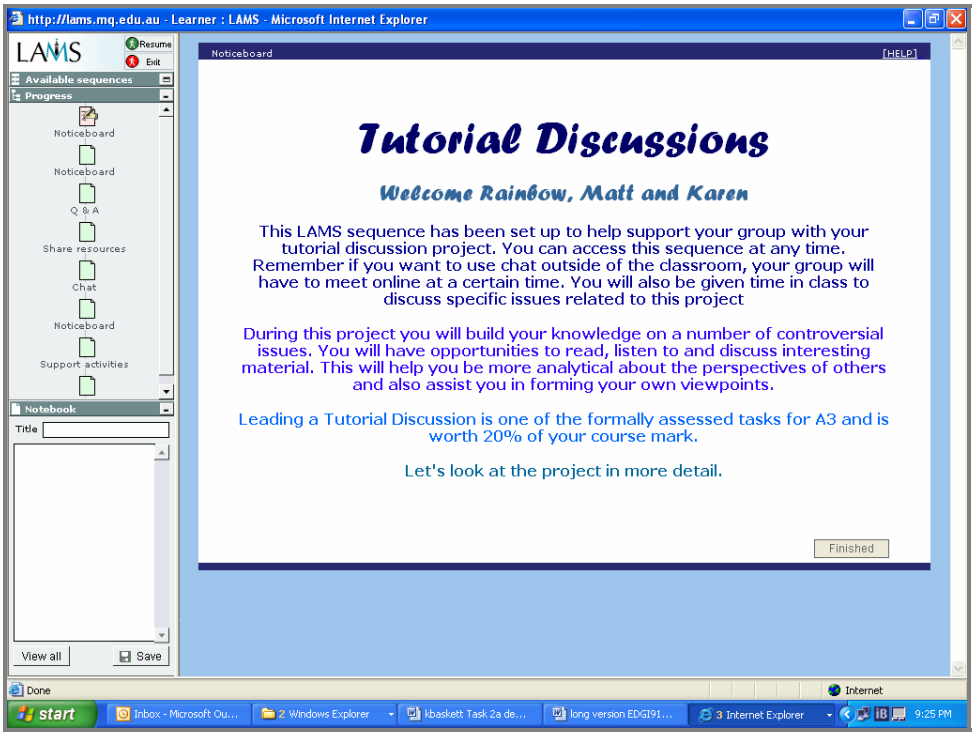


LAMS learner view (available sequences in left hand progress bar)

Teachers release sequences to students (through the monitor screen) as they are required. Note that progress bar in student view is divided into three sections: new sequences, started sequences and finished sequences. If a student leaves a sequence part way through, they are taken back to the same place they left off when they sign in again. Students can access finished sequences until the teacher disables and deletes the sequence in monitor. Teachers can monitor student progress through the monitoring interface or participate in class discussion through the learner interface.

As mentioned in section 2, LAMS is flash based, heavily influenced by learning design and based on a workflow model. Once students open a sequence, they are guided through a series of activities. Students

can access activities they have already completed at any time (using the left hand progress bar) but they can't access activities they have yet to complete.



Noticeboard – Academic 3 Project sequence

In the sense that students can't initially choose the order in which they want to do activities, LAMS may seem structured. Sequence 1 is designed for use in a computer laboratory (note-taking) and closely mirrors a classroom situation. This sequence is designed to be flexible enough that teachers can choose whether to do activities online or using traditional face to face methods. The project based sequence is designed to be used initially as a class in a computer laboratory and then for students to access at their own pace, from anywhere, anytime. In this sense this sequence is a lot less structured.

The following are some of the learning strategies I have incorporated into the sequences I have created. (A more detailed description of tools and activities follows in the next section)

- Providing opportunities for collaboration with other students and the teacher (chat, forum, Q&A)
- Encouraging students to learn from each other (Q&A, Forum, chat) (three levels of interaction with content)
- Providing a variety of activities and resources (breaking up content with discussion)
- Encouraging student self evaluation (survey, Q&A)
- Encouraging autonomous leaning opportunities (project sequence)
- Providing a learning environment that is activity based vs content based (ask "what do you want students to do with this content? What is the purpose of this activity?)
- Providing students with real world relevance through authentic tasks and access to experts (teacher and model answer)

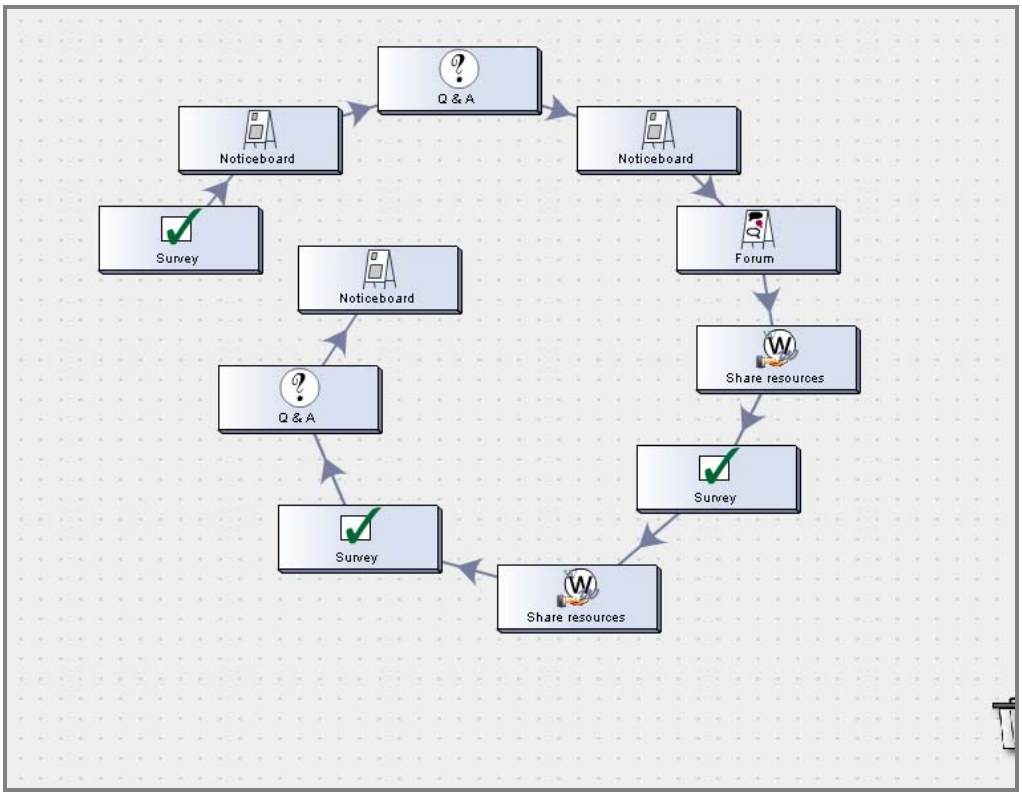
Both sequences employ self evaluation (from a student perspective) as an assessment strategy. This is achieved through the use of the survey and Q&A tools.

"Authentic activities are seamlessly integrated with assessment" (Herrington, 2002). I think this is particularly relevant to the project based sequence where the task is the assessment and the assessment

is the task. They are inseparable and the LAMS sequence is basically a scaffolding support to help students achieve accomplishment of the task.

5. Learning Strategies and Tasks

Sequence 1 – Academic English 3 Evaluating listening comprehension and note-taking skills



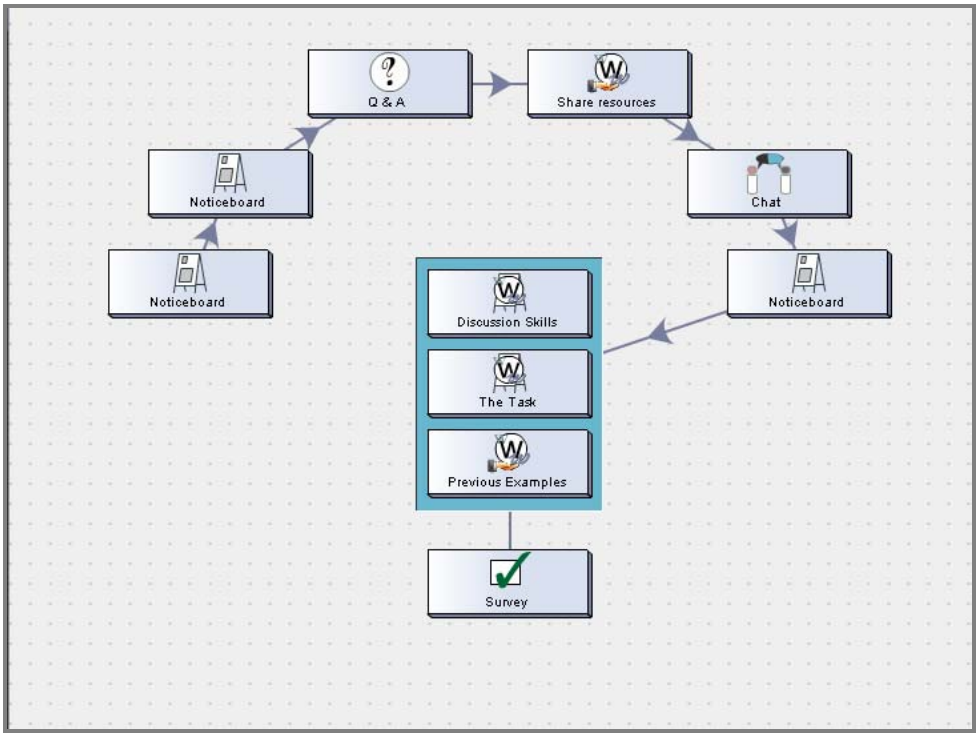
Activity	Aim	Teacher / student roles
Survey	Student self evaluation of their own listening skills before they start the sequence.	Student completes, teacher to help where necessary and monitor ongoing student issues.
Noticeboard	Introduces the key topic and activities of the sequence	Student reads, Teacher may want to verbally add extra comments.
Q & A	Students need to use abbreviations when taking notes. They work with a partner to 'decipher' these abbreviations and then should 5 of their own. This activity therefore acts as a brainstorm – they should have approx 25 extra abbreviations by the end of the activity.	Students work with a partner and one student adds their abbreviations. Teacher should help pairs of students as needed.
Noticeboard	Information on other abbreviations and strategies for using abbreviations in note-taking	Students read, teacher expands on notes.
Forum	Students have worked individually and in	Students and teacher participate in the

	pairs and can now use the forum as a whole class discussion on strategies for abbreviations.	forum.
Shared resources	This activity provides the opportunity for students listen to listen to part 1 of a lecture. Also provides students with the worksheet they need to fill in. This sequence is set so that the teacher can add the listening transcript while the sequence is being run.	Students listen and take notes and then fill in a worksheet. Students check their answers with a partner. The teacher may want to go over the answers as a whole class. (Teacher may also want to add the for the listening for the students at the end of the class)
Survey	Students self analysis of their listening skills.	Students complete the survey. Teacher to monitor and discuss with students if necessary.
Shared Resources	Students have access to the second part of the lecture and also to a second worksheet. Once again the teacher has the opportunity to add the transcript if they want.	As above
Survey	As above	As above
Q & A	Students think about signposting used in the previous listenings, before reading about them in the next activity. (prediction)	Students answer. Teacher could hold a class discussion when all groups have answered.
Noticeboard	More information on signposts.	Students read, teacher elaborates on points as necessary.

Clarifications to be made at NCELTR staff at next meeting:

- Each individual to listen to mp3 in the lab? If yes – they will need headphones.
- Alternative is for teacher to stop class and play through their computer – this would make classroom time management easier.
- Do teachers want to upload the worksheets in shared resources or simply photocopy the worksheet and hand them out to students?
- Do teachers want students to have access to the transcripts after listening?
- Do teachers want to add a model text for the listening worksheets?
- Do teachers want “stops” added through LAMS to control timing issues?
- Do teachers want to add an extra listening to practice singposting? Could be for homework.

Sequence 3 – Academic English 3 Tutorial Discussion Project



Activity	Aim	Teacher / student roles
Noticeboard	Introduces the key topic and activities of the sequence	Student reads, Teacher may want to verbally add extra comments.
Noticeboard	Gives students more in depth information about the project including a timetable	Students read. Teacher explanation and presence is needed as scaffolding during this activity. Students will need clarification on the nature of the project and the sub tasks involved.
Q & A	Brainstorming as a means to get students started on the project. They discuss what "controversial" means and how start to make suggestions as to what they might do for the project.	Students answer the question and read other member's answers. Teacher to help as necessary.
Shared resources	Students are given access to online newspapers. Both students and teachers can add files and URLS as they find them.	Teachers should give students enough time to search for articles at their leisure. Also point out that students can add their own URLs and files.
Chat	Students have been introduced to the project and had time to start researching. They are now given the opportunity to discuss their ideas at this point with the	Teacher can monitor students by ▫ Walking around the classroom ▫ Through the monitor interface in LAMS, or

	rest of their group.	▫ by contributing as a learner to one chat group.
Noticeboard	The following activities act as support for the project. Students can access them at any time. This noticeboard explains what the support activities are.	Student reads, teachers explains as necessary.
Optional activities – 2X Resources & Forum, 1 X Shared resources	1. Help with the task – students look at the assessment evaluation and discuss issues related to this in the forum below. 2. Examples of previous student's discussion topics. 3. Tutorial discussion skills – will be covered in a f2f environment but students may like to listen to them again and comment in the forum.	1. Students access in their own time, throughout the 3 week project. Teacher to monitor and participate in the forum. 2. students read if they need ideas for the task. 3. Students can access listening materials after they have been done in class for extra practice. Teacher to upload listening files after finished in class. Teacher should also participate in discussion forum.
Survey	Designed as a checklist for self evaluation of readiness before running the tutorial discussion. Students should focus more on items they say "no" to in order to prepare. Checklist taken from the assessment evaluation.	Students to complete and assess their own readiness. Teacher to monitor and provide feedback through f2f situations.
Clarifications to be made at NCELTR staff at next meeting: Do staff want to run a separate sequence with a forum and chat that is open to all groups during the project period (communication in this above sequence is only available to 5 x5 group members).		

6. The Learning Environment

Teachers and learners are provided with a login and password and access to the LAMS server through a URL. They can therefore use LAMS anywhere they have Internet access. These sequences in particular are designed to be used mainly in a classroom setting but also to be access in the ILC or at home. If students wish to use the chat tool outside of normal class hours they will have to make an arrangement to meet online at a certain time.

For student LAMS is quite intuitive to use. However students will want to explore the functionality of LAMS and this may result in them "clicking through" a sequence very quickly. This can be avoided by giving students an introductory sequence or by giving students clear instructions on the amount of time you expect them to spend on each activity and the length of answer you expect them to write.

It is advised that teachers receive basic training in using LAMS. Even though these sequences are pre-authored, the teacher will have to be familiar with the monitoring interface in order to run and monitor a sequence.

7. Delivery and Technological Issues

A comprehensive list of technical requirements exists at the following site:
http://www.lamsinternational.com/documentation/

I believe that the NCLETR computer lab already meets most of these requirements. We will need to make sure that chat ports 80, 8080, 9800 on the server are open.

Of particular note to students, their browsers must have:

- Flash 7.0 or higher browser plug-in installed
- Pop-up blocking (if any) disabled
- Cookies enabled

Broadband access is recommended. Individual student access through dial up (off campus) is possible but the LAMS sequence may run very slowly (particularly in sequences with Mp3s).

Students will also need;

- A media player to listen to downloaded Mp3s.
- Word processing software

8. Evaluation Procedures

Formative

- I will meet with the NCELTR teachers to show them the sequences before the presentation. I have specific questions that I want to ask and I will make any changes to sequences that they suggest. I will also receive feedback on the sequences during training of staff, scheduled for October.
- While creating sequences I will also use continuous self – evaluation by checking if this learning sequence meets my intended learning design and reflecting on any necessary changes.
- I will and have discussed/ checked aspects of the project with other colleagues.

Summative

From a MELCOE/LAMS perspective, we would judge that this project has been successful if NCELTR staff can see a relevance for using LAMS in their teaching and learning environment (and additionally for LAMS, if online sequences have to be developed as part of the commercial IELTS program). This will be determined over the course of the next few months.

From an NCELTR staff perspective, some of the following questions may be relevant in evaluating the use of LAMS;

- Does LAMS help or hinder students meeting the expected learning outcomes of the lesson?
- Was using LAMS better than, equal to or worse than a f2f lesson equivalent?
- How well does LAMS support teachers' personal approach to teaching and creating lessons?
- What works well and doesn't work well (using LAMS) for both the student and the teacher?
- Did LAMS provide a more flexible learning environment (than the current situation)?
- Can teachers see a use for LAMS in the future?

To find out this information, LAMS staff could give NCELTR staff a questionnaire after a period of LAMS use. NCELTR teachers could keep teaching journals where they noted reflections on LAMS use. To evaluate student responses to the use of LAMS, staff could add a "survey" activity at the end of each sequence asking students for their thoughts on using LAMS.

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9. NCELTR Syllabus documents –
   - Academic English 3 – Evaluating listening Comprehension and Note-taking skills
   - Academic English 3 – Tutorial Discussions

Appendix K

Previously Published Journal Article

(This paper has been published in Journal of Computing in Higher Education)

Designing Authentic Activities in Web-based Courses

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Abstract: Influenced by constructivist educational theory and advances in technology, there is increasing interest in authentic activities as a basis for learning in both face-to-face and web-based courses. Whereas traditionally, real-world activities have primarily served as vehicles for practice of skills or processes that are taught using traditional instructional methods, a more radical approach is to build a whole course of study around authentic activities and tasks. The authors of this paper argue that the value of authentic activity is not constrained to learning in real-life locations and practice, but that there are critical characteristics of authentic activities that can be incorporated into the design of Web-based courses to enhance learning online. The paper includes a description of the theory, research, and development initiatives that provide the foundations for this approach. Finally, the paper presents guidelines and examples for the design of complex authentic activities for online learning, together with the implications of this approach for teachers, students and designers.

Designing Authentic Activities in Web-based Courses

Introduction

College and university instructors have long recognized the advantages of learning in authentic situations. The apprenticeship system was once the primary method for education and training in skills and processes relevant to specific crafts. The practicum or internship, whereby students spend days or weeks performing in real-world workplace such as clinics and schools, is an effective method for learning the practices of professions such as medicine and education (Boud & Solomon, 2001), especially if strategies for encouraging reflection are included (Schon, 1987). There is increasing interest across higher education in service learning whereby students, with instructor guidance and support, perform authentic practices that have real consequences and outcomes (Stanton, Giles, & Cruz, 1999). In other higher education contexts, students are assisted to form fully operational businesses, to diagnose illnesses in real patients, to form video and multimedia production teams with real clients, and to conduct scientific experiments and data collection on the Internet.

The merits of such engaging and authentic learning environments have been well documented, particularly in reference to situated learning (e.g., Bennett, Harper, & Hedberg, 2001; Brown, Collins, & Duguid, 1989; Duffy, Lowyck, & Jonassen, 1993; Honebein, Duffy, & Fishman, 1993; Luca & Oliver, 2001; McLellan, 1996, 1997; Wilson, 1996). Nevertheless, the evidence for real-life experiences is not always positive (Eyler & Giles, 1999). For example, in discussing apprenticeships in relation to situated cognition, Wineburg (1989) noted: 'No doubt some apprentices find their apprenticeship absolutely authentic, but I can imagine others who find it absolutely tedious, inefficient, repressive, servile, tradition-bound, and in some cases, downright mean' (p. 9). Lave and Wenger (1991) also noted that the quality and consistency of

apprenticeships vary enormously. They argued that apprenticeships do not inevitably result in learning in practice, and indeed that the apprenticeship itself is not the issue. The critical issue for them, and the real value of these experiences, is the 'legitimate peripheral participation' the apprenticeship allows. Even when real experience works well, it is not always possible for higher education instructors to organize these authentic learning experiences in real life settings for reasons such as the limitations of the subject matter, practical constraints such as physically moving students to locations of practice, and precautions against risks of danger to students or others.

The argument advanced in this paper is that the value of authentic activity is not constrained to learning in real-life locations and practice, but that the benefits of authentic activity can be realized though careful design of Web-based learning environments. The design of such environments must be informed by an analysis of the critical characteristics that help to enhance learning. Lave and Wenger (1991) cautioned that the conception of situated learning was substantially 'more encompassing in intent than conventional notions of "learning in situ" or "learning by doing" for which it was used as a rough equivalent' (p. 31). The challenge they put to researchers was to identify the critical aspects of situated learning to enable it to be translated into teaching methods that could be applied in the classroom. The purpose of the research described in this paper is to distill those elements that contribute to the success of authentic learning environments, to analyze the antecedents and mediating variables, and to provide guidelines for the design of activities to embody those characteristics. Such characteristics can then be applied in a variety of learning contexts, such as simulations, case studies, role-plays, and scenarios, both in the classroom and in online learning situations.

Authentic Activities

Activities, investigations and problems have always been at the heart of student involvement in meaningful learning contexts. Teachers provide such activities to enable students to interact with the learning environment, and to learn, apply and practice newly acquired skills. Activities have been defined by Brophy and Alleman (1991) as: 'Anything students are expected to do, beyond getting input through reading or listening, in order to learn, practice, apply, evaluate, or in any other way respond to curricular content' (p. 9).

However, a well-designed activity can be so much more than an opportunity for students to practice and apply their learning. In this paper, it is proposed that the activity students perform as they complete a course of study is the single most important element in the design of the learning environment. A complex and sustained activity can motivate students to learn. It can provide meaning and relevance to complex content, enable collaborative problem solving, justify the creation of polished products, and provide integrated assessment of achievement. Indeed, it can be the central organizing element of an entire course of study.

There is no lack of research and literature written on the use of authentic activities over the past decade or more. There has been a great deal written about the differences between the kinds of activities and problems we face in real-world situations and those typically designed into courses of study. For example, Sternberg, Wagner and Okagaki (1993) differentiated between the kinds of problems learners face in academic situations and practical, real-world applications. They contended that academic problems tend to be: formulated by others, well-defined, complete in the information they provide, characterized by having only one correct answer, characterized by having only one method of obtaining the correct answer, disembedded from ordinary experience, and of little or no intrinsic interest. For example, it is unlikely that the

following typical mathematics textbook exercise would ever be encountered in this form in any realistic context, or that students would necessary know when to apply it in appropriate circumstances:

> $2x + 1 = 7$. Solve for x

Similarly word problems, while attempting to provide a real-world context, fail to replicate the essential elements of a meaningful and realistic problem. For example:

> Jenny and her friend left Perth to visit a winery. They bought 3 one-liter bottles of wine, 5 bottles each containing 750 milliliters, and two half-liter bottles of wine. What was the total quantity of wine bought?

Why does the student need to know how much wine Jenny bought? If the total was needed to write on a customs declaration, or Jenny needed to calculate her likely blood alcohol level after consuming this wine, this is important contextual information that is missing from the problem description. As it stands, the problem remains a simple and pointless algorithm dressed up with a few words. Bottge and Hasselbring (1993) have pointed out that such word problems are inadequate because:

> they describe situations in a textual rather than a contextual form; they typically include key words such as 'in all' or 'how many more' that can trigger a specific number operation—unlike real problems that offer no such clues; and there is usually only a single correct answer, which takes only a few minutes to solve. (p. 36)

Such activities often lead only to an enculturation into the practices of classrooms rather than the real-world transfer teachers expect. Clayden, Desforges, Mills and Rawson (1994) noted

that student efforts to make sense of classroom activities generally lead them to focus on working practices rather than abstract ideas. 'What they learn … is how to do work, how to be neat, how to finish on time' (p. 164).

In direct contrast to the academic approach, practical problems tend to be characterized by: the key roles of problem recognition and definition, the ill-defined nature of the problem, substantial information seeking, multiple correct solutions, multiple methods of obtaining solutions, the availability of relevant prior experience, and often highly motivating and emotionally involving contingencies (Sternberg et al., 1993, p. 206). Key differences between the school-based approach and real life approach have also been developed and summarized by Lebow and Wager (1994) (see Table 1).

Table 1: Real-life versus in-school problem solving (Lebow & Wager, 1994)

Real-life	In-school
1. Involves ill formulated problems and ill structured conditions.	1. Involves 'textbook' examples and well structured conditions.
2. Problems are embedded in a specific and meaningful context.	2. Problems are largely abstract and decontextualized.
3. Problems have depth, complexity and duration.	3. Problems lack depth, complexity, and duration.
4. Involves cooperative relations and shared consequences.	4. Involves competitive relations and individual assessment.
5. Problems are perceived as real and worth solving.	5. Problems typically seem artificial with low relevance for students.

While the differentiation between the two approaches is largely within the context of classroom instruction, the same distinctions may be drawn for the design of online learning environments. In completing activities and solving problems online, students frequently learn to invoke 'sub-optimal' schemes to enable them to proceed, rather than deal with the content in a way that promotes true understanding. Many of these online programs are so tightly designed to

process student input, they fail to account for the nature of real-world problem solving, where the solution is rarely neat and the salient facts are rarely the only ones at students' disposal.

In contrast, a number of authors suggest that authentic activities should be ill-defined so that students must *find* as well as *solve* the problems. Learners need to have opportunities to: explore a situation with all the complexity and uncertainty of the real world, have a role in determining the task and how it might be broken up into smaller tasks, select relevant information, and find solutions that suit their needs. Because authentic activities mirror real world tasks, they require students to use teamwork, interpersonal skills, technology, decision making, and other skills to complete the task successfully (Perreault, 1999). For instance, Myers (1993) developed three criteria for measuring the authenticity of an activity:

> (1) the activity provides opportunities for the students to achieve something that they perceive as real or genuine;
>
> (2) the activity challenges, inspires and empowers learners to take risks and exceed personal limitations; and
>
> (3) the activity makes some difference in the lives of the learners. (p. 72)

Others have also discussed the importance of providing an authentic context to the task. Jonassen (1991) noted that authentic activities have real-world relevance and utility, and recommended that authentic tasks be integrated across the curriculum. Similarly, Bransford, Vye, Kinzer and Risko (1990b) described the following criteria for authentic activities to maximize the effectiveness of the approach:

- A single complex problem should be investigated by students.
- Students identify and define their own questions.

- Students must have the opportunity to experience the problem from a number of different perspectives.
- Students work on the problem over a "reasonably long period of time" (p. 394), that is weeks rather than days.
- Activities are logically related to the problem.

Young (1993) also listed the attributes of real-life problems which need, where possible, to be replicated in authentic activities. The problem must provide:

- Ill structured complex goals
- Opportunity for the detection of relevant versus irrelevant information
- Active/generative engagement in defining problems as well as solving them
- Involvement of the student's beliefs and values
- An opportunity to engage in collaborative interpersonal activities (p. 45)

Many other theorists and researchers (e.g., Gordon, 1998; Lebow & Wager, 1994) have also emphasized the importance of designing collaborative, rather than independent, learning activities, and others such as Duchastel (1997) have pointed out the importance of diversity, rather than uniformity, of outcome. The Cognition and Technology Group at Vanderbilt (1990b) have stressed the importance of complexity and the necessity of providing an environment capable of sustained examination.

Some argue that it is impossible to design truly 'authentic' learning experiences. Petraglia (1998) argued that authenticity can be neither "predetermined nor preordained," and such attempts often result in little more than "preauthentication," that is, "the attempt to make learning

materials and environments correspond to the real world prior to the learner's interaction with them" (p. 53). In supporting this view, Barab, Squire and Dueber (2000) argued that authenticity occurs "not in the learner, the task, or the environment, but in the dynamic interactions among these various components … authenticity is manifest in the flow itself, and is not an objective feature of any one component in isolation" (p. 38).

Petraglia (1998) contended that learners need to be *persuaded* that they are participating in an authentic learning environment. This theme is also adopted by Kantor, Waddington and Osgood (2000) who, when referring to the kinds of goal-based scenarios they designed for Anderson Consulting, argued that: "It is a simulation of a client engagement in which the participants tacitly agree to go along with an interpretation of job reality which we have crafted" (p. 212). According to Cronin (1993), the message for designers and teachers of online learning environments is a simple one: in designing authentic activities, 'students' experiences … should more closely resemble the experiences they encounter in real life' (p. 80).

10 Characteristics of Authentic Activities

As described above, many writers and theorists have suggested quite specific design criteria for activities which, if implemented well, can enhance students' learning as they engage in tasks that reflect the critical characteristics of genuine roles and activities of professionals in real world settings. In reflecting on the characteristics of authentic activities described by researchers, we have derived ten design characteristics of more authentic activities (Reeves, Herrington, & Oliver, 2002):

1. *Authentic activities have real-world relevance*

   Activities match as nearly as possible the real-world tasks of professionals in practice rather than decontextualized or classroom-based tasks (e.g., Brown et al., 1989; Cognition and

Technology Group at Vanderbilt, 1990a; Cronin, 1993; Jonassen, 1991; Lebow & Wager, 1994; Oliver & Omari, 1999; Resnick, 1987; Winn, 1993).

2. *Authentic activities are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity*

   Problems inherent in the activities are ill-defined and open to multiple interpretations rather than easily solved by the application of existing algorithms. Learners must identify their own unique tasks and sub-tasks in order to complete the major task (e.g., Bransford et al., 1990b; Brown et al., 1989; Cognition and Technology Group at Vanderbilt, 1990a; Lebow & Wager, 1994; Sternberg et al., 1993; Winn, 1993).

3. *Authentic activities comprise complex tasks to be investigated by students over a sustained period of time*

   Activities are completed in days, weeks and months rather than minutes or hours, requiring significant investment of time and intellectual resources (e.g., Bransford et al., 1990b; Cognition and Technology Group at Vanderbilt, 1990b; Jonassen, 1991; Lebow & Wager, 1994).

4. *Authentic activities provide the opportunity for students to examine the task from different perspectives, using a variety of resources*

   The task affords learners the opportunity to examine the problem from a variety of theoretical and practical perspectives, rather than a single perspective that learners must imitate to be successful. The use of a variety of resources rather than a limited number of preselected references requires students to detect relevant from irrelevant information (e.g., Bransford et al., 1990b; Cognition and Technology Group at Vanderbilt, 1990b; Sternberg et al., 1993; Young, 1993).

5. *Authentic activities provide the opportunity to collaborate*

   Collaboration is integral to the task, both within the course and the real world, rather than achievable by an individual learner (e.g., Gordon, 1998; Lebow & Wager, 1994; Young, 1993).

6. *Authentic activities provide the opportunity to reflect*

   Activities need to enable learners to make choices and reflect on their learning both individually and socially (e.g., Gordon, 1998; Myers, 1993; Young, 1993).

7. *Authentic activities can be integrated and applied across different subject areas and lead beyond domain-specific outcomes*

   Activities encourage interdisciplinary perspectives and enable diverse roles and expertise rather than a single well-defined field or domain (e.g., Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990a; Bransford et al., 1990b; Jonassen, 1991).

8. *Authentic activities are seamlessly integrated with assessment*

   Assessment of activities is seamlessly integrated with the major task in a manner that reflects real world assessment, rather than separate artificial assessment removed from the nature of the task (e.g., Herrington & Herrington, 1998; Reeves & Okey, 1996; Young, 1995).

9. *Authentic activities create polished products valuable in their own right rather than as preparation for something else*

   Activities culminate in the creation of a whole product rather than an exercise or sub-step in preparation for something else (e.g., Barab et al., 2000; Duchastel, 1997; Gordon, 1998).

10. *Authentic activities allow competing solutions and diversity of outcome*

    Activities allow a range and diversity of outcomes open to multiple solutions of an original nature, rather than a single correct response obtained by the application of rules and

procedures (e.g., Bottge & Hasselbring, 1993; Bransford et al., 1990a; Bransford et al., 1990b; Duchastel, 1997; Young & McNeese, 1993).

Investigating Authentic Activities Online

As stated by Lebow and Wager (1994): "When authentic activity is the model for appropriate learning activity, the perceptions of the learner and the affordances of the environment represent an integral and inseparable context of learner/environment" (p. 241). The Cognition and Technology Group at Vanderbilt (1990b) describe authentic activities as 'generative' because the completion of the task requires the students to generate other problems to be solved. They draw a distinction between these authentic tasks and simple word problems that already define the problem, such as: "If you travel 150 kilometers at 90 kph, how long will the journey take?"

Compare this simple problem with one described by Reeves and Laffey (1999) in an undergraduate engineering course where the students' task is to plan a mission to Mars, encompassing the design a research station there as well as the creation of a renewable power source to sustain life once a station is established. Such activities guide learning in entire courses of study. They are not provided simply to enable students to practice skills taught in more didactic, content-focused ways. They are integral to the way students approach and study the course, and provide meaning to complex curricula.

At Edith Cowan University in Western Australia, a *Graduate Certificate in Online Teaching and Learning* has been developed according to the guidelines of authentic activity described above. The aim of the program is to assist instructors to have the confidence to design and plan effective online learning environments themselves. The program consists of four courses: *Online Teaching and Learning, Resources for Teaching and Learning Online,*

Designing Effective Online Learning Environments, and an *Online Learning Project Unit*. The design of the courses is characterized by strongly student-centered environments, with authentic and conceptualized learning tasks in collaborative settings, using integrated assessment strategies and learning scaffolded by instructor support. The courses are designed to be delivered online and to embody a variety of online teaching and learning strategies.

The first course entitled *Online Teaching and Learning* (Figure 1a) was designed to explore issues associated with the creation of effective learning environments, and draws heavily on recent theory and research. The course is based upon a task (Figure 1b) wherein the student takes on a role in a scenario set in a fictitious university. The student is required to evaluate a website that has been set up as an exemplar for a consortium of universities planning to develop a joint online course. The students then, in collaboration with other students (posed as representatives from the other universities) recommend a set of guidelines for website development, and then redesign the original website (or one of their own choosing) according to those guidelines. While comprising a single sustained task, the activity can be evaluated at three points.

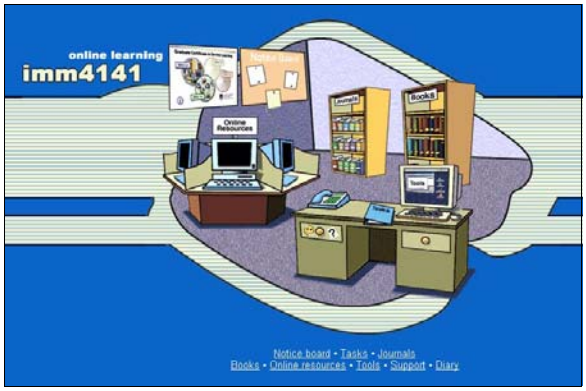

Figure 1a: The main interface for *Online Teaching and Learning*

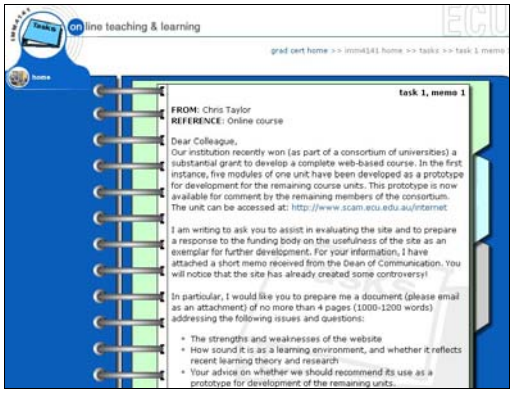

Figure 1b: The task presented in a memo

Our current research project (Herrington, Oliver, & Reeves, 2002), entitled *Authentic activity as a model for web-based learning,* has sought to investigate examples of courses or instructional units that embody the critical elements described above. Using these characteristics as criteria for the selection of appropriate courses to study, our research has sought to investigate the characteristics of authentic activity that facilitate a whole course of study being encapsulated within complex tasks, and to determine the factors that contribute to the successful adoption and implementation of activity-based online courses. We have used the criteria listed above to select courses or units of study that use authentic activities as a central core of their presentation. The courses must have a major online component, not simply comprise supplementary material to on-campus delivery. Examples of the types of online courses that use authentic activities are given below.

In a post-graduate unit entitled *Research Preparation: Research Methods,* students do not learn research methods by studying texts describing research methodologies and appropriate applications. Instead they work virtually in a graduate research center (Figure 2a) where they are given the task of investigating the closure of a rural school. They do this using both qualitative and quantitative methods, and they are assisted by two virtual researchers who have collected data from the community and assembled the data in raw form. The students can examine school records, population data, interviews with teachers, parents and community members, newspaper reports and other documents (e.g., Figure 2b). Students produce a report that analyses the impact of the closure of the school on the rural community.

Figure 2a: The graduate research center

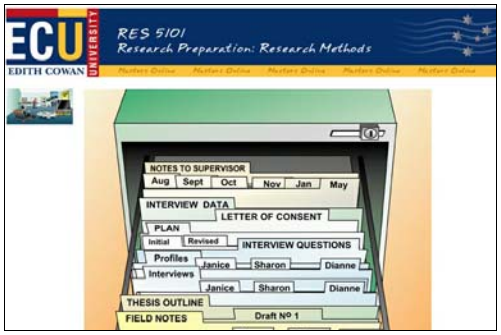

Figure 2b: Qualitative data in the filing cabinet

In a semester long course entitled *North American Fiction and Film*, (Figure 3a) students study novels written by North American writers such as Melville, Hemingway, DeLillo, Vonnegut, Atwood, and Esquival, and they view film versions of the same works (if appropriate). In the course, they are given the role of Editorial Board Members of an online scholarly journal (Figure 3b), to which they submit book reviews and articles based on their study of the literature. The students collaboratively design a guide for novice reviewers on how to write a book review. The teacher of the course is the journal editor, and an edition of the journal is published online at the end of the semester. A range of literary resources, articles and reviews are accessible from the website. The theoretical and design framework of the course is described in Fitzsimmons (2001).

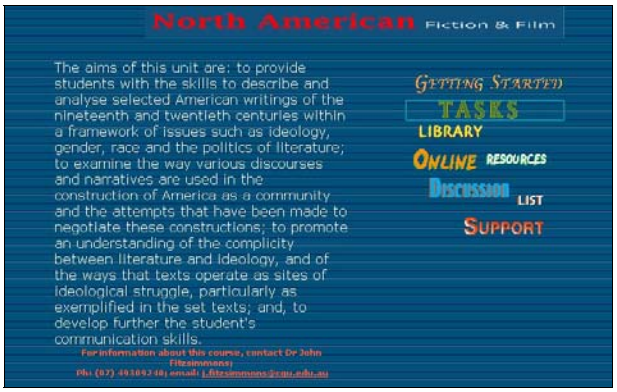

Figure 3a: Main interface of North American Fiction and Film

Figure 3b: Memo inviting students to join Editorial Board

Coastal and Marine Systems is a post-graduate course where activities are specifically designed to mirror the typical problems that a coastal manager or an environmental consultant might encounter. For example, in one major task (Figure 4a), it is proposed that a marina has been developed, and as part of the approval process, annual monitoring of water quality is required. The monitoring encompasses water inside the marina as well as a site several hundred meters outside the marina, in well-flushed ocean conditions. The students are provided with a set of real data collected by the course teachers from inside and outside the marina, and they are required to understand, analyze and interpret the data and draw conclusions as to whether the water quality within the marina is different to that outside, and if so explain the possible causes. The evaluation is presented as a report within the context of the renewal of the marina license. The course is constrained, to a degree, to the requirements of the proprietary software, Blackboard (originally the plan included a more realistic interface with clickable visual links and metaphors) (see Figure 4b) but nevertheless, the task incorporates the characteristics of authentic activities described earlier.

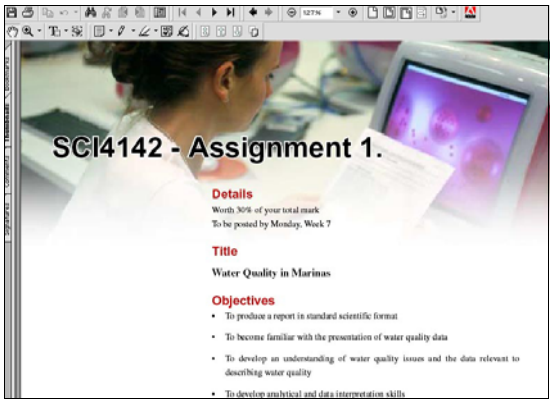

Figure 4a: Major activity on marina development and water quality

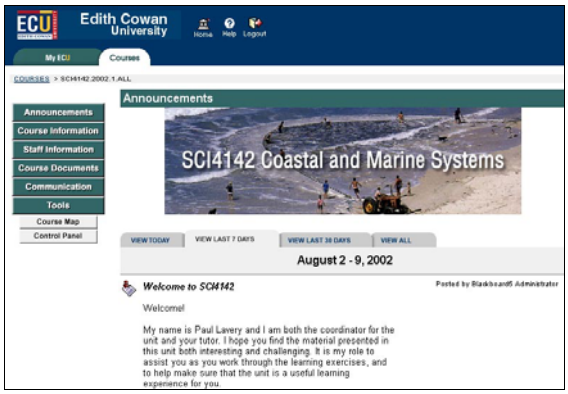

Figure 4b: Main interface of Coastal and Marine Systems in Blackboard

In another example of complex activity, Pennell, Durham, Orzog and Spark (1997) described a web-based environment, *Writing in Organizations*, part of the third-year curriculum for Bachelor of Arts (Communication Studies) where students learn business communication skills by accepting temporary employment in a virtual recording company (Figure 5a). They are given a complex task to complete, specifically preparing a report on whether the company would benefit from the introduction of an internal newsletter. In order to complete this activity, they make appointments, keep a diary, 'interview' the director and other employees (Figure 5b), and write letters, and memos as required.

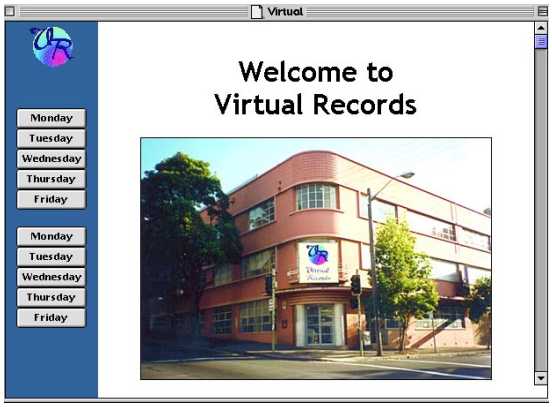

Figure 5a: Main interface of Virtual Records

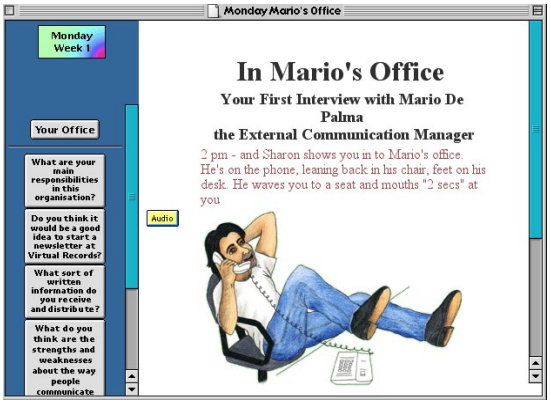

Figure 5b: Interviewing one of the employees

While most of the online learning environments we have studied have involved the creation of simulated work places and often incorporate extensive resources such as graphics, video, and sound files, other examples studied are less resource intensive while still retaining fidelity to the authentic characteristics described. For example, in an introductory biology course for online delivery (described in Koenders, 2002) students investigate a simulation of the discovery of new life forms, and are introduced to the interpretation of microscopic images of cellular structures. In the scenario, students are given a role as biologist who has joined an expedition to a remote lake in Siberia where several microorganisms are found that cannot be classified. They 'collect' the specimens and return to the university to analyze them. On the website, they are provided with images of unicellular organisms apparently unknown to science. Students are assigned to groups of four where they analyze the specimens and prepare a report. The scenario is not drawn in an elaborate, resource intensive manner, but built up through the creation of an interesting and engaging idea.

The learning environments described have varying degrees of fidelity to the characteristics of authentic activities defined earlier, but all have strong linkage to real-world professional practice. Faculty members, instructional designers, and others associated with the design and delivery of the courses are being interviewed, and the websites analyzed. Student responses are being gained through online questionnaires. The research is ongoing, and analysis is focusing on the identification of conceptual themes and issues emerging from the data, using techniques such as clustering, and making contrasts and comparisons (Miles & Huberman, 1994).

Some Issues Arising from our Research

While analysis is preliminary at this stage, several trends have emerged, and there are implications for the design of online learning environment, the teaching of such courses, and further research efforts.

Generally, the teachers involved in units and courses featuring complex, authentic activities (as described above) are enthusiastic and positive about their teaching and about the quality of student learning in the course. All have found the experience of designing and teaching the course to be professionally enhancing, through their own learning of recent educational research and pedagogy, through the experience of teaching in new and innovative ways, and in many cases through publications and conference presentations about the course and other professional activities. In short, they are engaged in the "scholarship of teaching" (Shulman, 2000).

One theme which has emerged strongly from a number of different sources in our research is the nature of authenticity, and how 'authentic' environments are often the creation of the teachers', authors' and instructional designers' imaginations, and are thus inevitably someone's *view* of what is authentic. Petraglia (1998) has been critical of this shortcoming,

calling it ‘the real world on a short leash’ (p. 53). There is nevertheless, much evidence to suggest that these learning environments can provide a great deal of meaning to otherwise decontextualised facts and skills, and can enhance the transfer of deep and lifelong learning (Barab & Landa, 1997). At what point do students become engaged, if ever, in these scenarios? Is there a pattern to their acceptance of the terms of the authenticity, and how important is the suspension of disbelief? (Herrington, Oliver, & Reeves, 2002).

Another recurring theme is time, in terms of both the teachers’ and the students’ commitment to authentic activities. Many of the teachers interviewed to date have mentioned the inordinate amount of time involved in both the preparation of the authentic tasks and environments, and the teaching of the online course (Reeves, 2002). Teachers also reported that students were likely to spend much more time on the tasks, some complaining of the demands, others appreciative of the sense of deep engagement they experienced with the learning context. The time commitment problem has also been noted in many other authentic learning environments, some of which have reverted to more traditional modes despite strong evidence of effectiveness, including the Mission to Mars engineering course described earlier (Reeves & Laffey, 1999). If the large time commitment is a ‘labor of love’, willingly given by the intellectual owners of the course, it is also likely that this commitment is not sustainable over the long term, and courses based on authentic tasks will be abandoned for more manageable—and more traditional—lecture/tutorial modes of instruction.

Proponents of authentic activities as described here are generally enthusiastic and committed teachers who willingly provide time and effort beyond the usual expectations. Further research may help to identify authentic activities in online units that are offered to large student cohorts. Investigation of large scale, successful initiatives will possibly yield a great deal of

information on how these environments can be sustained with standard resources and faculty allocations, rather than an abundance of goodwill and generosity on the part of teachers. Longer term studies may also reveal the kinds of support that host institutions can develop to facilitate course units employing authentic and complex activities.

It is hoped that analysis of our own and further research data will help to suggest those characteristics of authentic activity that facilitate a whole course unit of study being encapsulated successfully within complex tasks, and to determine the factors that contribute to the successful and sustainable adoption and implementation of activity-based online course units. We encourage others to engage in this research agenda with us.

Acknowledgements

This research is supported by the Australian Research Council and the Australian-American Fulbright Commission We wish to offer special thanks to the teachers, authors and instructional designers of the courses described, for their thoughtful and considerate participation, and for permission to reproduce pictures of their websites: Trevor Bennett, Clare Brook, Marsha Durham, John Fitzsimmons, Jan Gray, Annette Koenders, Paul Lavery, Maria Northcote, Russ Pennell, Heather Sparrow; and the University of Western Sydney, Central Queensland University, and Edith Cowan University.

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