PROJECTS-TO-THINK-WITH AND PROJECTS-TO-TALK WITH: HOW ADULT
LEARNERS EXPERIENCE PROJECT-BASED LEARNING IN AN ONLINE COURSE

by

HUEI-LIEN CHEN

B.S., National Open University, Taiwan, 1995
M.S., Cardinal Stritch University, 2002

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Secondary Education
College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2006

ABSTRACT

In many college of education programs, the feasibility of online courses has provided opportunities for in-service teachers who are pursuing a higher educational goal while working full-time with school and/or family responsibilities. Although preliminary evidence on project-based learning (PBL) in traditional classrooms with younger learners suggests that students are highly motivated, it is not clear whether adult learners recognize the value of the online PBL approach. This study documented adult learners' learning experience with online projects, their collaborative experience, and their learning experience with technological tools. The result of this study can contribute to our understanding of the strengths and the obstacles in an online PBL environment.

Nineteen participants who registered in a graduate level course participated in this case study over a 16-week semester. They collaborated in small group of 2–5 members in order to communicate and construct projects at a distance. Qualitative and quantitative data were collected and interpreted based on a descriptive case study design. Multiple sources of data include course documentation, archival data from course management system, student-created projects, surveys, and interviews. A model for content analysis of CMC was applied to qualitative analysis of the electronic discourse.

Findings of this study indicated that participants gained positive experience in this new way of learning. In particular, three themes related to online PBL approach emerged: (1) project relevancy and authenticity as the primary concerns in guiding driving question, researching information, and constructing artifact; (2) synchronicity is indispensable for online collaboration; and (3) repeated exposures with technology tools reduce the fear and reinforce the skill to be learned.

PROJECTS-TO-THINK-WITH AND PROJECTS-TO-TALK WITH: HOW ADULT
LEARNERS EXPERIENCE PROJECT-BASED LEARNING IN AN ONLINE COURSE

by

HUEI-LIEN CHEN

B.S., National Open University, Taiwan, 1995
M.S., Cardinal Stritch University, 2002

A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Secondary Education
College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2006

Approved by:

Major Professor
Dr. Diane McGrath

ABSTRACT

In many college of education programs, the feasibility of online courses has provided opportunities for in-service teachers who are pursuing a higher educational goal while working full-time with school and/or family responsibilities. Although preliminary evidence on project-based learning (PBL) in traditional classrooms with younger learners suggests that students are highly motivated, it is not clear whether adult learners recognize the value of the online PBL approach. This study documented adult learners' learning experience with online projects, their collaborative experience, and their learning experience with technological tools. The result of this study can contribute to our understanding of the strengths and the obstacles in an online PBL environment.

Nineteen participants who registered in a graduate level course participated in this case study over a 16-week semester. They collaborated in small group of 2–5 members in order to communicate and construct projects at a distance. Qualitative and quantitative data were collected and interpreted based on a descriptive case study design. Multiple sources of data include course documentation, archival data from course management system, student-created projects, surveys, and interviews. A model for content analysis of CMC was applied to qualitative analysis of the electronic discourse.

Findings of this study indicated that participants gained positive experience in this new way of learning. In particular, three themes related to online PBL approach emerged: (1) project relevancy and authenticity as the primary concerns in guiding driving question, researching information, and constructing artifact; (2) synchronicity is indispensable for online collaboration; and (3) repeated exposures with technology tools reduce the fear and reinforce the skill to be learned.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

DEDICATION

I dedicate this dissertation to my wonderful family, especially my mother Mrs. Tuan-Erh Lou Chen (羅端兒), and my father Mr. Hsou-I Chen (陳守儀), who know little about educational theories but raised three Ph.D. daughters. They gave me a positive attitude toward challenges through a simple faith in God. I thank my wonderful husband, Mr. Kuo-Huang Chang, who came to the United States with me and has supported me both spiritually and financially. Let me also say "thank you" to my precious son, William, who left his friends in Taiwan when he was in the age that friends meant everything to him. And, this research is dedicated to: my sister-in-law, Ms. Kuo-Feng Chang, for taking care of my parents-in-law; my outstanding sisters and brothers-in-law including Ms. Huei-Huei Chen and Mr. Hui-Wen Lin, for accompanying my parents; Dr. Hui-Ping Chen and Mr. Chris Lieser for being supportive family; Mr. Jack Liu for answering my emergency calls once in a while; and Dr. Pearl Huei-Chu Chen, for teaching me how to write academic papers, how to be a researcher, and for bringing out the good ideas in me.

CHAPTER 1: INTRODUCTION

In 1938, more than six decades ago, the International Council for Open and Distance Learning (ICDE) began its first conference. Bunker (2003) summarized trends and patterns that have been recorded in the ICDE conference proceedings over the past years. These research trends - accessibility, quality, methodology, internationalization, and educational technologies - could provide insight on alternative approaches facing distance education today.

In all countries, continuous learning for adults is becoming essential as many jobs are emerging to replace traditional job (Hanna, 2003). As a result, traditional universities are facing increasing pressures to be creative and innovative in providing maximum access to adult learners as efficiently as possible. At the same time, the distinction between on-campus learning and distance learning is blurring as wireless access to the Internet is being created. Classes with multiple formats for learning are provided as options to more and more students. Today's learners, especially adults, expect institutions of higher education to be responsive to their individual needs, which means providing course schedules and formats that are convenient, easily accessed, and independent of fixed times and locations (Dillman, Christenson, Salant & Warner, 1995; Kearsley, 2000). As cautioned by Frank Mayadas, the director of the Sloan Foundation's Asynchronous Learning Network, the online learners face unique challenges; consequently, they are more demanding of quality services such as high speed connections, technical supports, and/or instant feedback than the on-campus learner population (Carr, 2001).

Online education and traditional distance education, they share certain attributes such as the fact that both are time- and place-independent and the interaction is mediated. However, as distinguished by Burge (1988), traditional distance education typically relies on a mass delivery

of pedagogic material using mail, radio, or television. Learners are expected to self-study, usually with access to a tutor or facilitator by phone or mail. The interactivity of the face-to-face model is not present or at the same level in distance education. This is consistent with Moore's (1986) finding that traditional distance learning emphasizes the independence of the learner rather than the group and the activity level. Furthermore, Barab, Thomas, and Merrill (2001) suggest that the focus of online learning has shifted from dissemination of information to fostering collaboration. Online education has the potential to support group communication via a variety of distance learning technologies. The social, affective, and cognitive benefits of online peer interaction and collaboration are comparable to those provided by face-to-face education.

Many course management systems (CMS) have been developed during the last decades, including open source and proprietary products with different functions or characteristics ranging from whether the product offers chat functions, assessment tools, video conferencing, or compliance with disability standards. At Kansas State University, where this research was conducted, the College of Education switched from the Blackboard™ course management system to K-State Online (KSOL)[1] in 2006. This transition created a challenge for faculty to transfer their courses from Blackboard™ to the KSOL system. As suggested by Smart and Meyer (2005), universities need to consider time and effort needed to make the transition a success for their courses and students. Although research on converting courses from one CMS to another has been surprisingly lacking and calls for holistic investigations, it is beyond the scope of this study.

---

[1] K-State Online (KSOL) is a course management tool developed by Axio Learning, a company owned by Kansas State University.

CMS has adopted the inspiring idea of using the computer as a tool to amplify intellectual processes (Harasim, 1990). In the history of the computer in education, early pioneer works include Bush's *memex*, a theoretical device that would allow individual to store books, records, and communications as a supplement memory (Bush, 1945). Unfortunately, Bush's *memex* was never constructed. Two decades later, Engelbart's *On-Line System* (NLS), later marketed as *Augment*, emphasized the provision of tools to support collaboration among people doing their work in an asynchronous, geographically distributed manner. Then, in the early 1960s, Nelson (1987) coined the phase *hypertext* to denote online writing and reading that are non-sequential and heavily cross-referenced and annotated. In Project *Xanadu*, Nelson envisioned having users create linkages between ideas and explore those linkages, using a variety of features that facilitate developing and tracking interconnections. Together, these pioneering visions and systems explored the potential of using computers to create *cognitive* and *social* connectivity– webs of connected information and communication among knowledge constructors. Later on, Turoff (Hiltz & Turoff, 1978) invented EMISARI, a *computer conferencing system,* to structure human communication for information exchange and effective problem solving with a group of members. This view of using computers to create cognitive and social connectivity remains popular, and many educational communities have adopted this *collective intelligent* view of a computer system that supports both individual and social aspects of learning.

Harasim (1990) identifies five attributes that consist online education as a unique mode: (1) many-to-many communication, (2) place independent group communication, (3) time independent communication, (4) text-based communication, and (5) computer-mediated communication (CMC). Among those, CMC is the most significant attribute, as Harasim states:

> "… CMC offers not only increase learner's access to information- and do so powerfully and successfully- but can also facilitate knowledge building activities. This is where the

interest in CMC and online education lies- and where the challenge lies. We are developing and using new tools: How do they work? In what ways might the new media- particularly computer-based tools- empower our intellectual processes, to make us better thinkers, learners, and problem solvers? " (p. 52-53)

CMC, defined as human communication via computer, may facilitate active construction of meaning. In response to new information, a learner actively generates responses, both positive and negative, a process that stimulates cognitive restructuring. Brown (1989) views technology as a means to support collaborative conversations that ensure construction of understanding instead of using technology as a cognitive delivery system. Furthermore, Brown indicates that knowledge building is a sense-making pursuit. Through conversation, negotiation, and authentic activity, learners add contributions to a shared knowledge base.

Perkins (1986) also views knowledge as a sense-making pursuit. Opposing processing knowledge as information passively, he argues that the learner's actively employing *knowledge as design* "would mean knowledge as structures adapted to a purpose, just as a screwdriver or a sieve are structures adapted to a purpose" (p. 3). Scardamalia and Bereiter (2003) defined *knowledge building* as "the production and continual improvement of ideas of value to a community" (1370). They further distinguish the differences between knowledge building and learning, although the terms are commonly used interchangeably in education. They contend:

> "Learning is an internal, unobservable process that results in changes of belief, attitude, or skill. Knowledge building, by contrast, results in the creation or modification of public knowledge- knowledge that lives 'in the world' and is available to be worked on and used by other people" (p. 1370).

Moving from the role of passive receiver/processor to the role of knowledge constructor/producer requires a *developmental trajectory*. Scardamalia and Bereiter summarize three traditional approaches that attempt to launch learners onto the developmental trajectory. The first approach focuses on foundational knowledge, based on the assumption that learners are

able to use learned knowledge if they learn it well enough, the knowledge creation is not applied until graduate school. The result of this approach leads to the majority of people unprepared for the challenge of knowledge creation when they enter graduate school. The second approach focuses on subskills (now often known as the "21st century skills", Scardamalia & Bereiter, 2003) such as critical thinking, scientific method, and collaboration. Unfortunately, when facing the real world workforce, only a few people are capable to assemble these subskills into use. The third approach, associated with "learning communities", "project-based learning", and "guided discovery", is currently widely used in conjunction with the use of information technology. Yet, Scardamalia and Bereiter caution that, without careful consideration, this approach might too easily decline toward *shallow constructivism*. Accordingly, Scardamalia and Bereiter (2003) distinguish between shallow and deep forms of constructivism:

> "The shallowest forms engage students in tasks and activities in which ideas have no overt presence but are entirely implicit. Students show little awareness of the underlying principles that these tasks are to convey. In the deepest forms of constructivism, people are advancing the frontiers of knowledge in their community. This purpose guides and structures their activity: Overt practices such as identifying problems of understanding, establishing and refining goals based on progress, gathering information, theorizing, designing experiments, answering questions and improving theories, building models, monitoring and evaluating progress, and reporting are all directed by the participants themselves toward knowledge building goals." (pp. 1370-1373).

Project-based learning (PBL) is increasingly an integral part of educational reform. Evidence has begun to show that PBL can enhance the quality of learning and leads to higher-level cognitive development through students' engagement with complex problems and collaboration with experts and peers (Newell, 2003). In the design process required by a project, learners develop skills and abilities such as the research skills, organization/project/time management skills, ability to represent understanding in the artifact, presentation skills, metacognitive skills, ability to accept others' evaluation, and skill and willingness to revise the

project (McGrath, 2003). Examples can be found in science and mathematics learning (MacGregor and Thomas, 2002; Goldman, Duschl, Ellenbogen, Williams & Tzou, 2003); multimedia production (Yang, 2003; Liu & Hsiao, 2001), study of student agency (Barron & CTGV, 1998), study of motivation (Blumenfeld, et al., 1991), and study of collaborative learning (Hargis, 2005; Day, Lou, & Van Slyke, 2004-05; Marchaim, 2001; Blumenfeld, Krajcik, Marx & Soloway, 1994).

While PBL facilitates learning in traditional classroom settings, PBL also supports an online community of learners (Murphy & Gazi, 2001; Synteta, 2000). Likewise, while PBL engages traditional learners, PBL also benefits non-traditional learners such as pre- and in-service teachers in professional development programs (Frank & Barzilai, 2004; Toolin, 2004, Rosenfeld & Ben-Hur, 2001; Krajcik, Blumenfeld, Marx & Soloway, 1994). Although PBL has not yet had a universally accepted definition, this study adopts four summarized features provided by Blumenfeld and his colleagues (Blumenfeld, Krajcik, Marx & Soloway, 1994):

"(a) a driving question, encompassing worthwhile content that is meaningful and is anchored in a real-world problem; (b) investigation and artifacts that allow students to learn concepts, apply information, and represent knowledge in a variety of ways; (c) collaboration among students, teachers, and others in the community; and (d) use of technological tools such as microcomputer-based laboratories, graphing software, hypermedia, and telecommunications, which help learners represent and shared ideas." (p. 540)

McGrath (2002) furthered articulates PBL as "teaching and learning around projects that are driven by an authentic question or problem that is central to the discipline/curriculum, involves the building of a community of learners, and culminates in the presentation of a student-constructed work to an outside audience" (p. 42). In addition, to go beyond the hands-on activity attribute, Chen and McGrath (2004-05) proposed the notion of *cognitive PBL* that focus on helping learners overcome learning obstacles that are not commonly addressed in simple PBL environments.

This study investigates adult learners' experiences in an online cognitive PBL environment whose design was based on three rationales: First, PBL promotes learner autonomy and collaboration. Since the number of online learning programs/courses is increasing, PBL would help support a community of learners who are expected to be highly autonomous and to take responsibility for self-regulated learning; also, to collaborative with peers in order to gain more perspectives. Second, PBL embraces technology. In the light of contemporary theories for learning such as constructivism (Phillips, 2000), constructionism (Papert & Harel, 1991), situated cognition (Lave & Wenger, 1989), and cognitive apprenticeship (Collins, Brown, & Holum, 1991), an important concept that has been discussed recently focuses on making thinking visible–an essential skill for 21st century learning (Perkins, 2003). Even so, it is difficult to implement this concept with few research studies available to guide us. A technology-assisted PBL environement encourages learners to explore tools that can be used for inquiry, communication, construction, and expression (Bruce & Levin, 1997); and consequently, making both individuals' and the group's thinking visible to the community so that it can be easily accessed and reviewed later on. Third, PBL values learning with projects. According to Liu (2003), PBL "typically starts with an end product, which serves as a driving question compelling students to learn about the central concepts and principles of a topic while engaging in producing the product" (p. 24). Students are reported more engaged when working on a meaningful external artifact. Papert and Harel (1991) described this motivational aspect with the project method as "objects-to-think-with" and "objects-to-talk-with."

Despite these rationales, we know little about how PBL affects adult learners in an online learning community. Studies on PBL with younger learners in traditional instructional settings are not necessarily applicable to online PBL that deals with adult learners and complex learning

tasks. While research is needed to find better teaching and learning strategies in an online learning community, an important area to explore is students' learning experiences around projects through collaborative interactions within a small group. As suggested by Dillenboug (1999), a collaborative learning situation includes a variety of contexts and interactions. It would be meaningless to assess the effects of collaborative learning without "*zooming in*" to gain a better understanding of the underlying processes. Therefore, this case study focusing on identify and situate for the reader the central themes that characterize the course dynamics can make an important contribution to our understanding of adult online learners' collaborative learning experience with projects.

Statement of the Problem

Many educators seem to have the impression that PBL is a motivational, hands-on approach yet is only good for younger and/or inexperienced learners, as the term "shallow constructivism" described by Scardamalia and Bereiter (2003). Despite the trend to incorporate online PBL to engage adult learners, little research has been done to guide the design and implementation of online projects in higher education. Research needs to be conducted to observe and document the learning process as students collaborate in groups to complete a series of projects at distance. In addition, the process of using technology tools at a distance needs to be investigated to contribute to further study on distance technologies.

Purpose of the Study

The purpose of this qualitative case study is to attempt to achieve research goals at three levels as suggested by Maxwell (2005):

> *1*. At the theoretical level, this study attempts to understand the dynamics of using
>   PBL to guide online collaborative learning around projects, and thereby, to fill the

gap in current knowledge on the impact of online PBL on students' learning experience.

2. At the practice level, this study attempts to understand participants' learning experiences within KSOL, and to find out how participants deal with difficulties such as technical problems, time constraints, and group conflicts. These factors may or may not hinder the quality of the projects produced by groups. In addition, this study also attempts to understand the instructor's experiences in structuring online courses that meet the PBL criteria. The findings provide insights toward further studies in using CMS for better teaching and learning.

3. At the personal level, since the researcher had her bachelor degree from the National Open University in Taiwan, this study meets a personal interest in designing better online learning environments that enhance quality teaching and learning for distance education.

Research Questions

1. What are the quality and nature of participants' learning experiences over a series of different projects (as gleaned from their perceptions as well as their performance in three different projects) within the context of an online project-based learning community? What are some difficulties/problems associated with participants' learning experiences?

2. How do participants' online project-based learning experiences affect their use of educational technology tools over the semester?

3. What are participants' group collaborative experiences in communicating and constructing projects online?

4. What are the instructor's experiences in structuring this online PBL course? What are the difficulties in meeting the six PBL criteria in an online PBL environment? And what are the strategies used to manage class virtually?

Significance of the Study

Many higher education instructors are asked to move their courses online, despite the fact that some of these courses might be targeted to students in a traditional learning environment. With the help from institutional technical support services, the task of moving from face-to-face learning to an online format may not be so daunting. To enhance online learning quality, several remedies have been proposed, for examples, Gagné's (1965) nine events of instruction, which provide a framework of hierarchical instruction in order to facilitate learning at each level, is still viable to guide online course design. Keller's *attention*, *relevance*, *confidence*, and *satisfaction* (ARCS) model is still relevant in promoting learner motivation (Song & Keller, 2001). Moore's (1986) proposition of appropriate opportunities for dialogue, appropriately structured learning materials, and appropriate learner autonomy is still helpful to assist learners succeed within transactional distance.

All of these models are focusing on the technical dimension of online learning. There has been much discussion with respect to using these models to guide instructional interactions among learners with the content and with the instructor. What seems to be lacking is an equally important social dimension to the online learning community. Therefore, the focus of this research was on this social dimension, and it is this aspect that is highlighted.

PBL has been used in various settings: traditional classrooms, online courses, grade schools, and higher education, including teacher education programs. Despite the popularity of PBL, research has not provided sufficient understanding on how the PBL method guides adult learners in constructing collaborative projects within the online learning community. Therefore, this case study provides thick descriptions of the learning dynamics within a semester-long online graduate level course, and investigates how students explore ways to use Web-based tools

that help learners communicate and construct projects over time. The main objective is to investigate both the instructor's experiences and the participants' learning experiences with the project method using the CMS tool. Such research is expected to contribute to the improvement of pedagogy in the design and use of CMS for education.

Limitations of the Study

This research is a descriptive case study. Case studies can be viewed from different perspectives: some consider the case an object of study; the others consider it a methodology (Creswell, 1998). Maxwell (2005) identifies several goals that can be achieved in qualitative research, including: (1) understanding the meaning, (2), understanding the particular context, (3) identifying unanticipated phenomena and influences, and generating new grounded theories, (4) understanding the process, and (5) developing causal explanations. However, Stake (1994) indicates case study should be a study of the particular case. This research does not attempt to make any generalizations, but pays attention to what can be learned from this single case for two reasons: first, the 24 students enrolled in this course were diverse in terms of their ages, geography localities, technology experiences, learning styles, teaching experiences, working habits, and personal beliefs and values; and second, the information gathered from this specific case was bounded in time and place, and to that particular situation (course, system, instructor, university, etc.). Therefore, the findings of this study are not generalizable to other settings, yet the findings are relevant to research on online learning.

Another limitation is the use of Internet communication technologies to collect data. Traditionally, qualitative data are obtained through face-to-face methodologies such as classroom observation and/or interview. Recently, both quantitative and qualitative data have been collected through Computer-Mediated Communication (CMC), via either synchronized or

asynchronized Internet tools. Although some researchers are concerned that the collected

electronic data might lack visual social cues for analyzing and interpreting the data, Giese (1998)

argues that using the Internet is a new way of transmitting meaning. Mann and Stewart (2000)

further explain the idea:

> "…, the Internet is both a technological and a cultural phenomenon. As qualitative
> researchers, we consider it insufficient simply to demonstrate the technological advances
> the Internet might allow us to achieve. In Internet Communication and Qualitative
> Research the Internet is considered not simply as a technological tool but as a wholly
> new, constructed environment with its own codes of practice." (p. 7)

Accordingly, based on Mann and Stewart, the information collected via Internet

communication technology is "a hybrid showing features of both spoken and written languages"

(2000, p. 182).

Definitions of Terms

Computer-Mediated Communication (CMC). CMC is using computers as medium for human

communication. The possible types of CMC include synchronous CMC such as real-time chat,

computer conferencing; and asynchronous CMC such as email and text-based messaging

systems.

Course Management System (CMS). CMS is an elaborate computer program that allows

instructors to manage materials distribution, assignments, communications and other aspects of

instruction for their courses. Such electronic learning (e-learning) systems are sometimes also

called Learning Management Systems (LMS), Virtual Learning Environments (VLE), education

via computer-mediated communication (CMC) or Online Education. (Wikipedia, n.d.)

Cognitive Project-Based Learning (Cognitive PBL). Complex project-based learning with

cognitive and metacognitive learning goals, specifically aims to support higher-order thinking

(Chen & McGrath, 2004-05).

12

Cognitive Tool (CT). "Any tool that can support aspects of learners' cognitive processes" (Lajoie, 1993)

Making Thinking Visible (MTV). A term used to encourage making the processes of knowledge building and critical thinking explicit. Possible examples of MTV can be a technology-mediated instructional plan, languages, or software to represent one's own thinking, and to respond to one another's ideas.

Online Learning Community (OLC). An online learning community is a place where learners work collaboratively as a community to achieve learning objectives through networking and/or Internet technology.

Project-Based Learning (PBL). PBL is described as teaching and learning around projects that are driven by an authentic question or problem that is central to the discipline/curriculum, involves the building of a community of learners, and culminates in the presentation of a student-constructed work of an outside audience (Blumenfeld, Krajcik, Marx, & Soloway, 1994; McGrath, 2002).

CHAPTER 2: LITERATURE REVIEW

Education is shifting its focus from teaching to learning, from a teacher-centered perspective to a student-centered perspective (Land & Hannafin, 2000). In this paradigm shift, educators are confronted with challenges such as how to design a learning environment that facilitates self-regulated learning within a constructivist learning environment (CLE). A CLE supports individuals or groups as they attempt to negotiate multiple points of view; scaffolds thinking and actions in order to deepen understanding; and allows learners to amplify and extend cognitive capabilities to reach their potentials (Mayer, 1996; Bransford, Brown, & Cocking, 2000; Driscoll, 2000).

Among a variety of approaches that are consistent with the constructivist perspective, Blumenfeld, Krajcik, Marx, and Soloway (1994) suggest using project-based instruction as a model for teacher learning. They assert project-based instruction as:

> "one attempt to embody constructivist theory. Other attempts include conceptual change approaches to instruction (Pintrich, Marx & Boyle, 1993), interactive technology environments such as Papert's (1993) microworlds, and cognitive science-based programs such as the work of Newman, Griffin, and Cole (1989). Project-based instruction cannot be portrayed through a traditional curriculum-implementation model where teachers follow prescribed practices. Instead, teachers apply a range of practices congruent with the theory but tailored to meet unique classroom circumstances and their teaching style" (p. 540).

Today, the new technology of the World Wide Web (WWW) has opened up a new era for teaching and learning. Web-based learning places a heavy demand on students' autonomy and collaboration within the virtual community. Hargis (2005) suggests that the five aspects of PBL–a driving question, investigation, collaboration, technology, and artifact–work well in the context of an online environment because "[t]elecommunications allow students to interact with a wider community of other students, and outside science experts to share information, data,

resources, and ideas (p. 157)". However, the results of PBL may vary depending on the types of

project and the levels of student engagement. To distinguish different types of PBL in terms of

cognitive engagement, the notion of Cognitive PBL (Chen & McGrath, 2004-05) was proposed

to help learners overcome learning obstacles that are not commonly addressed in simple PBL

environments. In short, Cognitive PBL supports higher order thinking and focuses on helping

students develop effective cognitive strategies.

This study has the potential to contribute to the development of the Cognitive PBL

framework by providing a deeper understanding of the dynamics of using PBL to guide online

collaborative learning around projects. In this chapter the three theoretical perspectives (1)

constructivism, (2) constructionism, and (3) distributed cognition, are first discussed. Secondly,

under the topic of project-based learning, collaborative learning and technological tools that are

important to online PBL are discussed. And thirdly, research on PBL in a variety of learning

contexts is reviewed.   Constructivism, constructionism, and distributed cognition are discussed

as the theoretical underpinnings for PBL because they support the essential features of PBL

(Krajcik, Bluemenfeld, Marx & Soloway, 1994) as listed below:

1. A driving question or problem that sets the scene for the project
2. Student construction of an artifact and presentation to an outside audience
3. Student collaborative research often over an extended period of time
4. Community of inquiry
5. Use of technology-based cognitive and communication tools

Taken together, the three theoretical perspectives discussed below emphasize

students working with authentic knowledge problems and producing collaborative

artifacts that embody their creative work with ideas within a community of inquiry, in

which cognitive responsibility is distributed among all the members in the group.

Theoretical Perspectives

Constructivism

Over the last 25 years, the theoretical paradigm has shifted from viewing the learner as a passive information processor to seeing the learner as an active constructor of knowledge. This view of knowing is labeled as *constructivism*. According to Perkins (1991), constructivism is an engaging and collaborative concept to whose evolution many thinkers have contributed. Beers (n.d.) gives examples of these thinkers, including: (1) Socrates- who encouraged students to think critically without being given an absolute answer, a method known as the *Socratic Method*. (2) Jean Piaget- who found that the learner learns through construction of one logical structure after another by passing through stages of *equilibrium* and *disequilibrium*. The learner starts out in a state of equilibrium with his or her own worldview, and through interacting with others and the world, the learner is forced to deal with new perspectives and becomes decentered, a state of disequilibrium. Eventually, the learner either assimilates this new concept by fitting it into an existing mental model or accommodates this new concept by restructuring an existing mental model. Or, the learner may reject the new concept if no viable conception can be made to the existing mental model. (3) Lev Vygotsky- who indicated that language, culture, and adult guidance and/or collaboration with more capable peers are an integrated part of the learning process. Within the community of social development, learners are able to move from their actual developmental level in which they can solve problems independently to the level of their full potential; between these two levels is what Lev Vygotsky called *Zone of Proximal Development* (ZPD). A ZPD is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable

peers" (Vygotsky, 1978, p. 86). Ideally, learners will reach the full potential of their ZPDs with the help of tools and guidance from the teacher and/or more knowledgeable peers within a learning community. (4) John Dewey- who believed in education as "a process of living, not a preparation of future living" (Dewey, 1974, p. 430). (5) Jerome Bruner- who viewed education as a process of discovery, only the learners know where to categorize information in their heads, therefore they should be actively involved in the whole process (Bruner, 1996). (6) Seymour Papert- who was a formal student of Piaget and furthered develop the theory constructionism, which will be discussed in the next section.

Over the years, constructivism has grown into a big tree with many branches, such as radical constructivism, social constructivism, cultural constructivism, critical constructivism. Among those, radical constructivism and social constructivism are the most often mentioned branches in comparing and contrasting different types of constructivism. According to Staver (1998), radical and social constructivism share the same foundation; they both view: (a) knowledge as built up by individual and the community; (b) social interaction as the means by which people build up knowledge, primarily through language; (c) cognition and language as functional and adaptive; and (d) the purpose of cognition and language as making sense of meanings, that is, bringing coherence to an individual's world view, or to a community's shared knowledge base. However, Staver makes the distinction that, while radical constructivists focus more on the individual's cognitive process, social constructivists emphasize more the influences of social aspects through language and interactions with others. Although one of the major criticisms of constructivism is our empiricist tradition suggesting that knowledge comes form the senses and from experiences, Staver (1998) pointed out that, as humans, we are restricted regarding the subject of ontology because we have access only to our own lens. The remedy is

to adopt the social constructivist perspective of learning by rejecting truth as correspondence with an external reality and instead viewing truth in terms of internal coherence and viability. Today, many learning and/or instructional theories that rest on a constructivist foundation have adopted the social constructivist perspective (Land & Hannafin, 2000; Wilson & Myers, 2000).

As stated by Jonassen (1992), constructivist learning is not supposed to mirror reality, but rather to construct meaningful interpretations. Moreover, Perkins (1991 b) suggests that constructivist pedagogy often imposes high demands on the learners in regard to the following aspects:

Cognitive complexity- Constructivist instruction asks students to cope with very complex situations. Perkins (1991b) distinguished three paths and associated conflicts in conventional constructivist pedagogy: (1) Conflict-buried: this conventional instruction asks learners to follow the path and ignore the conflict between their prior experience and the target learning model. The outcome is learners learn to play the school game for the tests and assignments without any recognition. (2) Conflict-faced: this Piagetian path asks learners to compare and contrast their naïve models with an unfamiliar model. However, learners often have a hard time with this path due to the lack of familiarity with the newer model. (3) Conflict-deferred: according to Perkins, this path is seldom used. Learners in this path are asked to just learn a new way of thinking and talking about the phenomena under study while being asked to bracket their intuitive models until the new way has become consolidated. Then the instruction turns back to the learners' naïve models and encourages learners to explore the relationships between the two models.

Task management- Students need task management skills to sequence learning experiences. Task management is distributed in the whole class including the teacher, the instruction, and the learners themselves. Perkins claims that if students lack the opportunity to

manage their own learning, they are not likely become autonomous thinkers and learners. One

solution that helps with both task management and cognitive complexity is the scaffolding or

coaching strategy proposed by the apprenticeship model (Collins, Brown, & Newman, 1989).

Cognitive apprenticeship is a contemporary learning model that implements traditional

apprenticeship strategies but focuses on the cognitive process in order to make the expert's

thinking process visible to the apprentices. This model is increasingly being applied to

classroom research. However, how to provide appropriate scaffolding and coaching strategy in

online learning environments with a large group of students remains to be answered by future

research.

Buying in- Learners' attitudes toward the constructivist learning approach is another

concern. Perkins points out that in constructivist learning, students need to learn two things at

once: content area knowledge and the new way of learning. Therefore, they should be given

time to "buy-in" to the new way of learning.

Constructionism

Seymour Papert developed this version of constructivism, which he referred to as

constructionism. This theoretical point of view is based on his findings that individual learners

are more engaged when working on an external artifact that is meaningful to them, what he

refers to "objects-to-think-with" (Papert & Harel, 1991). Papert was a pioneer in artificial

intelligence; he believes that the better way to teach kids about computers and mechanics is to let

them build an actual working machine and program it. For example, Papert developed the

computer language LOGO; with LOGO, children are encouraged to invent their own objects-to-

think-with, such as the *Turtle*, a computer-controlled cybernetic "animal."

According to Evard (1996, p. 224), a strong emphasis on constructionism is placed on "created objects being external to their creator, as things 'in the world' can be shown, discussed, examined, probed, and admired." Moreover, when students share a creation with others, they not only obtain deeper understanding of other people's perspectives, but also refine their created object. In a study of fifth-grade students' discussions around designing an educational video game project for younger students, a computer-based system was used to provide *a public communication space*. Notably, Evard discovered that students learn through both asking and answering authentic questions; moreover, "…a public communication space to the Game Design Project could provide designers with the ability not only to share their questions and ideas with more students, but to reflect on their own words" (p. 225).

In a study of how children perceive others' perspectives, Ackermann (1996) argues that although Piaget's functional theory of intelligence provides a solid ground for understanding how people regulate their boundaries with the world, it fails to explain the self-correcting function of accommodation. Ackermann suggests that s*eparation* and *connection*, *diving in* and *stepping out*, *self-projection* and *self-diffusion* are necessary for cognitive growth and repeated over time for learners to make sense to the world. Accordingly, Ackermann proposes two keys to learning: *perspective-taking* and *object construction* that anchored from Piaget's functional theory, the balance between "stability and change, closure and openness, or, in [Piaget's] own words, between *assimilation* and *accommodation*" (p. 27).

Although some educators use constructivism and constructionism interchangeably, the major distinction is that the former is *learning to do*, while the latter is *learning by doing*.

Recently, PBL has focused on empowering students with technology tools for knowledge construction. Within a constructivist framework, this approach requires students to be active

constructors of meaning as they interact with learning tasks, their peers, and technology tools to construct new understanding. Constructionism (Papert, 1991, 1993) applies this idea of knowledge construction to student construction of physical or digital artifacts (e.g., models, charts, poems, plays, robots, computer games) that embody their understanding of concepts being studied. Therefore, PBL is based on constructionism emphasizing understanding to be externalized, shared, reflected upon, evaluated, and revised through constructing an artifact. In addition, a technology assisted PBL environment provides a public communication space for perspective-taking and object construction.

Distributed Cognition

Distributed cognition theory is based on *social learning* theory. Since the popularity of Russian psychologist Lev Vygotsky who asserted that culture is the prime determinant of individual development, social learning has been widely discussed by developmental and educational theorists. Salomon and Perkins (1998) articulated two metaphors for learning:

> "On one hand, we have the conception of the individual leaner, emphasizing the acquisition of knowledge and cognitive skill as transferable commodities… One the other hand, we have the sociocultural conception of learning as a collective participatory process of active knowledge construction emphasizing context, interaction, and situatedness" (p. 2).

I believe that both of these two aspects of learning, the "cognitive, acquisition-oriented" conception of individual learning and the "situative, participatory-oriented" conception of social learning are important. Salomon and Perkins suggested that research should look for evidence within the social context, because individuals' learning is facilitated by others, and the meaning is often socially constructed. Salomon and Perkins (1998) defined it as *social mediation of*

learning and provided four perspectives to help us deeper understanding of how individual and social learning intertwine:

   1. *The social mediation of individual learning-* An individual learns from a teacher, a parent, a master, or from the others, as described by Vygotsky's conception of *zone of proximal development*. Salomon and Perkins called this most familiar form of learning "*cognitive and acquisition-oriented"* version of individual learning. However, this perspective on social learning involves critical conditions such as feedback, guidance, challenge, and encouragement. The other condition involves the *objectivization* of one's thoughts, "when communicated and shared, can be discussed, examined, and elaborated upon as if they were external objects" (Salomon & Perkins, 1998, p. 8).

   2. *Social mediation as participatory knowledge construction-* Individuals are seen as being involved in an integrated and highly situated social system in which interactions serve as "the socially shared vehicles of thought" (Salomon & Perkins, 1998, p.3). Interactions, can take the form of team problem-solving or collaborative and cooperative learning. This perspective views the individual and the social agents as "a unified learning system" in which learning outcomes are both situated and distributed among the participants. Salomon and Perkins describe this radical version of social learning as *situative and participation-oriented*.

   3. *Social mediation by cultural artifacts-* In some cases, the learner may not receive direct help from people but obtains help from the cultural surroundings such as books, videotapes, or rich information sources. This is known as learning with tools, or cultural artifacts. Learning with artifacts has become apparently important because "artifacts are themselves culturally and historically situated, carrying the wisdom and hidden assumptions" (p. 4) for

directing learning and making decisions. It is believed that computer-supported learning environments offer more opportunities for this form of social learning.

4. The social entity as a learning system- "Organizational learning has its own characteristics related to what is learned, how it is learned, and the adjustments called for to enhance learning"(p. 12). This form of collective learning systems occurs in groups, such as a family, a sports team, or a business organization.

According to Hollan, Hutchins, and Kirsh (2000), distributed cognition theory seeks to understand the organization of cognitive systems. It considers cognition as going beyond individuals to include interactions between people and with resources and materials in the environment. Two basic principles are provided to help us distinguish Distributed Cognition from other theories:

1. While the boundaries of traditional views of cognition are those of individuals, the boundaries of distributed cognition are those "socio-technical systems such as the bridge of a ship or an airline cockpit" (p. 2).
2. While traditional views look for cognitive events in the manipulation of symbols inside individual actors, distributed cognition looks for a broader state of cognitive events and does not expect all such events to be encompassed by an individual.

After observing cognitive processes in ship navigation in a natural context, Hutchins proposed three major findings (Hutchins, 2000):

"…cognitive processes may be distributed across the members of a social group; cognitive system involves coordination between internal and external structures; and cognitive processes may be distributed through time: earlier events can transform the nature of later events" (p. 176)

Traditionally, thinking and learning tend toward dependence on the individual alone – what Perkins called *person-solo*. However, Perkins (1992, 1993) indicates that people employ

objects within their *surroundings*, including other people, physical and information resources, to support, share, and undertake aspects of cognitive processing – what he called *person-plus*. That is, what can be learned is not just in the mind of the learner, but in the surrounding environment as well. Perkins (1995) suggests that the use of tools such as student journals, designer notebooks, computers, peer tutoring, or pair problem solving are examples of person-plus. Perkins believes that students will benefit more from distributed cognitions because knowledge resides not only in individual minds, but also in having access to tools or objects such as books, computers, or learning communities. Pea (1993) also views human cognition as distributed across individuals, environment, external symbolic representations, tools, and artifacts – *"as a means of coping with complexity of activities we often call mental"* (p. 81).

Project-Based Learning

Project-Based Learning (PBL) is a model of "organizing learning around projects" (Thomas, 2000). It starts with an "end product" (Liu, 2003) and "driven by an authentic question or problem that is central to the discipline/curriculum" (McGrath, 2002). It involves five aspects: a driving question, investigation, collaboration, technology, and an artifact (Krajcik, 1999). In addition, some researchers and many teachers believe that students are motivated in creating projects for authentic audience (e.g., Viner, 2003). In the reviewed literature, evidence has begun to show that PBL enhances the quality of learning and leads to higher-level cognitive development through students' engagement with complex problems and collaboration with experts and peers (Newell, 2003). Also, by viewing the design process as learning itself, learners develop skills and abilities such as research skills, organization/project/time management skills, ability to represent understanding in the artifact, presentation skills, metacognitive skills, ability

to accept others' evaluation, and skill and willingness to revise the project (McGrath, 2003).
Because this research is about teachers' learning experience within the online PBL environment,
the following two sections will review collaborative learning and technological tools that are
important to online PBL.

Collaborative Learning

Collaborative learning is based on Vygotsky's social development theory. Two of
Vygotsky's ideas help us understand this theory better. First, we cannot understand a child's
cognitive development without understanding the social interaction around the child (Vygotsky,
1978). According to Vygotsky, "every function in the child's cultural development appears
twice: first, on the social level, and later, on the individual level; first, between people
(interpsychological) and then inside the child (intrapsychological). This applies to voluntary
attention, to logical memory, and to the formation of concepts. All the higher functions originate
as actual relationships between individuals" (p. 57).

Roschelle and Teasley (1995) refer to *collaboration* as "…a coordinated, synchronous
activity that is the result of a continued attempt to construct and maintain a shared conception of
a problem" (p.70). Dillenbourg (1999) further suggests that a theory of collaborative learning
should meet the following four criteria:

(1) Situations – the situation requires group members who are "more or less at the same level,
   perform the same actions, have a common goal and work together" (p. 7). Three aspects need
   to be considered in a situation for collaborative learning to occur:

   i.   The collaboration is more likely to occur between people with a similar *status*,
         such as symmetry of action, knowledge, or status with respect to their community.
   ii.   Learners develop *shared goals* through the negotiation of goals; moreover, they
         also become mutually aware of their shared goals.

iii.   The *division of labor* is horizontal, that is, the labor is unstable in collaboration, roles may shift very quickly, rather than vertical division of labor that is a more fixed division and generally made explicit at the outset.

(2) Interactions- the collaborative interactions have three features:

i.   *Interactivity*- the degree of interactivity among group members is not defined by the frequency of interactions, but by the extent to which these interactions influence the group members' cognitive processes.

ii.   *Synchronicity*- collaboration implies *doing something together*, a synchronous communication rather than an asynchronous communication. Although there are delays in any computer supported learning environment, which might not be seen as synchronous communication, Dillenbourg (1999) argues, "this dichotomy corresponds to the underlying technology but not to the real performance of communicative systems" (p. 9).

iii.   *Negotiability*- in contrast to a hierarchical situation, collaborative interactions expect the dialogues to be more complex, such as group members argue for their standpoints, and they justify, negotiate, and attempt to convince others to some extent.

(3) Learning mechanisms- at the most fundamental level, learning occurs at the level of individual cognition and then extends to pairs and/or groups. These mechanisms include:

i.   *Induction*- the learners induce patterns relating referring expressions with referents.

ii.   *Cognitive load*- the learners' interaction with other group members increases their cognitive loads.

iii.   *(Self)explanation*- the learners continuing add, adjust, or remove solo-model of self explanation to fit with social explanations.

iv.   *Conflict*- a discrepancy between different viewpoints leads to conflicting statements or positions.

v.   *Internalization*- the individual transfers information from the social interaction to the inner reasoning.

vi.   *Appropriation*- learners reinterpret their own actions under the light of what their partners do or say next.

(4) The *effects*- to understand the effects of collaborative learning, Dillenbourg suggests not treating collaboration as a "black box." Rather, we need to "zoom in" to the interactions to gain better understanding of the underlying mechanisms.

Groups are the typically spaces that allow researchers to zoom in and investigate the interactions. After reviewing 50 articles that deal with stages of group development, Tuckman

(1965) proposed a four-phase pattern of group development, *forming* (individuals testing which behaviors will be acceptable in the group)*, storming* (conflict, frustration, and disruption at the group level and gradually determine the leadership structure)*, norming* (group finally settles down and members express their concerns for the interaction and maintenance of interpersonal relationships)*,* and *performing* (members show a simultaneous autonomy and mutuality). Tuckman identified two realms that small groups deal with, the *social*-realm and the *task*-realm. In the social-realm, the four-phase developing sequencings are testing-dependence, conflict, cohesion, functional roles, and anxiety for separation. In the task-realm, the four-phase developing sequencings are orientation to tasks, emotionality, relevant opinion exchange, the emergence of solutions, and self-evaluation.

McCreary (1990) suggests applying Tuckman's stages of group development to CMC. As McCreary points out, disruptions are an important and natural stage of true group formation. "The real challenge lies at the level of learning how to work and even how to "be" together, rather than simply to focus on getting the job done" (p. 124). Unless the group moves successfully through the storming phase, it will not achieve the highest degree of productivity in phase 4.

According to Nemiro (2004), not all stages developed in small groups, especially for groups that are developed and/or operated over Internet or Web communication. To assure groups reach the performing stage via technology tools, Nemiro suggests an important aspect that is often neglected:

> "Collaborative technology makes it easier to coordinate virtual teams of all sizes by enabling team members to post questions, work jointly on documents, schedule meetings, and track progress toward goals. However, collaborative technological tools simply will not work if the *climate* within an organization and within the teams that make up an organization does not foster and encourage people to work together. The same requirements hold for creativity… A creative climate for virtual teams includes solid

connections (at the task and interpersonal level) among team members and appropriate team member and management conditions and competencies that support creativity." (p. 43)

Nemiro furthered explains her viewpoint of these solid connections, what she called a two-dimensional connection: at the task-connection level, a sense of dedication, involvement, and commitment is developed; here the task goals are clearly defined and shared by all members. At the interpersonal-connection level, regular communication is necessary for sharing and updating information and results; furthermore, members develop a "family-like" feeling, a personal bond that goes beyond common goals and commitment to the task and care for one another. A sense of *trust* also needs to be developed, trust in one another's ability and expertise, trust that team members will share ideas, and trust that team members will give honest and constructive feedback. Inevitably, according to Nemiro, three contextual factors are considered as pitfalls in building connections among group members in an online context: first, the nonverbal communication– lack of visual cues is challenging. Second, a level of dehumanization and social isolation develops; as a result, messages in electronic mail tend to be "stronger and more uninhibited and assertive" (p. 47). And finally, the virtual environment offers little social context; it leads to problematic miscommunication if cultural differences are not properly addressed.

Similarly, while investigating how collaborative interactions influence problem-solving outcomes, Barron (2003) identifies a dual-problem space when learners are involved in collaboration, "a *content space* (consisting of the problem to be solved) and a *relational space* (consisting of the interactional challenges and opportunities)" (p. 310). Although Barron has found that, "on average, group work leads to better problem-solving and learning outcomes" (p. 308), Barron suggests that

"However, less research attention has been directed toward the variance between groups. Research on cognitive mediators of collaborative learning makes the important point that it is not simply the act of asking children to work in groups that is essential but rather the possibility that certain kinds of learning processes can be activated" (p. 308).

"To make progress on this agenda, measurement approaches are needed that capture variation in conversational exchanges and allow for analyses that preserve the group as the primary unit of analysis" (p. 309).

"Studies of conversational patterns that preserve the group as the unit of analyses may provide new insights about how and why some conversations are more generative than others for collective work and the emergence of learning opportunities" (p. 309).

Hence, Barron suggests the need for a better understanding of how social and cognitive factors intertwine in the accomplishment of collective thinking. In the current study, social and cognitive factors involved in the co-construction of knowledge are explored in terms of collaborative interactions, group dynamics, social negotiation, and the sense of community in order to answer Research Question 3: What are participants' group collaborative experiences in communicating and constructing projects online? For example, the interactions features as suggested by Dillenbourg (1999) are used for the initial coding categories in this study.

Technological Tools for Communication, Collaboration, and Cognition

According to Spitzer (1998), too often distance learning has focused on the technical dimension and failed to recognize that the human or social dimension has an equal share. Spitzer further provides some principles for designing a successful distance learning system. For example, the system should focus on the students, minimize pain, use appropriate technology, be sure of students' prerequisite capabilities, provide technical support, give time for students to adjust, use high-speed connection, and create a positive, motivating environment. The technological tools discussed below including CMC, Knowledge Building, and Cognitive Tools are technology-based cognitive and communication tools that support both cognitive and social

aspects of learning in online PBL. CMC such as email, online forums, and threaded discussions

can support discourse activities that make co-construction of knowledge possible with the project

approach. Ideas represented in the forms of discussions and conversations can be added, shared,

reflected upon, and assessed by everyone involved in the knowledge-building community,

including peers, instructors, or facilitators. This helps to make thinking process visible in group

communication and social negotiation of tasks and responsibilities for project completion. Tools

such as *Computer-Supported Intentional Learning Environment*s (CSILE) and its current version

Knowledge Forum that are designed specifically for knowledge building can further support

collaborative interactions and representation of concepts and ideas by helping learners make

explicit connections among concepts and their projects.

Computer-Mediated Communication (CMC)

Computer-Mediated Communication (CMC) can be classified into two general

categories, synchronous and asynchronous (Winiecki, 2003). Synchronous communication is

commonly known as chat, a real-time or near real-time interaction between persons at a distance

typing and responding to messages from each other. Asynchronous communication includes

emails, listservs, and threaded discussion systems in that the users may or may not be online at

the same time. The Table 1 below provides a summary of possible synchronous and

asynchronous communication tools.

Table 1. *Possible synchronous and asynchronous communication tools*

Synchronous Communication Tools	Asynchronous Communication Tools
- Face-to-face meeting	- Bulletin board
- Audio conferencing	- Shared database
- Video conferencing	- Web page
- Chat technology (IRC)	- Voice mail
- Telephone	- E-mail

- Intranet
- Threaded discussion
- Bulletin board
- Calendar
- Fax

While synchronous communication is often similar to oral language behavior, asynchronous communication is comparable to written language behavior. According to Mann and Stewart (2000), CMC might combine characteristics of both oral and written language as if the sender is writing text with conversation-like communication. Unfortunately, both synchronous and asynchronous communications have their negative aspects for qualitative research. In some studies, researchers have found that the Chatroom might not be a place for in-depth conversation, because chats are just like some oral communications in terms of being casual and superficial. Likewise, discussion messages might share the drawbacks of some written communication in terms of distancing the reader from the writer, and increasing misunderstanding rather then deepening understanding (Gaiser, 1997; Horn, 1998; Mann & Stewart, 2000).

On the other hand, CMC as a hybrid language, provides positive features of both spoken and written languages. One particular aspect is that the asynchronous communication, such as email and threaded discussion, allows thoughtful, organized and detailed communication that gives learners more time and flexibility to construct and digest extended messages (Murray, 1995; Morrisett, 1996). Moreover, "CMC is an effective tool for group decision-making, collective accomplishment of tasks, and for administering the communication process" (Henri, 1995. p. 160). "[L]earning to work as a group and accomplishing a common task might still be included among the learning objectives to be reached with the use of CMC" (p. 161).

Murphy, Drabier, and Epps (1998) conducted a study of a semester-long graduate course through a combination of qualitative and quantitative research design. The emphasis of their study was to identify the similarities and differences of interaction and collaboration patterns between CMC and face-to-face learning environment. The findings suggested that individual interaction strategies were altered within the computer conferencing environment such as the interpretation of facial expression to derive meaning, the absence of voice interaction to aid understanding, and the reliance upon printed text for cues to emotional content. In addition, the study also uncovered the barriers of collaborative learning via CMC such as the differences in team member contributions and variability in access to computer equipment, which may exist in every online learning community.

Gibson (2003) indicates that "the design of the instruction and its implementation create a social environment in which learning may occur. To ignore the importance of this context is to neglect a powerful influence on the learner and on learning, as we have come to understand through cognitive psychology" (p. 157). The effects of CMC on both individual and social learning remain to be an important topic for further study. Harasim (1990) asserts that CMC could facilitate knowledge building activities, which will be discussed next.

Knowledge Building (KB)

The term of *knowledge building* is found in many academic writings. Although the definition of knowledge building may be interpreted differently, they all share one aspect in common, that is, the process of KB involves an external artifact or a communal database in which collective discussion and synthesis of ideas are made visible through this artifact. A well-known tool for KB is the *Knowledge Forum*®(http://www.KnowledgeForum.com), which is the second generation of the *CSILE* (Computer-Support Intentional Learning Environments) project

that builds on the intentional learning framework developed by Marlene Scardamalia. According to Scardamalia, there is a public knowledge that lives in the world and is available for others to continue to work on (Scardamalia, 2002; Scardamalis & Bereiter, 2003; Scardamalia, 2004). This Web-based database software (Knowledge Forum®) has been used in a variety of contexts such as business, corporations, hospitals and classrooms to organize their knowledge-building communities and ultimately has lead to innovations and new research perspectives. More important, Knowledge Forum® has been used to unfold cognitive process, to encourage interaction and participation, and to make the knowledge building/thinking process visible through technology tools for both teachers and learners. One of the knowledge building principle, *collective cognitive responsibility* (Scardamalia, 2002), has been observed in every knowledge-based workplace.

In education, however, it is not easy for teachers to turn higher levels of cognitive responsibility over to students. To understand the implications of knowledge building tools and activities for PBL environments, it is important to understand the similarities and differences among various types of learning approaches. In particular, the differences between KB and PBL should be discussed so we can provide scaffolding strategies to support knowledge building activities that are critical in sustain deeper leaning in the PBL community. Scardamalia and Bereiter (2003) distinguish major differences among KB, discovery learning, PBL, collaborative learning, and threaded discourse:

- ***KB versus guided discovery learning***- KB calls for deep constructivism and greater degree of responsibility on the part of learners at all educational levels. In contrast, the overarching responsibility remains in the hands of the teacher in a guided discovery learning environment.

- ***KB versus project-based learning***- While KB engages learners in the full process of knowledge creation, students in some PBL environment might focus on hands-on activities and fail to sustain the learning. Therefore, incorporating KB activities and tools in PBL environments should be considered as an important scaffolding strategy in the design of PBL experience.

- ***KB versus collaborative learning***- While collaborative learning involves distributed responsibilities, KB emphasizes collective responsibility and high-level, long-term aspects of knowledge works including creating new knowledge. The design of PB should take both distributed and collective responsibilities into consideration.

- ***KB versus threaded discourse***- KB treats ideas as real objects available to the whole community and allows participants to discuss, interconnect, revise, and replace. By contrast, threaded discourse has limited value for connecting ideas into larger wholes; also, the conversational threads of contributions are not modifiable. In this regard, the design of online PBL should consider the limitations of using threaded discourse or other CMC tools for knowledge building activities.

Scardamalia (2002) provides a set of principles and indicators that guide the design, use, and evaluation of a knowledge-building society. These principles and indicators as summarized in the Table 2, are useful for observing and evaluating KB activities in a PBL learning community.

Table 2. *Summary of socio-cognitive technological determinants of knowledge building (Scardamalia, 2002)*

Socio-cognitive dynamics	Technological dynamics
Real ideas, authentic problems	Support a culture for creative work with ideas
Improvable ideas	Provide opportunities for continual improvement
Idea diversity	Provide opportunities for diversity ideas

Rise above	Support emergent goals rather then fixed goals
Collective responsibility	Provide open, collaborative workspace for reading and building on others' messages
Democratizing knowledge, engaged participants	Allow participants to assess evenness of contributions
Symmetric knowledge advancement	Provide knowledge exchange across the community
Pervasive knowledge building	Encourage knowledge building as central to the community's mission
Constructive uses of authoritative sources	Encourage contribution from new information, referenced resources
Knowledge building discourse	Allow revision, encourage identifying shared problems and gaps in understanding Advance understanding beyond the level of the most knowledgeable individual
Embedded and transformative assessment	Increase literacy, 21st century learning skills, and productivity are by-product of mainline knowledge work

Although Knowledge Forum$^{®}$ is not used in this research, one of the objectives of this study is to understand whether the tools provided by K-State Online and other technology tools introduced to the participants help to build a community of learners that seem to support a development of a knowledge society as described by Scardamalia. For example, Scardamalia questions whether a discussion forum can provide opportunities for a diversity of ideas and suggests that it fails to support interaction among ideas. This lack of direct knowledge building tools such as Knowledge Forum may be somewhat addressed improved by the concept-mapping tool used in this study to provide for linking ideas and promoting the interaction among ideas.

Relevant research conducted by Stahl (2000) has proposed a model of collaborative KB. In this model, individuals incorporate personal and social knowledge-building process through two sets of understanding processes: the cycle of personal understanding and the cycle of social understanding (See Figure 1).
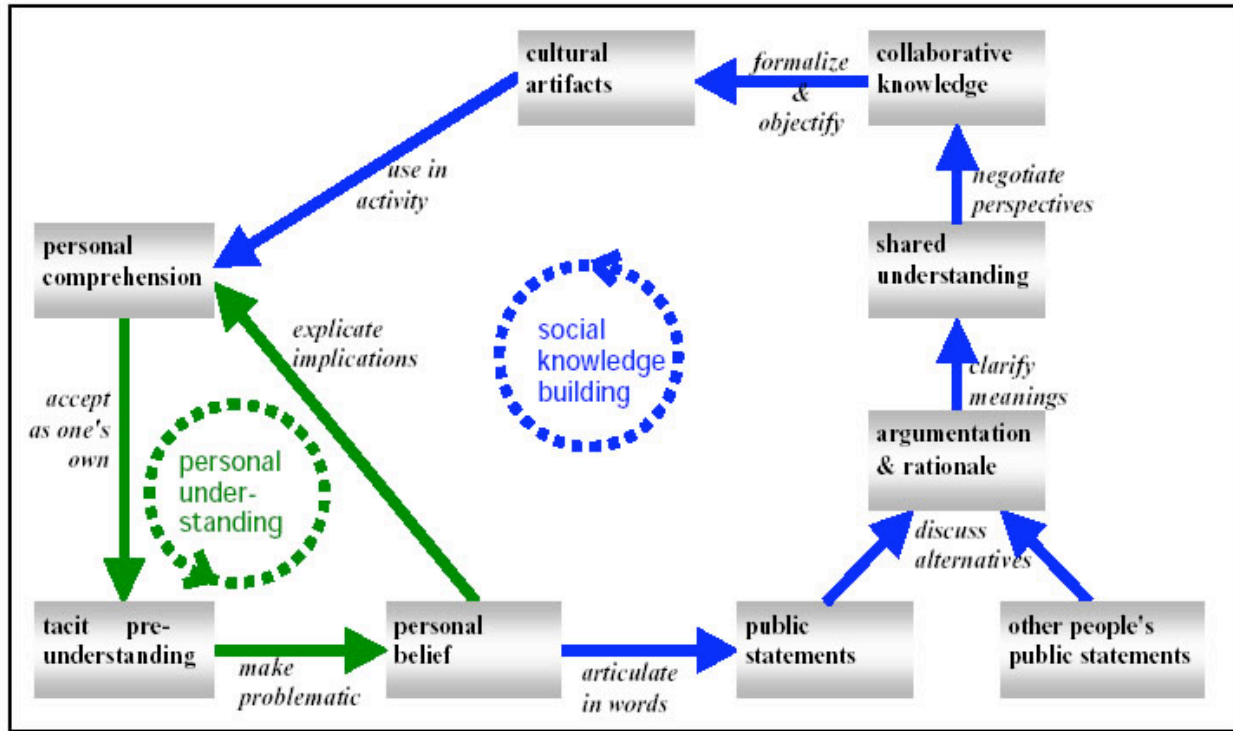
Figure 1. Stahl's (2000) diagram of knowledge-building processes(Source: copyright © 2000, Erlbaum Publisher. Used by permission of Erlbaum Publisher)

The cycle of personal understanding starts from the lower left corner: an individual's tacit or pre-understanding; through making problematic transformation, personal belief is formed; by explicating the implications and resolving conflicts or filling in gaps, the new comprehension is achieved.

The cycle of social understanding happens when the individual articulates his/her personal belief into public statements; through discussing alternatives with others, the original statements become arguments that providing rationale for different points of view; through interchanging clarification of different interpretations, a shared understanding is gradually achieved; through negotiating different perspectives, a collaborative result is accepted as knowledge. According to Stahl (2000), in a computer supported knowledge-building

environment, the collaborative knowledge will be formulized and objectified into cultural artifacts. Stahl (2000)'s eleven phases of computer-support, collaborative knowledge building include:

    a. articulate in words
    b. public statements
    c. other people's public statements
    d. discuss alternatives
    e. argumentation & rationale
    f. clarify meanings
    g. shared understanding
    h. negotiate perspectives
    i. collaborative knowledge
    j. formalize and objectify
    k. cultural artifacts and representations

As suggested by Stahl (2000), collaborative learning is a complex process. However, the phases of KB can serve as a conceptual framework for the design, use and assessment of collaborative knowledge-building environments. Sorensen and Takle (2002) applied Stahl's KB criteria to assess the quality of dialogues in a Web-based collaborative learning course. The course was assessed during the years of 1995, 1997, and 2000. Unfortunately, the findings only showed the length of comments increased from 1995 to 2000 as well as the quality of grammar due to the word processing tools became more available for off-campus learners. Nevertheless, the authors implied that the essay-like style of comments inhibited the evolvement and practice of a spontaneous and dynamic dialog.

Cognitive Tools

Visual thinking has been identified as one of the essential skills for the 21st century teaching and learning. However, with very few research studies available nowadays, it is difficult to implement this concept without a clear conceptual framework. A recent attempt to

incorporate visual thinking into practice is a teaching model - cognitive apprenticeship – as proposed by Collins, Brown, and Holum (1991). According to Collins and colleagues, cognitive apprenticeship places more emphasis on (1) the teacher's role- instructor provides modeling, scaffolding, coaching strategies and gradually moving students from a lower stage to a higher stage, and (2) the design of the learning environment, i. e., the educational building blocks: content, method, sociology and sequence for learning. But, this model fails to address the role of technology tools that mediate learning. Jonassen (1992) points out that technologies do not directly mediate learning. Rather, learning is mediated by thinking- the mental processes of learning activities. "We should focus less on developing sophisticated multi-media delivery technologies and more on thinking technologies, those that engage thinking processes in the mind (p. 2)." Thus, the term cognitive tool is used referring to a device or software that learners can use to transcend the limitations of the mind in activities of thinking, learning and problem solving (Pea, 1985). Lajoie and Derry (1993) believe that cognitive tools can serve as a catalyst for facilitating the development of metacognitive awareness and for generalizing self-regulatory skills. Jonassen (1992) suggests a cognitive tool can be viewed from three dimensions: *control*, *engagement*, and *synthesis*. It the control dimension, a cognitive tool demands more student control than teacher control. In the engagement dimension, a cognitive tool requires active participation rather than passive involvement. It the synthesis dimension, a cognitive tool calls for knowledge construction instead of knowledge representation. Examples of cognitive tools that have been used to support learning include semantic networking, knowledge-based/expert systems, hypermedia, computer-supported cooperative learning environments, Logo, microworlds, concept mapping, and idea processors (Kommers, Jonassen & Mayes, 1992).

Reeves, Laffey, and Marlino (1997) conducted research in which they described the use and effects of cognitive tools within a college engineering course at the U.S. Air Force Academy in the USA. Forty-one freshmen participated in this study and the results were gathered via direct observations, self-assessments, interviews, reflections, concept maps, email journals, and focus groups documentations. The results demonstrated significant differences between students who used cognitive tools (including the WWW, spreadsheets, and PowerPoint) and two control classes. According to Reeves and colleagues, higher order outcomes could be achieved via the implementation of a situated learning environment in which cognitive tools play critical roles. In addition, they asserted that technology is best used as a cognitive tool to learn with rather than as a surrogate teacher. In this study, technology tools are integrated into the online PBL environment as cognitive tools to engage participants in cognitive tasks associated with their projects. For example, three types of tools are used: message board, chatroom for communication, Web authoring tool for productivity, and concept mapping tool for making thinking visible, discussable, and correctable.

Research On Project-Based Learning

Diane Curtis (2002) has witnessed the power of PBL projects while working as an editor for the *George Lucas Educational Foundation* (www.glef.org). According to Curtis, PBL engages all learners from special education to gifted students. Students not only learn not only faster and longer, but also better. Success stories have been reported from elementary, middle, and high schools across the country and around the world. Three key areas of positive outcomes are student engagement, motivation, and deep understanding. Among these positive outcomes, student engagement and motivation are the most mentioned benefit in a variety of PBL research. For example, Liu (2003) conducted a study of students' cognitive skill development by using a

PBL approach to engage learners as multimedia designers. In this study, high school, middle school, and elementary school students work in small groups to create hypermedia products. The researcher suggests that a project-based approach enhances learners' design skills and resource management skills, which are two key aspects in developing cognitive skills. According to Liu's study, students at the high school level increased their understanding for "planning, searching information, connecting ideas, importance of audience, and collaboration" (p. 32). The findings are consistent with previous studies conducted by Lehrer and his colleagues (1994) which suggesting that the design process helped students to internalize various design skills. Students are reported to show increases in mental effort such as involvement, interest, planning, collaboration, and individualization.

In another study based on projects' effects on student achievement in relation to multiple intelligence (MI) (Özdener & Özcoban, 2004), 75 sixth-grade students were grouped into an instruction-method group and a project-method group according to students' pre-test data and their intelligence profiles. In each method group, there were two subgroups. The first subgroup consisted of students who tended to have the same MI field. The second subgroup consisted of students who tended to have different MI fields. At the end of the study, post-tests were used to compare to the pre-test grades. Although students in the instruction-method group also increased their achievement grades, students in the project-method group achieved a significant level of achievement grades as compared to the instruction-method group. According to the researchers, students in the project-method group had more opportunities to use thinking, problem solving, and their creative ability both in individual and group work applications. In addition, students in the PBL group were observed having the opportunity to review lessons they had learned previously. As for the subgroups, students with different MI fields performed better than

students with the same MI field. It was concluded that students with different dominant

intelligences had more opportunities to share information about their personal interests, skills

and experiences (Özdener & Özcoban, 2004). This finding is consistent with other studies

suggesting that when students accomplish projects together, they are often endowed with a

greater sense of achievement (McGrath et al., 1997; Liu, 2003).

In a PBL Web-based course, Murphy and Gazi (2001) conducted qualitative research in

which five PBL activities (discussions, role plays, simulations, evaluations, and panel

discussions) were investigated to find characteristics that enable students to meet their learning

objectives. Over the semester, through student interviews, communications, and course

evaluation, researchers found three major PBL project characteristics: (1) authenticity, (2)

collaborative work and communication, and (3) opportunities for knowledge enhancement and

skill building. In addition, researchers investigated strategies that students employed when

rotating to be either facilitators who prepare PBL learning units, or participants who complete

the PBL activities. The results showed that the students in the roles of both facilitators and

participants adopted a variety of strategies such as creativity and time management, which

helped them go through the process.

MacGregor and Thomas (2002) observed how secondary students, using the PBL

approach, design and determine the cost of setting up a low maintenance garden to be located

somewhere on the campus. In particular, the researchers focused on different instructional

scaffolding models of a system used, the Geometer's Sketchpad. Eighty-two tenth-grade

students from four geometry classes were randomly assigned to one of the two instructional

models: Model 1, structured problem solving or Model 2, student-generated problems with

teacher facilitation. Students formed groups of three to work collaboratively to complete the

garden projects. Students in Model 1 resulted in learner outcomes characterized by greater

understanding of the concepts and less frustration with the process of using Sketchpad.

However, many students in the Model 2 expressed a sense of self-confidence and pleasure with

their accomplishments.

Wang, Laffey, Wangemann, Harris, and Tupper (2000) conducted a research seeking to

understand the use of computer-supported collaborative learning (CSCL) technologies via the

Web. In the project scenario, 45 students aged from 13–17 were asked to design a wireless

communication system for cars. Students worked in groups of five under the guidance of

college-age online mentors. The results indicated that (1) the youth' sense of audience was

limited to their mentors; only a few youth were aware of the existence of other teams; (2) the

sense of task authenticity and ownership increased youth's level of interest and frequency of

participation, and (3) the youth formed a mental models of the "spaces" while working on the

iExpeditions, a website that provided coordinated set of communication and collaboration tools.

Wang, Laffey, and Poole (2001) reported the same research but with a different emphasis

on how students construct shared knowledge using the iExpeditions. The study investigated the

relationships between the participants' ways of talking and the quality of shared knowledge

constructed. The ways of talking were identified as (1) disputational talk (disagreement and

individualized decision-making); (2) cumulative talk (speakers build positively but uncritically

what the other has said); (3) exploratory talk (partners engage critically but constructively with

each other, resulting in negotiation and rational debate); and (4) individual talk (a participant

posts a comment, but no one responds to it). The results indicated that cumulative talk was

predominant while the exploratory talk was infrequent and resulted in many teams ending up

with abandoned artifacts. In addition to investigating the relationships among the results of

teamwork and the various ways of talking, Wang et al. called for more research to examine team formation strategies and the presence of social talk and their relation to building greater trust among team members.

PBL research was also found in programs for pre-service teachers. A qualitative PBL research study conducted by Land and Greene (2000) focused on how pre-service teachers generate and evolve project ideas while using the Web. Multiple source of data were gathered from think-aloud protocols, videotaped observations of system use, and student-generated documentation. The results uncovered several important findings, for example, all students were able to generate a project in an open-ended, problem-based environment using the Web. In addition, three major findings are particularly noteworthy. First, goal-driven student projects achieved more coherence compared to data-driven student projects. Second, most students had difficulty about how to conceptualize the Web as a learning tool. Third, increased instructional scaffolding is necessary for students using the Web in situations where they are novices in regard to the system and the domain being studied. Such scaffolding may enable students achieve greater coherency and experience less frustration.

In Europe, PBL is labeled as the *Project Method*. Haake, Haake, Schümmer, and Lukosch (2005) point out that the project method has its root in architecture education toward the end of the 16th century in Europe and reintroduced by the American educational theorist Kilpatrick in 1918. Project is defined as "a *purposeful act* in the context of childhood education" (p. 21). In order to reduce isolation, dropout rates, and to enhance students' motivations at the German distance teaching university, the project method was employed in a Web-based collaborative learning environment involving students in two software engineering labs. Students worked on initial tasks individually, then discussed their contributions at a distance,

followed by a face-to-face meeting where group formation and initial work planning took place. After the main work-at-a-distance phase, a final face-to-face meeting was used for presentation, assessment, and project review and debriefing. Although problems are reported, such as technical problems, social and coordination problems, and frequently rescheduled and modified work plans, "[e]ven so, dropout rates decreased, and motivation and the quality of the group products increased" (p. 24).

There is an increasing amount of research-based studies that supports the use of PBL (Thomas, 2000), however, most of the studies emphasized well-structured and extensively developed projects that were not created by teachers. We need more "grassroots" interventions, as Thomas defined them: interventions that have been designed and implemented successfully by teachers in the classrooms (Thomas, 2000). Ravitz and colleagues (Ravitz, et al., 2004) also agree on the need. As the authors point out that either assigning student projects to do or telling teachers they should used PBL in their classrooms does not automatically mean they will take advantage of the rich learning opportunity available.

Nonetheless, Kozma and Schank (1998) suggested 8 years ago that schools should start planning to connect teachers and students to the 21st century. One approach suggested by the authors was using PBL to support school reform; in particular, while developing projects, the use of technology as cognitive tools can help teachers and students manage the complexities of project-based learning. Consistent with Kozma and Schank's reseach, Guzdial (1998) also recognized the importance of technological support for project-based learning. Moreover, Guzdial developed a five-stage model of project progression to explore how to support project-based learning with science students from middle school to college students studying chemical engineering and computer science. Unfortunately, Guzdial indicated, "[w]hile our experiences

point the way toward effective supports for project-based learning, it is clear that significant research is yet to be performed." Specifically, Guzdial suggested that classroom teachers play important roles as gatekeepers, for teachers' role with technology and teachers' comfort with technology are critical factors for student success.

McGrath and Sands (2004) reported a school district in North Carolina that had committed to a five-year plan for technology-infused PBL by the year of 2006. The school district recognized that the urgent need in creating an effective, technology-based learning environment could not be focused merely on the student side; the teachers also needed a different approach to professional development. Such professional development provides training including PBL methodology and how to use advanced technologies. The district believed that by providing supports at all levels and available funding for teachers to engage major change in instruction, this type of top-down training "would convince teachers to step outside their comfort zones and embrace PBL" (p. 36).

Chen and McGrath (2004-05) proposed a framework of Cognitive PBL that incorporates educational technology tools for *inquiry, communication, construction,* and *expression* as described by Bruce and Levin (1997) to help learners succeed in complex tasks. Another strategy for helping teachers is a website was developed by the Buck Institute for Education and Boise State University (Project-Based Learning: The Online Resource for PBL, 2005): a multi-pathway, interactive, video rich website designed to prepare pre-service and practicing teachers to implement academically rigorous, standards-focused PBL. This PBL-Online Website (http://www.pbl-online.org/) offers online staff development resource, modules for use in teacher training programs, a 3-credits online course, and a space for sharing collaborations project examples from the subscribers. However, both the above-mentioned approaches are in the

developing stages and have not been shown to lead to significant changes in schools. More

research is needed in the future.

Overall, the conceptual framework below illustrates the interplay of several forces with

adult learners' online success. These six components are particularly important in shaping the

online PBL: a driving question, research over time, collaboration, technology, artifacts, and

authentic audience (see Figure 2).
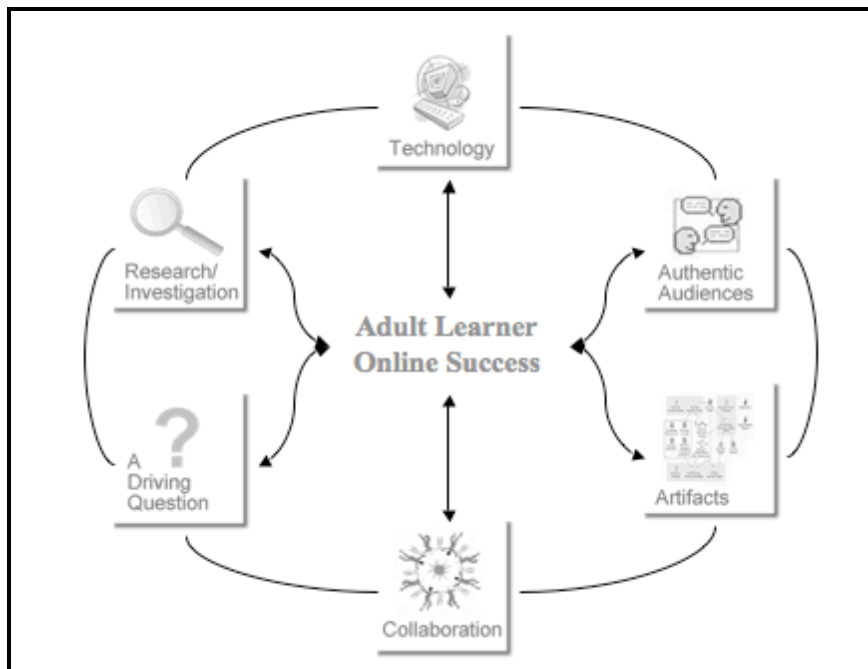
Figure 2. Illustration: Conceptual framework of online PBL

Based on the literature reviewed, research on project-based learning in a variety of

educational settings has suggested numerous positive outcomes. Among those outcomes, a high

level of student engagement and motivation has been the most mentioned benefit in the

literature. Students engaged in project-based learning have shown increased mental effort, and

when they accomplish project together, they are often endowed with a greater sense of

achievement. At the same time, they are learning many other skills related to time management

research, creativity, collaboration, etc. Previous studies, however, tend to focus on younger learners' experience with PBL in the traditional classroom settings. Despite the recent trend in incorporating PBL approach into online learning in higher education, little research has been done to document adult learners' experience in such relatively new learning experiences. For this reason, the present study was a case study of an intact online class of adult learners–mostly teachers–as the participants were engaged in collaborating on a series of three projects that were designed by the instructor to fit the guidelines of project-based learning. The study aims to document teachers' first-hand learning experience with projects, their collaborative experience with others, and their learning experience with technology–especially via the online format. One particular goal of this study is to expand our knowledge on participants' learning experiences over a series of collaborative projects in an online learning environment. This allows us to gain insights into how adult learners construct individual and shared understanding, the nature of collaborative discourse and group dynamics, and the role of technology tools for collaboration, communication, and project construction in online PBL. The results of this study can provide recommendations for PBL and online course design as well as for improving online course management systems.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

To understand adult learners' experience of learning to work as a group to accomplish collaborative tasks within a course management system (CMS) environment, a qualitative research design was employed. According to Merriam and her associates (2002), "qualitative research is descriptive and inductive, focusing on uncovering meaning from the perspective of participants" (p. 44). In particular, this qualitative research is a descriptive case study that endeavors to present a holistic, in-depth description of the learning context. The purposes of this qualitative case study include:

- to understand the dynamics of using PBL to guide online collaborative learning around projects in order to learn more about the impact of online PBL on students' learning experience.

- to understand participants' first-hand learning experiences within KSOL, and to find out how participants deal with difficulties such as technical problems, time constraints, and group conflicts.

- to understand the instructor's experiences in structuring online courses that meet the PBL criteria, and to provide recommendations for designing online learning environments.

The discussion in this chapter is organized into the following sections: (1) research questions, (2) research design, (3) context of the study, (4) data sources, (5) data analysis, and (6) establish trustworthiness.

Research Questions

1. What are the quality and nature of participants' learning experiences with different projects (as gleaned from their perceptions as well as their performance in three different projects) within the context of an online project-based learning community? What are some difficulties/problems associated with participants' learning experiences?

2. How do participants' online project-based learning experiences affects their use of educational technology tools over the semester?

3. What are participants' group collaborative experiences in communicating and constructing projects online?

4. What are the instructor's experiences in structuring this online PBL course? What are the difficulties in meeting the six PBL criteria in an online PBL environment? And what are the strategies used to manage class virtually?

Research Design

> "Qualitative and quantitative methods are not simple different ways of doing the same thing. Instead, they have different strengths and logics, and are often best used to address different kinds of questions and goals (Maxwell & Loomis, 2002). The strengths of qualitative research derive primarily from its inductive approach, its focus on specific situations or people, and its emphasis on words rather than numbers" (Maxwell, 2005, p. 22).

This study is a descriptive case study (Yin, 1989) framed as a single case, with six learning groups and projects as embedded cases. According to Yin, a descriptive case study describes an existing phenomenon (process, activity, group, site, situation, etc.) within a particular context or a bounded system and does not intend to define questions and hypotheses (i.e., exploratory case study) or to explain cause-effect relationships (i.e., explanatory case study). This study also employs the basic interpretive qualitative research perspective (Merriam et al., 2002) which aims to understand (1) how people interpret their experiences, (2) how they construct their worlds, and (3) what meaning they attribute to their experiences. Overall, the purpose is to understand how participants construct reality and meaning via social interactions and how they make sense of their experiences. This is achieved through presenting a thick case description and extensive use of quotes in the findings.

The research follows the case study procedures as outlined by Yin (1989, 1994), consisting of:

Study questions - This study is based on the research questions concerning how adult learners collaborate and learn around projects online. PBL (see definition on page 13) was implemented as a framework to guide online teaching and learning in which participants' learning experiences with projects, collaborative experiences with group members, the characteristics of the online PBL community, technology tools used, and the instructor's experiences in designing, delivering, and managing class online are the principal interests of the study.

Study propositions – The research questions of the current study are exploratory in nature and therefore this study does not have a proposition (Yin, 1994). Yin suggested that if propositions are not present, researchers should employ a general analytic strategy to guide data analysis. The strategy used in this study is to develop a descriptive framework to organize the case study. This is consistent with Stake's (1995, p. 15) suggestion that the design of all research requires "conceptual organization, ideas to express needed understanding, conceptual bridges from what is already known, cognitive structures to guide data gathering, and outlines for presenting interpretations to others." The detailed descriptive data on the embedded cases (see Appendices A–G) of this study provide the conceptual organization (i.e., a case study database in Yin's terms) to guide data collection, analysis, and interpretation.

Units of analysis - In order to answer the research questions, this study looks for relevant evidence within the whole class and the embedded six learning groups and projects (See Appendices A–G).

Linking data to propositions – As noted above, this study does not have a proposition but employs a descriptive framework or a conceptual organization as suggested by Stake (1995). To link data to the conceptual organization, Stake (1995) further suggests looking for patterns, and for consistency within certain conditions, which he called "correspondence." This looking for consistency requires taking more time and looking at the data over and over again, reflecting, triangulating, and being skeptical about first impressions and simple meanings. These analytical strategies were used in examining, comparing, and contrasting the detailed descriptive data on the embedded cases (see Appendices A–G) that provided the conceptual organization to guide the research process.

Criteria for interpreting the findings - Yin (1994) suggests that the predicted pattern must be defined prior to data collection for descriptive case study. For this study, criteria are based on the research questions as well as themes that have been suggested by the relevant literature in chapter 2. For example, the six PBL aspects, online learning experience, and difficulties are three directions to be examined.

Context of the Study

Course Description

EDCI 718 *Learning Technologies* was a Web-based graduate level course. The target students were teachers and other educators who would like to gain modern points of view about teaching and learning using technologies. Students were exposed to a broad introduction to the field of educational computing. As the instructor specified in the course description:

> *In this course, you will look at the various roles that computers may take in a learning setting, and explore ways of integrating technology into a curriculum from various points of view. You will learn which types of software are best for different parts of the learning process. You will view educational software and learn about how to find and evaluate that software. You will have an opportunity to learn by the same methods that you are encouraged to use for your own students' learning.*

The instructor also listed her contact information, required textbook, resources, course goals, course requirements, late work and incompletes regulations, grading criteria, academic honesty policies, and accommodation. In addition, the instructor provided tips for how to be successful online learners for this course.

Meeting prior to the start of the course, students registered in this course were encouraged to attend a two-hour orientation session on a Saturday morning on the campus where the course was offered. (For those who lived too far away or had conflicts; their orientation was by handout and email of the course syllabus. See Appendix H.) The remaining 16 weeks of the course were online. The course was housed inside a course management system (CMS) called the *K-State Online* (KSOL), powered by *Axio Learning*, a company owned by Kansas State University. Only the KSOL administrators, the instructor, two future instructors, the researcher, and registered students had access to log on to this course. EDCI 718 had been offered via Internet within another CMS, *Blackboard*[TM] for two years. With the rapidly changing trends in the educational technology field, the course content had been modified regularly. The overall

class schedules, discussions, activities and projects are structured for a 16-week semester, as shown in the following table:

Table 3. *Class schedule, activities, and projects*

Week	Main Activity	Sub Activity	
		Individual Activity	**Group Activity**
1	Getting Started	Breaking the Ice NETS & Self Assessment	
2 - 5	Tutor Project	Individual Software Review Discussion 1 Discussion 2 Reflection on project 1	Group Formation Group Software Review Lesson Plan & Integration Justification
6 - 11	Tool Project	Start journal on project 2 Post top 3 tool ideas Post video examples Tool goal accomplished Discussion: Student-created multimedia Post hypermedia examples Tutee research Discussion: PBL Feedback on other group Vote the best group project	Try out chat room and archive Concept mapping task Work on group project Revise group project
12 - 15	WebQuest Project	Start journal on project3 Discussion Make a simple webpage Learn new skill Discussion Feedback on other group	Work on group webquest project Revise group project
16	Issue Paper & Final Exam		

This study observed and documented how adult learners experiencing the following three projects over the semester:

Project 1: TUTOR Project-

Students were provided with resources to help them become familiar with a variety of Computer Assisted Instruction (CAI) software such as *drill and practice*, *tutorial*, and *simulation* programs. This project required students to be able to locate and evaluate CAI

software, to know when and how to use a certain type of CAI software, and to plan a lesson that integrates a piece of CAI software. This project took place from week two to week five.

Project 2: TOOL Project-

This project focused on technology tools. The purposes were to explore the constructivist learning approach with project-based learning activities, and to learn something about the features of this kind of learning environment that encourage higher order thinking. By participating in this Tool project, students experienced what a learner might go through while engaging in PBL activities. By learning and using some of the IT tools, students learned the advantages and disadvantages of using these tools.

Also in the second project, students learned a new skill, located hypermedia examples, video examples, and tried out the concept mapping tool. Then for the project itself, students used the learned skills and integrated them into a project that followed project-based learning as its format. Three kinds of tools needed to be considered for the projects. First, integrated student use of a cognitive tool, such as the concept mapping tool. Second, integrate a communication tool for collaboration. And third, use a productivity tool to present the project that students created. All of these were to encourage higher order thinking skills.

This project took place from week six to week eleven. (See Appendix I)

Project 3: QUEST Project-

Students learned how to design curriculum with rich content in an authentic learning environment. They were required to design and develop Web pages and explore how designing the web pages may be connected to teaching and learning. In addition,

students learned the issues in integrating the Internet, communication tools, and productivity tools into the curriculum and discuss how this is different from integrating the CAI software into the learning environment.

The purpose of the QUEST project was to explore the constructivist learning approach through an Internet-based classroom activity. Students looked at several WebQuest examples and participated in a small WebQuest. As a participant in the quest, students experience what a student might go through while engaging in WebQuest activities. Students then developed a small WebQuest to gain experience from a teacher's perspective. This project took place from week twelve to fifteen. (See Appendix J)

Participants

Twenty-four students, 18 females and 6 males, registered EDCI 718 in the spring semester of 2006, including 20 graduate students and 4 undergraduate students. Students in this research were given a consent form for volunteer participation in this study. Nineteen students agreed to participate in this study, which included 15 females and 4 males. Among the participants, there were 11 in-service teachers, 2 substitute teachers, 1 college instructor, 1 university librarian, 3 pre-service teachers, and 1 on-campus graduate student. The majority of the participants were Caucasians along with 2 international students, one African and one Asian.

Learning Groups

Students formed six learning groups of four at the beginning of the semester. The group formation was based on self-selection after the course orientation and the first assignment, *Ice Breaker*, designed to help students to know one another. These six groups included:

Team A - this all females, all teachers team consisted of Lillie, a third grade teacher; Dora, an eighth grade teacher; Tonya, a school bus driver who also substitute taught; and Cindy. This team was formed based on the commonality among the group members who are full-time working mothers while pursuing their master degrees. Lillie, Dora, and Tonya agreed to participate in this study.

Team B - this all-female team consisted of Nina, a kindergarten teacher; two middle school teachers, Rebecca and Doris; and Wendy. Members in this team worked in the same school district and had been taking classes together (online or not) for their master degrees prior to this class. Nina, Rebecca, and Doris agreed to participate in this study.

Team C - this team consisted of three males, Brian, Martin, and Kevin, and one female. Brian and Martin were high school teachers, as was Carol. Team members in this group worked in the same school district, they knew each other prior to the class but may not taking online class together before. Brian, Martin, and Carol agreed to participate in this study.

Team D - this team consisted of two males and two females. Ann, an international student who was working toward her master degree; Nola, Toby, and Peter were undergraduate students majoring in secondary education with an emphasis on business education. Ann, Nola, and Toby were on campus while Peter worked in another state during the semester that this study took place. Ann, Nola, and Toby agreed to participate in this study.

Team E - this all-female team consisted of Beatrice, an elementary school teacher; Regina, a substitute teacher; Anita, a university librarian; and Ashley. Team members

in this group were at different localities; this is a team that had to deal with everything online. Beatrice, Regina, and Anita agreed to participate in this study.

Team F - this team consisted of one male, Omar, who was an international doctoral student and three females, including Kate, a middle school teacher; Tina, a teacher who did not indicate her grade level of teaching; and Allison who was a college student. The majority of the team members were on campus while Tina lived in another state. Omar, Kate, Tina, and Allison agreed to participate in this study.

While 16 students reported their previous online learning experience as positive, four students (Ann, Beatrice, Regina, and one non-participant) reported that they hadn't had any online learning experience before. The remaining four students did not report on this topic (Ashley, Dora, Martin, and one non-participant). All of the six project teams consisted of experienced and inexperienced online learners. The six project teams were research units for later data analysis.

Instructor

The instructor of EDCI 718 has a doctoral degree in Cognitive Psychology and extensive experience and background in the field of educational technology both in theory and practice. In addition, the instructor had provided a PBL environment for both face-to-face and online courses. The role of the instructor was to *facilitate* participants learning using a PBL approach, and building learning experience that required problem-solving, research skills, and collaborating with other group members. The instructor was also the course designer who had had several years of experience working with the Blackboard™ CMS. However, due to constrained budgets and the increasing cost of CMS licenses to support the growing body of users, the College of Education changed from Blackboard™ to KSOL before the spring semester 2006. This

movement had challenged faculty who used Blackboard^{TM} because of the extra time needed to transfer their courses to the KSOL and the need to learn the differences between the two systems. Like many other faculty in the COE, the instructor attended KSOL workshops to learn the new CMS. This study also investigates how the instructor made use of different CMSs, and what can be recommended for future web-based course design that helps online adult learners learn better.

Researcher

The role of the researcher in this case study was a mostly non-participant observer. The researcher attended the orientation section to introduce herself to the participants and described briefly the research she planned to conduct. In order to create rapport with the research participants, the researcher volunteered to host a workshop to help the participants to learn certain techniques and skills needed for completing the third project, which required them to build a simple webpage. According to Lincoln and Guba (1985, p. 39), only the human instrument is "capable of grasping and evaluating the meaning of that differential interaction". In addition, the researcher had herself enrolled in EDCI 718 during her first year of doctoral study; her learning experiences with the textbook *Integrating Technology for Meaningful Learning* (by Grabe and Grabe, 2004), the assigned readings, and in completing class assignments and projects endowed her with an "insider" perspective to the course experience. It is true that the problem of researcher bias is frequently an issue. Creswell (1998) suggests clarifying researcher bias from the outset of the study to help readers understand the researcher's standpoint that impact the inquiry. "In this calcification, the researcher comments on past experiences, biases, prejudices, and orientations that have likely shaped the interpretation and approach to the study" (p. 202).

The Technological Context

K-State Online

Figure 3. K-State Online (KSOL). (Source: copyright © 2005, Kansas State University. Used by permission of Kansas State University)

K-State Online (KSOL; see Figure 3) was used to support the instructor and participants engaged in collaborative online projects. KSOL is password-protected and can be accessed via two entry pages: the *View* page has a minifying glass ( ) metaphor; and the *Tools* page has a wrench ( ) metaphor. Within the tools page, the administrators, the instructor, the future instructor, and the researcher had access to a series of *tools* that consisted of five primary areas and their associate areas (See Figure 4):

- Course Management- Components, Announcements, Email Configuration
- Content Management- Manage Files
- Communication- Calendar, Message Board, Chat Room, Live Lecture
- User Management- Roster, Create Terms, Student Groups
- Assessment- Assignment Manager, Gradebook, Grading Rules, Question Manager, Survey System

Also important to note was the Roster area in which student names, pictures, IDs, and

contact emails were posted.
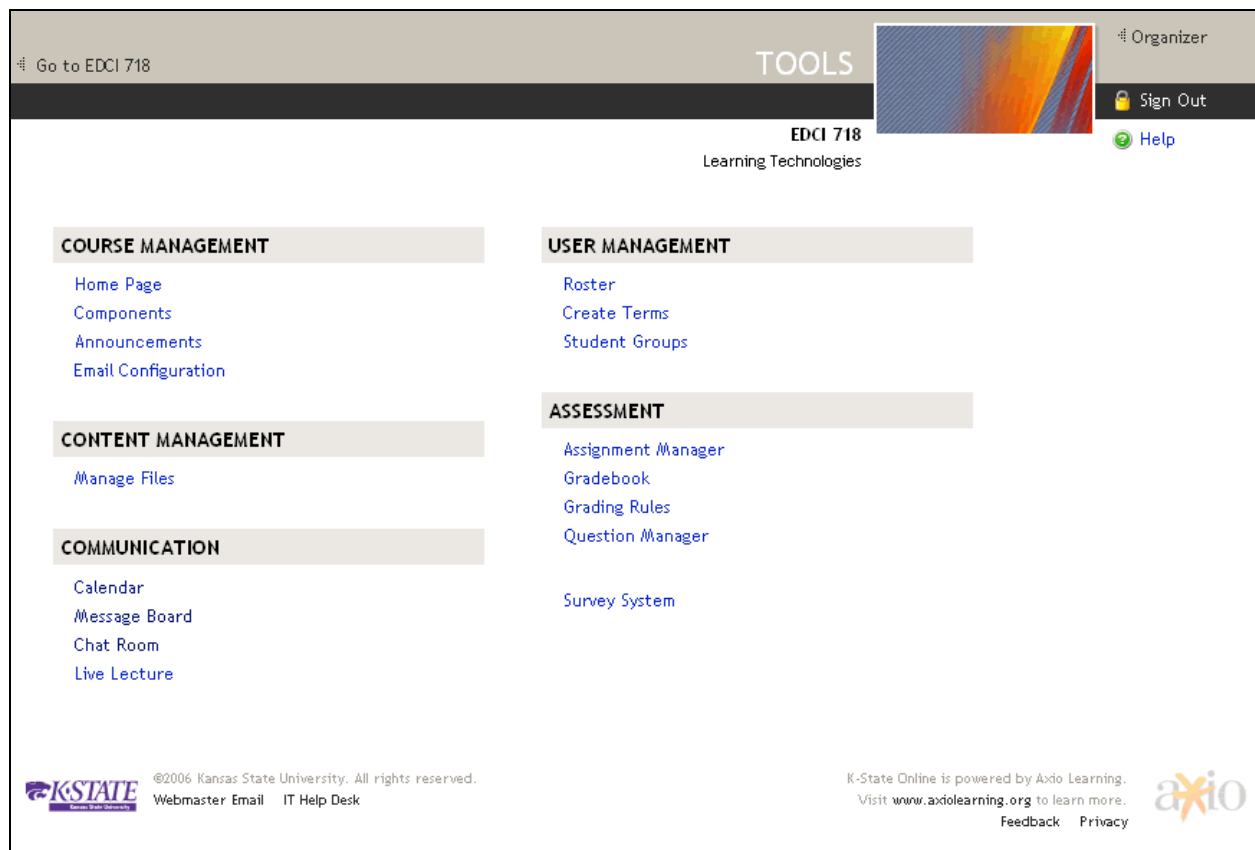
Figure 4. KSOL - tools page. (Source: copyright © 2005, Kansas State University. Used by permission of Kansas State University)

Within the view page, registered students had access to the course content that consisting

of an announcement area where the instructor posts project due dates, reminders, or any changes

to course expectations. In addition, three main areas and associate areas as shown in Figure 5:

- Course- Information, Calendar, Gradebook
- Content- Getting Started, TUTOR Project, WEBQUEST Project, PBL/IT Project, Issues Paper, Final Exam, Archives
- Collaboration- Char Room, Message Board, Groups, Profiles, File Dropbox

Students could manage their profiles by providing nickname, hobbies, or anything they would like the class to know. Uploading pictures of the students was also available. Then the students could decide whether or not to publish their profiles for the whole class to view.

Figure 5. KSOL – student view page. (Source: copyright © 2005, Kansas State University. Used by permission of Kansas State University)

Data Sources

The researcher conducted the research according to the agreed proposal under the supervision of her major professor. She informed the participants with regard to the purpose of the study while paying special attention to issues of confidentiality, and gathered signed consent forms in keeping with Institutional Research Board policies. She also ensured that the data collected were accurate, relevant, valid, and suitably stored and archived.

In a case study, the generated results can be based on any mix of qualitative and quantitative evidence. The evidence need not always include a direct and detailed observation as a source of evidence (Yin, 1994), but may include a set of evidence, its analytical interpretations, and lessons learned. Yin (1989) further suggests six sources of evidence: documentation, archival records, interviews, direct observation, participant observation, and physical artifacts. Of the six sources, neither the direct observation nor the participant observation was feasible. To overcome that constraint, the researcher logged into KSOL from time to time to observe the class dynamics and took notes for issues that to be examined. In addition, the researcher's prior learning experiences with this course provided an insider's point of view for her to judge and interpret what happened within the learning context. The collected sources are described in the following paragraphs.

Documentation

Course announcements, course syllabus, resources, assignment instructions, and project descriptions were collected and printed out as hard copies.

In addition, one or two students from each group were asked to participate in a follow-up email or face-to-face interview according to their survey answers in order to clarify vague

meanings and to gain more insights. The focused interviews were used to confirm data collected

from other sources such as project reflections, student journals, and surveys.

Archival records

Archival records including synchronous and asynchronous online communications

(discussion board messages, chatroom histories, email records, etc.), student self reports (journals

and/or reflections), and student self-rated Professional Competency Continuum assessment.

Online Communications

Group Message Board (GMB) and Main Message Board (MMB)

The instructor posted topics/questions for groups to discuss onto the *Main Message*

Board (MMB). In general, individual participants discussed these topics with their group

members within the *Group Message Board (GMB)*. When the group reached to a conclusion in

regard to that specific topic, at least one of the group members was responsible for posting a

summary to the public discussion board. Messages in both public and group discussion boards

were displayed in a similar way and could be sorted either by threads, by dates, and by authors.

However, the group discussion boards were restricted to group members only. The group entry

page is shown in Figure 6.
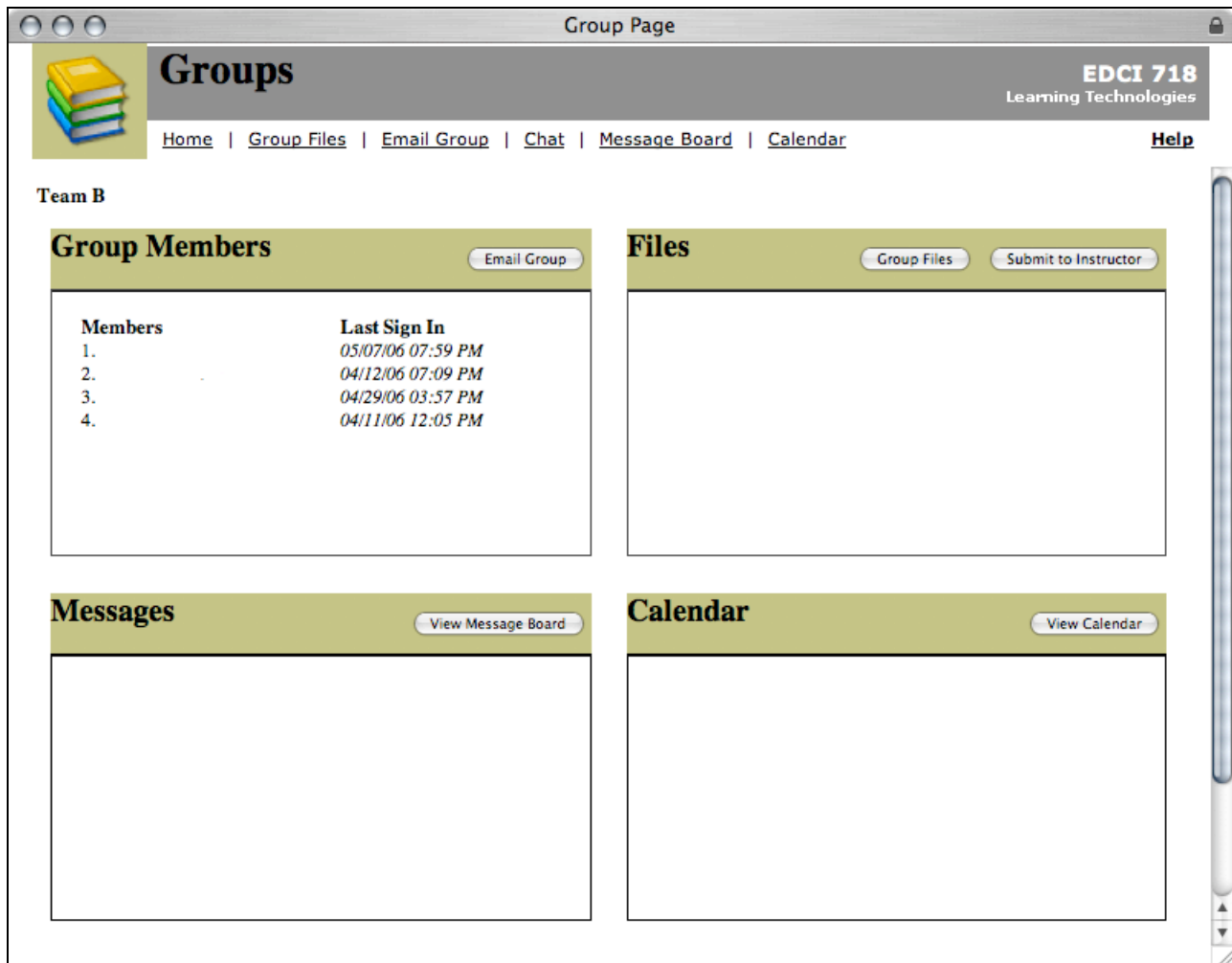
Figure 6. KSOL - Group entry page. (Source: copyright © 2005, Kansas State University. Used by permission of Kansas State University)

Chatroom

Another online communication tool available in KSOL is a synchronous communication tool - Chatroom. During project 2, team members were encouraged to set up a convenient time for every team member to "meet" online, to brainstorm project ideas, to ask and to answer questions, and/or to discuss group work. The chat history is automatically archived when closes this window (see Figure 7).
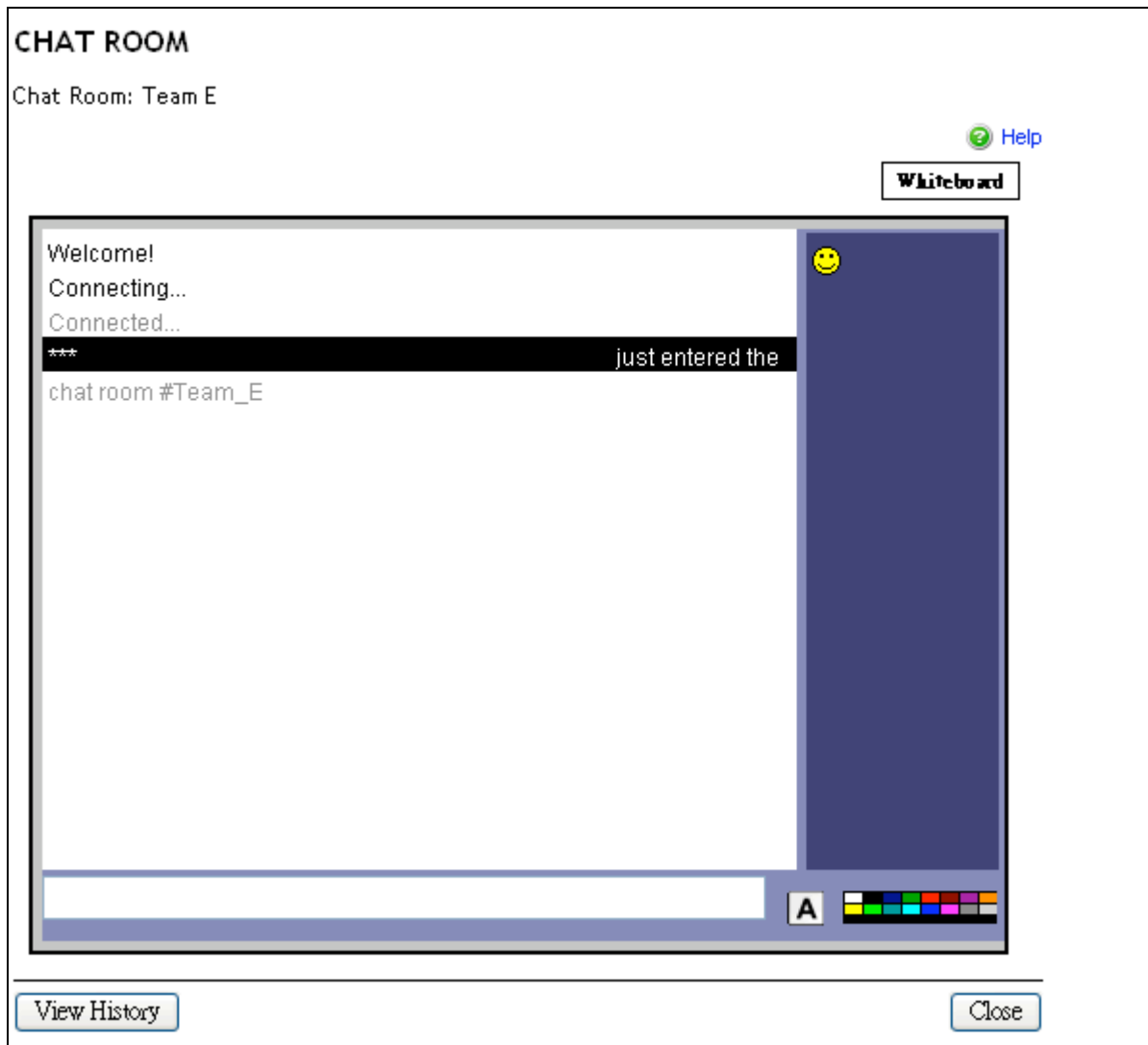
Figure 7. KSOL- Group Chatroom page. (Source: copyright © 2005, Kansas State University. Used by permission of Kansas State University)

PCC Self Assessment

The Professional Competency Continuum (PCC) assessment was administered during the class to assess educators' status with technology skills and knowledge. The PCC Assessment Tool features two different assessments: (1) The ***General Assessment*** provides a quick, 20 question (25 for administrators) overview; (2) A ***Detailed Assessment*** can be taken in any of the 5 major areas of the continuum. The 5 major areas are: Administrative competency; Classroom & Instructional Management; Core technology skills; Curriculum, learning and assessment; and

Professional practice." Students are asked to select two areas (i.e. the general assessment and one area from the detailed assessment, or two areas from the detailed assessment), for each assessment item, rate themselves for current skill level as either *entry*, *adaptation*, or *transformation*. After taking an assessment, students needed to summarize responses and rated their levels in the two areas assessed. The criteria for each level are:

Entry: The educator is aware of the possibilities that technology may hold within the area assessed, but they currently lack the training, access to technology, or opportunity to exhibit skill in this area.

Adaptation: The educator is somewhat skilled in this area, and the use technology is primarily in support of the same type of learning activities that were present before the technology arrived.

Transformation: The educator is very skilled and sometimes serves as a resource to others. Technology has become a catalyst for significant changes in the learning environment.

During the first week, under the topic of *National Educational Technology Standards (NETS)* posted on the *Message Board*, students reported on which areas they did well and what areas they needed to learn to improve and compared to the performance profile in the NETS Teacher Standards. The participants' self-reported CSS assessment reports provide background information about participants' knowledge and skills in using educational technologies.

Student-Created Projects

Students in EDCI 718 were required to complete three projects: the *Tutor* project, the *Tool* Project, and the *WebQuest* project. Because this course was about learning technologies, course objectives involved not only learning the trends and issues related to educational technologies, but also included exploring some of the emerging technologies and most importantly, learn how to use them. Some of the individual tasks served as indicators of a

certain level of competence before students could really be expected to successfully create team

projects. There were 18 projects in total (6 groups x 3 projects).

Table 4. *Team projects overview*

Team	Tutor Project Group Software Review	Tool Project Technology Integration Project	WebQuest Project Create WebQuest
A	*The Oregon Trail, 5th Edition*		
B	*Kid Speak Spanish*	*Recycle-Reuse-Reduce A Project Based Program*	*The American Civil War*
C	*The Stem Cell Guy*	*Three Branches of Our Federal Government in Action*	*Tired of Paying $3 a Gallon? A WebQuest for 10th Grade Science*
D	*Oregon Trail*	*The Telephone*	*The Civil War*
E	*Hot Dog Stand*	*Mission: Museum*	*Latin America*
F	*Genetics' Discovery School*	*School Newsletter*	*Diversity Cultures*
G		*Hansel and Gretel Reader's Theatre Script*	*Give It To Me Straight!*

These electronic projects were collected along with the grades and comments from the

instructor.

Survey and Interview

After all groups completed their three group projects, participants were administrated a

survey. This survey consisted of four categories; the first three categories were aligned with the

first three research questions. The last category asked for participants' learning experience with

tools they were available in KSOL for further course design considerations. Each category had

four open-ended questions. There were 16 questions in total. Sample questions can be found in

Appendix K.

After the class, the researcher conducted follow-up email interviews with some of the

participants and the instructor. These interviews were used primary to confirm data collected

from the class observations, project reflections, student journals, discussion board messages, chat histories, and survey findings. In other words, the interviews with participants and the instructor can be viewed as member checks.

The multiple source of data were collected/downloaded and organized into individual files for each data source (course information, chat histories, discussions, e-mails, instructor responses, survey, student journals, and student work). These data were entered and stored in a computer database created by Microsoft Access. These individual files (tables) were linked and queried in order to generate reports. Finally, these reports were printed out and ready for data coding.

Data Analysis

In case studies, the goal of data analysis is to communicate understanding (Merriam, 1998). Miles and Huberman (1994) provideeffective data analysis techniques to achieve this goal. Their procedure consists of the following three concurrent flows:

Data reduction -
1. Selecting, focusing, simplifying, abstracting, and transforming the data in multiple sources
2. Writing summaries, coding, teasing out themes, making clusters, making partitions, writing memos

Data display -
1. Matrices, graphs, charts, networks
2. Extended text

Conclusion drawing and verification -
Maintain openness and skepticism throughout the process

Yin (1994) encouraged researchers to make every effort to produce an analysis of the highest quality. In order to accomplish this goal, the researcher should show that the analysis relied on all the relevant evidence; include all major rival interpretations in the analysis; address the most significant aspect of the case study; and use the researcher's prior, expert knowledge to further the analysis. Moreover, Stake (1995) indicates that just keep the eyes sharp and an open mind are not enough. He points out that analysis means taking something apart, how is this part related to that part, and then put the pieces back together again in a more meaningful way. This process goes on and on; however, through *direct interpretation* and *categorical aggregation*, the researcher reaches new meanings. Often, the search for meaning is a search for patterns, and for consistency in certain conditions, which Stake refers to *correspondence.* Some meaning appears in single instance, some usually appears over and over again.

This study implements Henri's (1992) model for content analysis of CMC to qualitatively analyze the electronic discourse. Henri's model provides five key dimensions for content analysis: participation rates, interaction patterns, social cues within messages, cognitive skills, and depth of processing. This study looked specifically at the interaction, social, and depth of processing dimensions. The electronic data sources were coded and categorized according to the research questions. For each major theme, primary categories were created; and for each category, sub-categories were created.

Establish Trustworthiness

According to Mayer (1947), observational study of everyday thinking can provide credibility but may be weak in dependability, while using simulation tasks can produce results that are dependable but may lack transferability. Since this case study uses thick and rich description to demonstrate the phenomenon within the online PBL context, the credibility is strong.

To increase the dependability, the survey instrument was piloted in the fall semester of 2005. The results obtained from the survey were triangulated with multiple data sources such as student-created artifacts, individual journals, discussion board messages, chatroom histories, surveys, interviews, and instructor comments. According to Yin (1989), "pilot case reports should be explicit about the lessons learned for both research design and field procedures" (p. 81). The lessons learned from the pilot study are listed in the Appendix L.

In addition to impose pre-existing hypotheses on the data, the interpretations were also grounded in the data and systematically worked out the relation to the data. The data were collected in electronic form and stored on a computer. Besides, a database was created for generating reports. These reports were then printed out for data coding.

In triangulating these interpretations, multiple sources of evidence (student created artifacts, chatroom archives, discussion board messages, instructor comments, surveys, interviews, student journals) were examined as a means of increasing the credibility derived from interpretations (Yin, 1989).

CHAPTER 4: OBSERVATIONS AND INTERPRETATION

Stake (2003) states that "[t]he purpose of a case report is not to represent the world, but to represent the case" (p. 156). Merriam (2002) also suggests that the central tenet of qualitative research is that individuals construct reality in interaction with their social worlds. According to Yin (1989), embedded cases (groups) are *subunits* that can "add significant opportunities for extensive analysis, enhancing the insights into the single case" (p. 52). In this study, participants worked with group members to complete class projects; their learning experiences were bounded by specific conditions within their group context. Therefore, the six learning groups were the subunits being studied to contribute to description of the holistic case. In order to provide a complete picture of the case and the participants' constructed realities, the rich and thick descriptions of the embedded cases are provided in Appendices A–G. In this chapter, the instructor and team profiles are described first to provide the context of the case. Within this context, observations and interpretations for each research question are presented, followed by the discussion of major emerged themes from the findings.

Meeting Dr. M

The first opportunity for the students to meet Dr. M in person was attending the EDCI 718 orientation. In the orientation session, a mobile lab was used in a wireless classroom. Dr. M demonstrated how to access KSOL, reach class assignments, post messages, and send emails within KSOL. Before the class was dismissed, Dr. M asked students to post an introductory message in an ice breaker activity to ensure students were capable of using KSOL. These introduction messages provided information about participants to help people them form groups. The complete *Ice Breaker* activity message is listed in Appendix K. Below is the introductory message posted by Dr. M:

Hi, I am new to using K-State Online so we can learn about this together.

I have one cat and one dog. I spent last summer in Oregon and loved it - the food, the proximity to the ocean and mountains.

I teach in a masters and doctoral specialization in Curriculum & Instruction called Educational Computing, Design & Online Learning.

In order to help online learners succeed, Dr. M posted messages suggesting time management and ways to collaborate from a distance. She also fostered an environment of flexibility by encouraging the use of different strategies for collaboration and tools as means for communication, for example:

You must plan on spending a good deal of "lab" time on a computer in order to complete your work. You must also plan time to collaborate in person (face-to-face or on the phone) and/or virtually (that is, by e-mail, online discussion board, chat or other electronic means) with your assigned or chosen group.

It is our intention to have collaboration that is meaningful and helpful to participants. You will have three group projects. It is a good idea to collaborate with people who are near to you in distance, in case you should want to meet face-to-face. This is particularly important for the third project. You may also switch groups after each project if you like. Finally, let me say that you do not need to meet face-to-face, but neither is it prohibited. Use whatever collaboration strategies work for your group.

It is important to note that switching groups was acceptable after each project. In the chat interview with the researcher, Dr. M. revealed the reason for this policy:

Dr. M: *my philosophy is that these are adults. I am asking them to do something difficult. If they cannot cooperate with each other to do that task, then the learning is not going to happen. So, I told them when they first formed a group that they could change groups for the next project if they wanted to.*

Meeting Project Teams

There were six project teams in this research. However, because some participants did switch groups, these teams did not have the same membership throughout the semester. In the project 1 phase, the six teams were A, B, C, D, E, and F. After project 1, Kate from team F

switched to team C. In the middle of project 2, Lillie and Cindy from team A switched to team

F; Tonya and Dora from team A formed the team G. Team A ceased to exist. Specifically, for

project 2 and 3, the six teams were B, C, D, E, F, and G. To help understand the overall team

formation and associated team project(s), the table below summarizes each team's membership

for each project. Note that for the confidentialty purposes, all of the participants' real names are

replaced with pseudonyms. Also note that only those who gave permission to participate in this

study are listed in the Table 5:

Table 5. *Team formations over projects*

	Team A	Team B	Team C	Team D	Team E	Team F	Team G
Project 1	Lillie Tonya Dora	Nina	Brian Carol Martin	Nola	Beatrice	Kate Omar Tina Allison	
Project 2 & 3		Rebecca Doris	Brian Carol Martin Kate	Toby Ann	Regina Anita	Omar Tina Allison Lillie	Tonya Dora

Team A Profile

     Lillie was a third grade teacher for 6 years. She enjoyed playing games, reading,

running, and sewing. In particular, Lillie indicated that she was a fan of a TV show, *The*

Amazing Race. She was taking another online class while taking this class; as she said "*I like the*

freedom that online learning provides". In addition, Lillie felt comfortable about using

computers for her job. (Note: Lillie switched to team F in the middle of project 2)

     Dora worked as a graphic designer for 10 years. She just got her teaching degree from

the university and become a first year 8th grade reading teacher. Dora had two sons and she

spent much of her spare time at various ball games because of her sons. Dora loved travel; she

visited Taiwan last summer and planed to return this year. Dora enjoyed scuba diving and snow

skiing with her family. As to her online learning experience and computer experience, Dora

indicated:

> *I have not had any problems taking on-line classes at KSU, and plan on taking more in the future. As far as computer experience, I feel that I am computer literate. I actually enjoy working on computers and creating graphic designs. I worked as a graphic designer for 10 years, before returning to KSU for my teaching degree.*

(Dora left team A and formed team G in the middle of project 2)

> ***Tonya*** was a first year graduate student working on her Master's degree in Curriculum

and Instruction. She was school bus driver and also substitute teacher in the classroom. Tonya

was a mother of five children. As she described it, *"I am always surrounded by kiddos!"* Tonya

had taken several online courses during her undergraduate study and was taking some other

courses while taking this class. As she indicated:

> *I enjoy the online format, especially with a family and work. However, it can be a challenge to make yourself sit down at the computer when there are so many demands at home! Keeping up with the assignments is the key!*

As her computer skills, Dora expressed her excitement to learn more:

> *I feel I am basic when it comes to computer. I can email, do Power Point presentations, type documents, etc. I enjoy computers and hope to learn so much more!*

(Tonya, along with Dora, formed team G after project 1)

Lillie, Dora, Tonya, and Cindy (who did not participate in this research), formed team A,

which was disbanded after project 1. Team A encountered collaboration problems and the group

members either switched to another group or formed a new group. The problems are fully

described in Appendix A as well as in the discussion of Research Question 3. Since Team A's

group space on KSOL was deleted, there were no data collected except student reflections and

journals. After that, the six research units were Team B, C, D, E, F, and team G.

Rebecca came to the class orientation with her 3-week-old baby; besides her newborn, she had two other small children. Rebecca was a 5th grade teacher, she taught language art for nine years, and this year she started to teach math. She sat with another three teachers, as she described, "*our group is working toward our master's degree. We have already completed our ESL endorsement. We will finish the rest of our Curriculum & Instruction degree this summer.*"

Prior to this class, Rebecca had taken one online class the previous summer with this group of teachers. She mentioned that in that online class, she learned how to use the message board and she had gained more confidence with computer usage. *"Hopefully this class will give me practical information for classroom use.*"

Nina was a kindergarten teacher. She had taught kindergarten for three years. Before that, she taught high school special education for another three years. Nina also had two children and would have her third one in a few months. She hoped she could finish her master's degree before her baby was born.

Too, Nina had one online learning experience. She described her experience with computers:

> *My computer skills are medium. At my building they are considered to be high because I am one of the youngest teachers. I am interested in working with computers. I try to work with my kindergarten students on the computers often.*

Doris had been teaching for 19 years. She would be finishing her master's degree with Rebecca and Nina soon. Doris was confident about using the computer because:

> *I have a daughter with a degree in MIS so she is going to be my consultant throughout this course. I also have a son with a Tech Management Degree if I can't reach her…I am depending on my collaborative group help for me on a regular basis.*

All Team B members worked at the same school district throughout the semester, and they met face-to-face as their primary means of communication. As a result, the group seldom use their group spaces, such as the group chatroom or group message board. In the Professional Competency Continuum (PCC) assessment, Rebecca reported on her low rating in the professional development category and her fear of trying new tools, which might explain why this team was facing the challenges toward learning about learning technologies online:

> Rebecca: *I rated myself fairly low on the PCC Assessment Tool from the Milken Foundation. The questions regarding professional development were at the entry level because our district does not allow a lot of time outside or workshops and training sessions to implement new ideas. I am getting much better at using the computer; however, I don't like venturing out into unchartered territory. I like using the old, reliable programs that have worked for me in the past unless I have someone showing me each new step. Once I have been introduced to a particular program, I become very successful implementing the program in my classroom and personal life. I need to be using more technology within my classroom…*

The only chat record from team B in the public chatroom showed the team members were frustrated at times with technology problems. When one participant posted her problem with her computer at home, other students identified with her frustration, as indicated in the following chat conversations:

> Nina: *I need to figure out what is wrong with my computer at home.*

> Doris: *It is very frustrated when technology doesn't work.*

> Rebecca: *I know we need to have way more practice before we would implement this in our classroom.*

> Nina: *I do think this is a neat experience, and appreciate the opportunity to learn about it.*

> Doris: *I think so, but am not sure*

> Rebecca: *Also, we planned ahead to make sure we were all on line. Is that necessary?*

> Nina: *I will let you two stay on indefinitely, my kids might push buttons they are not suppose to*

Rebecca: *My kids would like to right now. They can't figure out how I could possibly be working on "class stuff".*

The complete description of team B's learning experiences with three projects are provided in Appendix B.

Team C Profile

Kate was a young teacher for three years. She taught math at a middle school and coached volleyball, basketball, and might be coaching tennis this semester. She was familiar with KSOL since her other graduate courses used it as well. Kate had just gotten married, and she was so excited about her wedding that she even posted her wedding picture in her profile. Also, she expressed, *"I look forward to working with some of you online!"*

(Kate was originally from Team F)

Brian taught Algebra and Geometry at high school level. He has also been an assistant football coach and boys swim coach for three years. Brian did not like travel; instead, he enjoyed camping by the lake with family, or hunting and fishing with friends.

Brian had only taken one online course; he liked the course, as he said:

I enjoyed the course, because I was able to complete multiple assignments in one setting and on my own time. Another positive aspect of the course was that I could get my questions answered quickly because all members of the class was checking in regularly.

Besides, Brian was confident about his experiences with technology, but he also admitted that he had no time to keep up with the rapid changes of technology:

I have always had positive experiences dealing with technology and computers, but I just have not had time to keep up with all the technology changes.

Carol was a Physical Science teacher at a high school for four years. She explained that *"Physical Science includes lessons in introductory Physics, Chemistry, Earth and Space Sciences."* Carol loved her teaching job, she said, *"it has been a wonderful place to me to grow as an educator. The amount of information I have learned is invaluable to me personally and professionally."* In addition her job, Carol told the class that she had two elementary age children.

Carol had taken three online courses before, but as she indicated,

..two of those courses were taken as undergraduate courses over five years ago and the information that I used has long since escaped my memory. My most recent online course, Ed. Leadership in Staff Development was a web based course but was primarily limited to posting messages on the message board. We were not required to develop a web page.

Carol believed her computer skills were on the basic level and was looking forward to more from this course. As she described:

I believe my computer skills are on the basic level. I am able to use a computer for everyday activities: email, internet searches (EBAY!), and using my gradebook program. I look forward to learning more about computers in this class.

<u>***Martin***</u> was a high school Biology teacher. He enjoyed playing guitar and mandolin; he uploaded a picture of him playing the guitar. Besides, Martin also participated in adventure racing and coached ultimate Frisbee.

Martin explained his distance learning experience long time ago:

The only other distance ed class that I took was a special arrangement that I made with a professor where I got my undergraduate degree to take Modern Physics during the spring semester of my first year of teaching (I needed it to extend provisional certification). Due to the business of first year teaching, about 2/3 of the class got crammed into the 2 weeks after the end of the school year. I think the delirium from lack of sleep actually helped me understand the quantum mechanics.

Martin was pretty confident with computers and related technology. However, he indicated that he had a history of procrastination, but he hoped he could change this habit because he was also taking another class within the semester. He indicated, "*I will, however, do most of my work on the weekends for this class.*"

At the beginning of the class, team C attempted to take advantage of the online course structure so as to maximize their time to fit into other life commitments. As some of the team members described:

Brian: *I think that the greatest benefit of on-line learning is that course work and discussion can be done at anytime. On-line learning allows for me to log on at any time*

of day which is very nice since I have coaching duties that take up a major amount of time after school.

Martin: *I definitely like the fact that I can do most of the work on my own schedule (within the bounds of what needs to happen within the group, of course) and the interaction within my group has been fine, but I knew everyone in my group before taking this class. I think a face-to-face meeting would improve communication, but I also think it is unlikely to happen due to everyone's busy schedule*

A more complete description of Team C's learning experiences with three projects are

provided in Appendix C.

Team D Profile

<u>Nola</u> was an undergraduate student majoring in secondary education with an emphasis in Business and Special Education. Nola planned to continue her education for her masters degree in Special Education. Besides her job at the football stadium, Nola had begun to substitute teach.

Nola was familiar with KSOL as she had taken a couple of online courses before. She was pretty confident in her computer skills as well, *"I have taken quite a few technology classes since I am in Business Education. I know my way around a little bit."*

<u>Toby</u> was a 22-year-old college student majoring in Secondary Education in Business Education. He would be working on a ranch in another state while taking this class. He described his hobbies as *"anything football and being outdoors."*

Toby described his online learning experiences with a computer programming class, *"I have taken a class online about Visual Basic that was very tough to do."* Toby felt confident about his computer skills and with many types of software. However, he said, *"The area that I struggle in with computers is programming, everything else I can hold my own."*

<u>Ann</u> was an international student. She was a graduate student majoring in Secondary Education with an emphasis in Reading and Language Arts. As she described her interests, *"I am very interested in learning computer web site design and learning languages."* In addition, Ann reported that she had only some basic computer knowledge.

The group problem that team D experienced was mostly from Ann. Ann was late in joining this class. She was enrolled late thus missed the class orientation. She did not respond to most of her group discussions. In addition, when she finally contacted her group members for

chatting, she entered the wrong chatroom. She entered the public chatroom while her team

members were chatting in their private group chatroom. The same situation happened 3 times.

In total, team D chatted 9 times; Ann finally made it to the 7th and the 8th chats. All of

these failures to connect really made her team members very upset. In the individual journals as

well as personal emails to the instructor, some participants reported:

> Toby: *I just checked my email at 9:00 pm tonight(4-4) and have seen the messages from Ann. I understand that Ann's intentions are good but it is always at the last minute. We have scheduled numerous chat sessions and ask people to email the group if they cannot make it and we never hear from her or if we do it is the day afterwards. It is frustrating because Ann has not contributed anything to any of our assignments.*
>
> Nola: *I was just going to let you know that we email her everything that we email each other. She never emails us back until recently. We already had our project finished on Sunday and that's when she contacted us. We had chat online on Thursday night and she never showed up or emailed us that she wasn't going to be there. We told her that she can do the revisions (because she asked if she could) for the project, but that makes me a little nervous because she wasn't there during the discussion online. We also asked her to email us before the discussion instead of after if she wants to participate in the project. She has only participated in one of the group projects so we weren't really sure what to do.*

Ann was not the only participant who confused between the public chatroom and the group

chatroom. On Feburary 24th, Ann met Tina from team F at the public chatroom and had a

conversation:

> Tina: *Hello Group F*
> Ann: *Hello*
> Tina: *hello again*
> Ann: *r u Group D menber?*
> Tina: *no group F. We planned to meet at this time*
> Ann: *so do we I think*
> Tina: *well I've been here since 4pm no sign of my group members*
> Ann: *me too~*
> Tina: *I wonder if we could Dialog about todays lesson inspite of us being from other groups. I understand if you think this would be proper. I not sure if it would be myself. I am anxious to finish this assignment before the deadline tonight at midnight.*
> *(Ann left the chatroom and joined the chatroom again)*

Ann: *My internet is unstable. What do you think about today's assignment?*
Ann: *I am back. Sorry, r u there?*
(Tina left the chat)
Ann: *all right, I am leaving ~~*

When asking additional suggestions for improving this class in the survey, Ann

commented:

Ann: *Please don't create 2 chat rooms that we may confuse and go to the wrong chat room.*

The poor communication caused a lack of trust and dedication to the project among team

members; eventually, it affected the quality of the team's projects. Team D's learning

experiences and collaboration problems are fully described in Appendix D. In addition,

problems with technology used for communication is discussed later in Research Question 2.

Team E Profile

   <u>Beatrice</u> was a fifth grade teacher and she had been teaching for 31 years. As she said, "*I enjoy it (the kids, especially), but want to expand my knowledge into the area of technology. Perhaps in the future I may be able to be an on-line instructor for my school district.*" In the meantime, Beatrice was the technology lead teacher for her building. "*It is very challenging, but I've learned a tremendous amount about computers (and I have a fat notebook of "how-to's).*"

   Beatrice enjoyed reading, especially historical fictions. "*I like to read good children's books and then recommend them to my students. I want to really get them turned on to reading-- it is one of my chief goals every year for my students.*"

   As Beatrice's online learning experiences, she said, "*this is the first college class I have taken in quite a few years.*" However, Beatrice was looking forward to it, "*I look forward to working with my group (whoever you are!).*"

   <u>Regina</u> was a substitute teacher in 3 districts, "*grade, middle school & high school-from 1 to 3 days a week.*" In addition to her substitute job, Regina was a grandmother of three grandchildren while helping her husband with an auction business. As she described, "*I am taking this class for hours to renew my certificate.*"

   <u>Anita</u> was an assistant director at a college library. She loved her job. Anita had extensive online learning experience and was familiar with KSOL, as she described,

> *I am a veteran of online courses, having received a Masters in Library Science entirely online. I enjoy these types of courses because I believe they allow you to get to know your classmates in a different way than in traditional classrooms.*

Also,

> *I have above average computer skills stemming from a Masters in Instructional Technology.*

Team E members lived at different locations so they worked entirely online. They utilized the Chatroom as the main means of communication tool throughout the semester. As Regina described:

> Regina: *Chat Room was the only way to discuss and complete a project since we do not know each other and live in different locations.*

Appendix N shows a sample chat history among three team members in which they were exchanging their individual concept mapping ideas, discussing PBL requirements, finding PBL examples, brainstorming ideas for the second project, and setting up next chat meeting time, etcetera. Team E's learning experience with the three projects can be found in Appendix E.

Team F Profile

Omar was a college level Engineering Physics instructor and a doctoral student. He was originally from Zimbabwe, he informed the class about his language but also felt that his English was not too bad. According to his group members, his writings was "wordy," as seen from the sentences below:

> *I enjoy learning more on the integration of technologies in school setup but have not done anything as yet, it's just a weird passion that I have. I have tried working with some guys in Turkey, Cambridge, and U Penn collaborating on papers, some of which are still pending.*

> *I usually want to start my assignments (yesterday) as early as I get my hands on it...I do not like to procrastinate, I know the stress associated with such kind of behavior.*

> *I believe in Community of learners, where they collaborate, ask questions, collaborate further to improve understanding...this done in any set up that encourages own knowledge construction.*

> *I believe I can do anything with excellence if the environment is conducive. I like meeting people and have fun sometimes.*

Tina was a mother of five children aged from 5 to 15. She lived and worked in a distant state with her husband, and coached basketball, softball, and volleyball in high school. Tina talked about her goal and her online learning experiences:

> *My goal is to attain my degree and use it towards furthering my education. I have been doing on-line education for approximately 2 years and love it. I feel that on-line education offers a variety of new avenues that I like to explore. I look forward to this class for a variety reasons. I look forward in getting to know all my classmates.*

Allison was a 23-year-old undergraduate student working on her Secondary Education with an emphasis in Business Education. She introduced herself as a single mom who had a three-year-old daughter. She said, "*In my spare time (when there is any) I enjoy reading,*

running and riding my horses." Other than these, Allison neither talked about her online

learning experiences, nor mentioned her computer skills.

Kate switched to Team C after project 1. Her introduction could be found in team C's

section.

Lillie and another member Cindy (a non-participant) joined team F during the project 2

phase. Lillie is introduced in team A's section.

Detailed description of Team F's learning experience with projects can be found in

Appendix F.

Team G Profile

Dora and Tonya were originally from team A. They worked as a team since they formed team G. In total, team G held 8 chats and accumulated up to 483 minutes in the chatroom. During their chats, Dora and Tonya shared their personal lives, family problems, school news, and many other things. While discussing class assignments, they multitasked simultaneously; for example, listening to radio, watching TV, eating ice cream or pop corn, grading tests, and talking on the phone, just to name some.

Apparently, Dora and Tonya had developed a sense of friendship to continue working on the remaining projects. For several times, Dora and Tonya felt that they were thinking alike. As they posted:

Dora: *good! Great minds think alike*
Dora: *We think alike*
Tonya: *Me, too. I think we are more alike than we ever knew!*
Dora: *I think so too! It's great. I need to find you a job in my building.*

Dora was excited about her new team, and her favorite teammate from the old team. Although a team of two would increase the workload, Dora felt that both she and Tonya were ready for the tasks ahead. As she described:

Dora: *I know it will be a lot more work for us, but I think Tonya is willing to step up to the plate and join me. I'm excited! This is going to be so much fun.*

Dora: *My role was an equal partner! With only two in our second group we counted on each other to be dependable and supportive of the other.*

Dora: *Here we go! Team G is ready for the challenge.*

Team G's learning experience with projects 2 and 3 can be found in Appendix G.

Discussions of Research Questions

The previous section provided contextual descriptions of participants' learning experiences within the group context in this particular online PBL course. Detailed description of each group's project experiences is provided in Appendices A–G. In this section, the discussion focused on the entire class level to provide a holistic understanding of adult learners' PBL experiences in this course. Findings based on data analysis of message board postings, chat histories, surveys, interviews, reflections, journals, and observation are discussed to answer the research questions.

Research Question 1

What are the quality and nature of participants' learning experiences with different projects (as gleaned from their perceptions as well as their performance in three different projects) within the context of an online project-based learning community? What are some difficulties/problems associated with participants' learning experiences?

To identify participants' learning experiences with projects within this online PBL course, I used the six PBL features, *driving question, research/investigation, collaboration, technology, artifact, and authentic audience* as the main categories to code data. The data sources included discussion board messages, project reflections, student journals, chatroom archives, survey, interview, student projects, and instructor comments on groups' project performance. Data analysis was conducted for each embedded case (i.e., group) and then the results were examined and analyzed at the whole case level. The results suggested that students' overall learning experiences in this course were positive. However, there were variations from project to project within this online PBL context. In the following sections, observations and interpretations on the quality and nature of participants' learning experiences and the difficulties/problems within the context of this online PBL course are discussed.

Observations and Interpretations

The following sections are organized as follows: (1) three project experiences, (2) PBL features and learning experiences, (3) difficulties in online PBL.

Three Project Experiences

In presenting the findings, it is necessary to revisit the project objectives and tasks for each project. Throughout the semester, students completed three group projects as described below:

<u>*Project 1:Tutor Project.*</u> In the first project, participants learned different kinds of software by trying out software they reviewed in order to identify the strengths and weaknesses for each software. The participants reviewed software of their choice individually and then evaluated another software with their group members. Then they wrote lesson plans to use the group-reviewed software and created a rubric for evaluating students' learning with this software.

<u>*Project 2: Tool Integration.*</u> The second project asked students to develop a project that integrated technological tools while following the six PBL requirements. In the project instructions (see Appendix I), Dr. M specified the learning goals and types of tools to be integrated:

Tool Integration Project (12 pts., Final Version Due April 4)

For this project I would like you to concentrate on several learning goals for yourself, associated with the question of how one might set up a constructivist learning environment that:

- Use **project-based learning** as its format
- Integrates *student* use of a **cognitive tool** (one of the concept-mapping tools your group members used)
- Integrate *student* use of a **communication tool**
- Integrates *student* use of a **productivity tool** AND
- Focuses on student higher-order thinking.

It will involve designing a *curriculum unit*, for a particular age group, with either a single-subject focus or an integrated curriculum topic.

The project consisted of two parts (Part A and Part B) and required participants to play double-role; in part A, participants played the *teacher role* while they developed a PBL unit for students use. The project itself was a description and explanation of the student project. In part B, participants played the *student role* while they created a project that followed part A's project description.

The figure below includes six teams' (teams B, C, D, E, F, G) concept maps for project 2's part B. Most maps were created in *Inspiration*® while team E used drawings in Word:

| Team B | Team C |

Team D	Team E
Team F	Team G
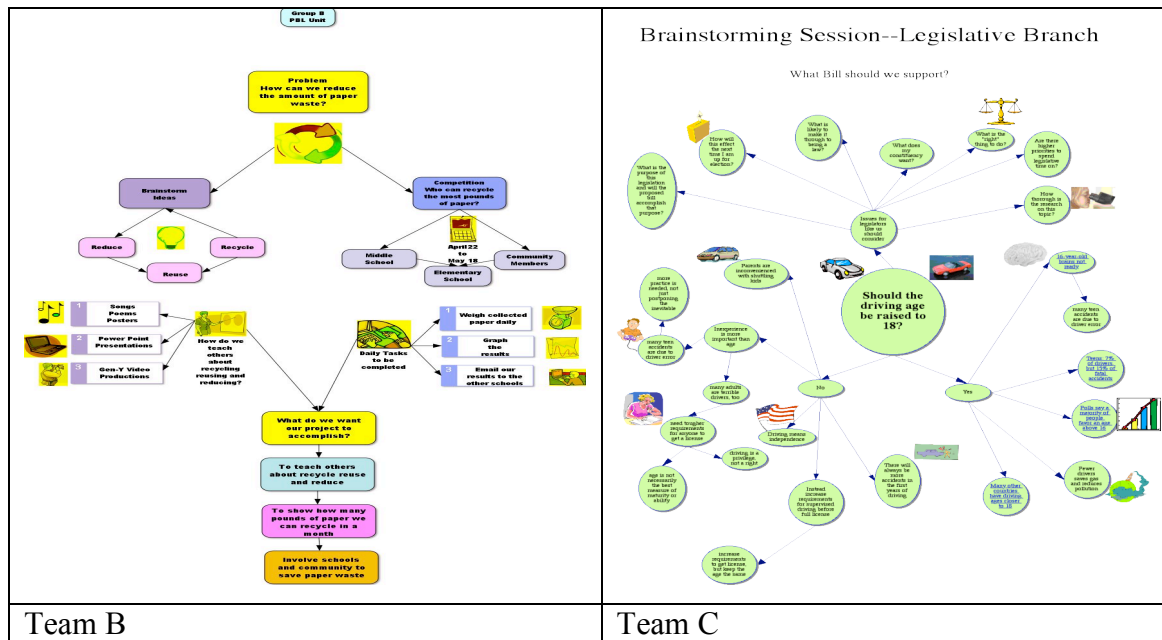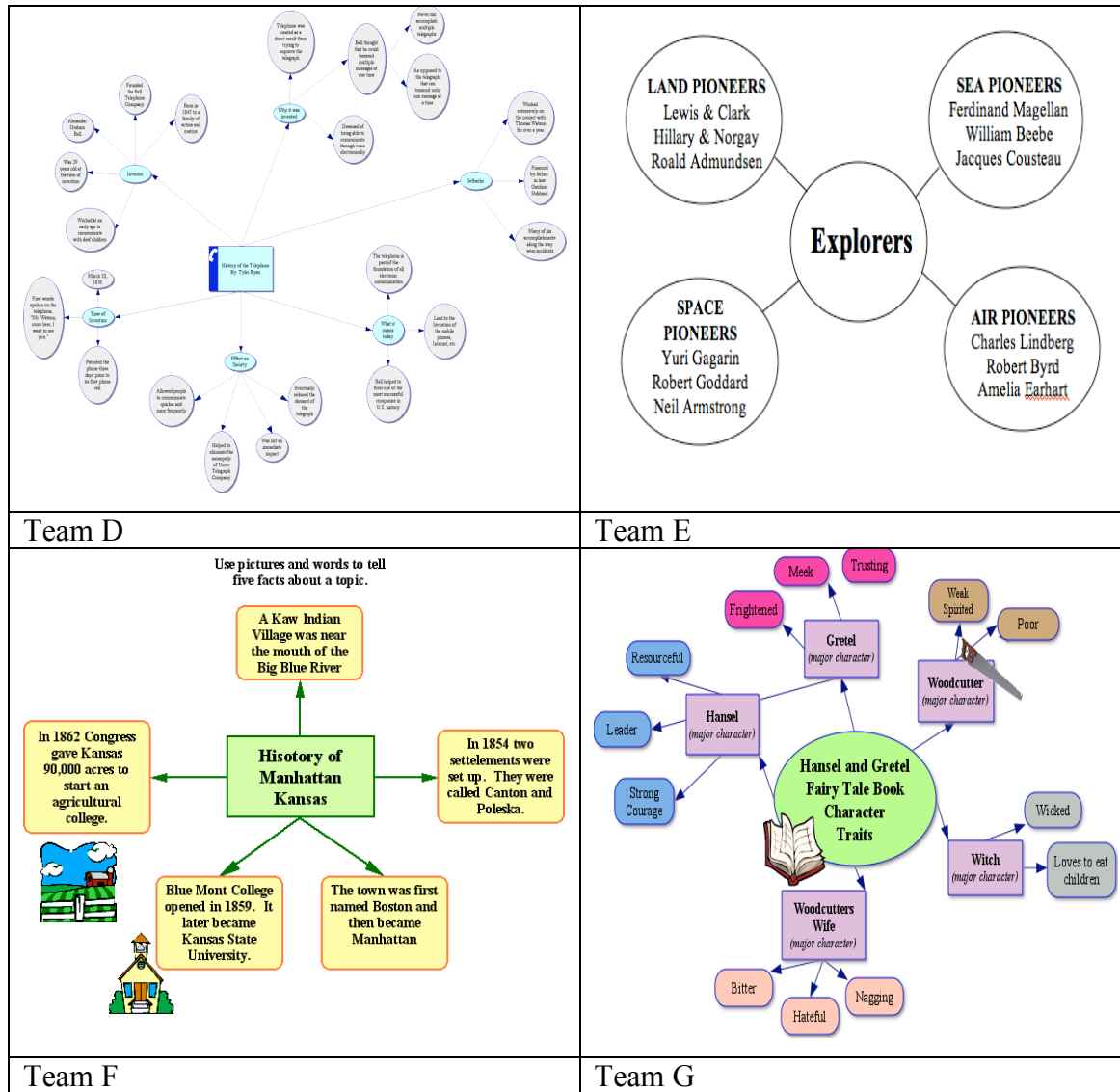
Figure 8. Teams' concept maps for project 2

Project 3: WebQuest. The third project asked students to develop a small-scale webquest

based on a constructivist learning approach for classrooms. In the project instructions (see

Appendix J), Dr. M specified the learning goals:

Develop a Small WebQuest (12 pts)
Due: May 2

By now you have looked at several webquest examples and participated in a small
webquest. As a participant in the quest, you gained first hand experience on what a
student might go through while engaging in quest activities. Now it's your turn to develop

a small webquest. While developing a webquest you will gain experience from a teacher's perspective. This project is an opportunity to put everything you have learned up to now to good use. The purpose of the QUEST project is to explore the constructivist learning approach with an Internet-based classroom activity. The main focus of this approach is to integrate the principles of constructivism to get learners involved in activities which are meaningful to them, to come to understand (not just find) content-related material, to take greater responsibility for their own learning, and to learn technology skills while they are doing it.   Remember there are two types of webquests:

- large actual expeditions which classrooms follow and interact with, and
- smaller webquests that teachers and/or students design (such as those listed in bestwebquests.com) about a single issue / topic or interdisciplinary subject.

Your team will develop a second type, a small classroom focused webquest for this project.

All the six groups developed their small-scale webquest and the instructor posted the urls for the whole class to review. The following figure shows screenshots of WebQuest projects created by the six teams:

Team B	Team C
Team D	Team E

Team F	Team G
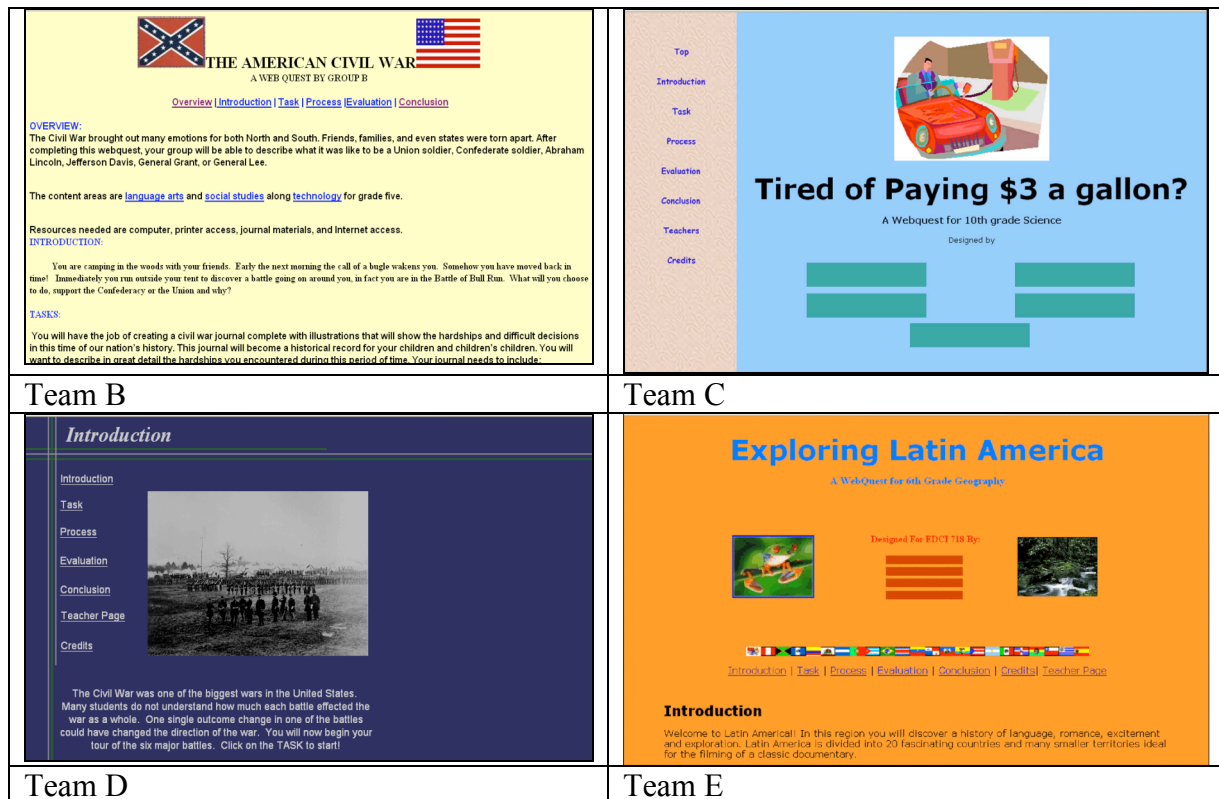
Figure 9. Teams' WebQuest screenshots for project 3

In general, participants' perceptions of the quality and nature of their learning experiences over the three projects were positive despite there were challenges during the process. The following table provides sample data on participants' learning experiences associated with each project and its challenges.

Table 6. *Sample data on learning experiences associated with each project and its challenges*

Projects	Sample Data on Learning Experience	Sample Data on Difficulties
Project 1: Tutor Project	We used Nina's expertise in her kindergarten classroom in order to help determine the best software.	[Note: No reported difficulties on evaluating software]
Project 2: Tool Integration	I really enjoyed tying technology and curriculum together.	The technology aspect was a challenge at times because I have learned to use different programs that are new to me.
Project 3: WebQuest	It is important for teachers to stay current in technology practice. The time to learn about each of these projects was time well spent. I did not have any prior information about the WebQuest, so it was particularly interesting to me.	Yikes, our web quest came up and it is a mess! Went down and conferred with the tech teacher-he was stumped; his only suggestion was to try and send the htm. File again, we did it, it did display better, but still not correctly.

Overall experience

The survey data revealed that thirteen out of the fifteen participants reported positive

learning experiences with the project approach (see items 1-4 in Table 7) while one participant

reported his experience as average (item 5) and the other participant reported that there were too

many factors need to be considered with these projects (item 6).

Table 7. *Participants' overall learning experiences with projects (n = 15)*

Participant Comments	Number of Responses
Positive Experience	Total=13
1. How technology could be integrated in the classroom	8
2. Excited about many possibilities out there	2
3. Positive on how to use some tools	2
4. Positive for learning how to plan project	1
Average Experience	Total=2
5. Average experience	1
6. Learn that many factors need to be considered	1

Sample quotes from survey and reflections regarding participants' overall learning

experiences are given below:

Beatrice: *Overall, my experiences were very, very positive. I have learned so much (I'm almost on overload!). It has been exciting to get acquainted with so much technology that is conducive to classroom and higher-order thinking.*

Kate: *My overall learning experiences were positive as I was learning not only about new tools, but learning about the experience that technology can give you within a classroom.*

Tonya: *WOW! I can truly say that I am much more knowledgeable and excited to use technology in the classroom.*

Dora: *I gained computer knowledge and how it can be easily implemented in today's classroom.*

Carol: *I didn't even know that much of the software even existed until this class – inspiration, webquests for example, were new to me.*

Ann: *It needs patience, good communications, and technology sense to complete these projects.*

Content and/or skills learned

As shown in the table below, nine participants reported they learned both content and skills. Four reported they learned more content than skills, and two reported they learn more skills than content. None of the participants reported they learned neither content nor skills.

Table 8. *Learn more content or more skills (n = 15)*

Participant Comments	Number of Responses
Both content and skills	9
More content	4
More skills	2
Neither content nor skills	0

Below are sample quotes regarding what was learned from these projects:

Rebecca: *I would say the content and the skills increased my knowledge base.*

Nina: *I learned new ideas about technology and how to integrate them into my classroom. I also learned how to use new technology tools.*

Nola: *I didn't really learn that much content, but I did learn the skill of creating a website.*

Why participants liked the projects

As shown in the Table 9, five participants reported they liked these projects for gaining knowledge on how to integrate technology into teaching and learning, and another 5 participants reported they liked these projects for being able to use some of the tools. The remaining 5 participants reported different aspects such as being able to stay current with technology, linking to teaching context, learning real things, challenging higher-order thinking, and learning from others.

Table 9. *Reasons why participants liked these projects (n = 15)*

Participant Comments	Number of Responses
Learn how to implement/incorporate/produce/apply technology in classroom	5
Able to use some of the technology tools	5
Stay current in technology practice	1
Link to their classroom	1
Learn authentic activities	1
Challenge higher-order-thinking	1
Learn others' perspectives and work collaboratively	1

Sample quotes regarding why participants liked these projects are given below:

Rebecca: *I learned different ways to implement technology in my classroom.*

Anita: *I appreciate the project topics. They were timely and extremely applicable in my classroom.*

Kate: *One thing I really liked about all of these projects was learning to use tools I had not used before and once I learned them, I was able to use them in the next project.*

Doris: *It is important for teachers to stay current in technology practice.*

Carol: *I liked that I was able to work with different people to compare answers and to spread the work among the group.*

Regina: *Learning a new educational perspective – authentic learning activities that should enhance student learning.*

Based on the findings above, the online PBL context was not only effective in helping participants expose to new technology tools, but also in organizing the values of using technology in education.

Perceptions of the project method

Although 15 participants completed this survey question, three participants' answers were off the topic. Therefore, only twelve participants' comments were compared. Six participants reported that the project method helped them learn; five reported that the project method somewhat limited their learning; one participant reported the project method both helped

and limited his learning, as he put it, it's "a fifty-fifty thing". Reasons for why the project

method was helpful included such things as: PBL provides an authentic learning experience,

encourages perspective-taking among peers, forces participants to learn new technology tools,

and provides repeated exposure with new tools. Reasons for why the project method was limited

included not allowing participants to see the whole picture, time constraints, and collaboration

issues (see Research Question 3 on participants' collaboration experience).

Sample quotes:

Helped

Beatrice: *By completing REAL projects it linked what we were learning in this class to real learning in the classroom. I can see how project-based learning can be easily incorporated into the classroom.*

Nina: *The project method made me learn these new tools even though I did not have a clue as to what I wan doing at times. It forced me out of my comfort zone and forced me to learn something new.*

Martin: *The project method was helpful because we were introduced to the tools in stages, but we were also USING them to complete a bigger project which allowed for repeated exposure, which helped to reinforce the skills.*

Regina: *I had never used message board, chat room, concept mapping and a lot other things we used, and had to learn quickly – doing projects correlated standards and higher order thinking skills that students will need.*

Limited

Carol: *It was somewhat limiting because I was only responsible for a small portion of one project. I did read through and give advise/suggestions to the group but I only really learned about the information I was directly responsible for.*

A fifty-fifty thing

Omar: *I think there is a fifty-fifty thing. I got a lot of help from this project. I leaned a lot, but on the other hand, like I said collaboration was a big issue.*

Participants' perceptions of the PBL experience are further discussed in the next section.

Challenges and difficulties within the online PBL context will be discussed later.

PBL Features and Learning Experience

Based on participant self-reported data, the first project helped participants explore when and where they could use different types of software in their teaching contexts; and more significantly, their first-hand experience in using the software helped them discover issues that students might encounter while using the software. However, in the following discussion of findings pertaining to students' project experience within the context of an online PBL community, project 1 will be excluded in the discussion because it did not contain the six PBL requirements (i.e., driving question, research/investigation, collaboration, technology, artifact, and authentic audience). The table below includes sample data of participants' learning experience and difficulties pertaining to PBL features. Discussions on the six features of PBL in relation to participants' learning experience are presented after the table.

Table 10. *Data analysis pertaining to PBL features*

PBL Features	Sample Data on Learning Experience	Sample Data on Difficulties
Driving Question	Our intent was to choose an idea that could incorporate all grade levels associated with our individual teaching assignments.	In the end we wound up working on a content area that none of us had a sufficient background in and after looking back on the project this is why part B people had so much trouble figuring out what to do.
Authentic Audience	After a relatively brief discussion about what topic we wanted to do, we decided on alternative fuel vehicles because we thought it was a topic that several of us might be able to use in class (physical science or biology).	Not being a social studies teacher it's a bit challenging to know how realistic the implementation of this will actually be.
Research/Investigation	Brian and Kate also researched the four alternate	I am surfing the web and getting nowhere in finding

	sources for gasoline powered cars.	examples of student-created hypermedia projects. Most of the things I look at are journal or research articles about student projects. Can someone give me a head's up about where should I start looking? Thanks. *Beatrice*
Collaboration	The only reason that the project was completed by the due date was that our group communicates very well with each other.	I think this is an ok way in completing our product, but felt it could have been better if there was more communication between our group in the process through email, chat rooms, or phone conferences.
Technology	I learned different ways to implement technology in my classroom.	It seems as though my school district is "behind the times" when it comes to AVAILABLE technology for teachers and students.
Artifact	Regarding webquests, I think they have real potential for use in the classroom.	Yikes, our web quest came up and it is a mess!

Forming Driving Questions

Based on the literature reviewed in Chapter 2, a driving question should target content

that is meaningful and anchored in a real-world. It also needs to be doable and relevant to

learners' needs and lives. Deciding on a driving question among group members in an online

PBL environment, however, was not an easy task. As one participant described it "…*getting*

started is the hardest part." This difficulty is especially evident in participants' experience in

Project 2: Tool Integration. In order to produce projects, learners depended heavily on "meeting

together" (online or face-to-face) during the decision-making process in which they used higher

order thinking skills to structure the project layout. It is evident that participants who missed the

initial decision-making process felt unable to help and failed to contribute their portions to the project, as can be seen especially from team members in team C (see Appendix C).

In addition, choosing a driving question that team members have little knowledge or experience with, or a topic that has no real-world applications to the team members, are issues that can contribute to learner frustration for the entire project. For example, despite the fact that all of the team members were science and math teachers, team C decided to do a social studies project while forming the driving question for their project 2. Due to this decision, the team was frustrated throughout the project from working on a topic that none of the team members were familiar with. In student reflections, participants stated their feelings about making such a decision. For example:

> Carol: *After a long debate in our group chat room, Team C decided to write and create our Tool Project based on the three branches of government - a tough task because none of us are social science teachers!*

> Brian: *I found it very frustrating that the majority of us are mathematics teachers and the other two are science teacher[s] and we could not come up with something in either content area.*

> Carol: *In the end we wound up working on a content area that none of us had a sufficient background in and after looking back on the project this is why part B people had so much trouble figuring out what to do.*

Martin blamed himself for missing the chat while forming the question. For example, in his reflection and journal, he said:

> *I have to admit that I'm a bit confused as to why we are doing a social studies project when we're all math and science teachers, but I think I voided my vote by missing the chat.*

> *I blame myself for a great deal of this because I missed the first chat where a lot of the important decision-making happened and then I didn't step up and immediately express my ideas about how to modify the project – I think the biggest thing that would have improved this project would have been if it was in one of our content areas.*

The need for relevancy and real-world applications of the driving question was further expressed by Martin:

> *The idea itself I think was a pretty good one, but I would rather be working on something that will actually be making into one our classrooms rather than just going through motions for the sake of the assignment.*

> *I will try to voice this more clearly as we get into this next project. It by no means needs to be in my content area, but one of us should benefit by getting at least the beginnings of a project to use in the classroom.*

As seen from Martin's example, participants' ***perceived relevancy of the driving question*** in PBL was the main factor that affected their commitment to their group projects. For participants, such as members of teams E and G (see Appendices E and G), who were motivated to take part in the decision making process, they made the project more reflective of their teaching experiences and specialized subject areas. In the reviewed literature, Liu's (2003) suggestion for PBL to "start with an end product" and use it to serve the driving question might help participants in forming a driving question. However, based on multiple data sources, (observational data, chatroom archives, discussion board messages, and participant self-report data), it seems evident that forming a driving question was much more difficult in an online context, where much of the discussion lacked the synchronicity and flexibility for social interactions as compared to face-to-face discussions (see Research Question 3 on online collaboration and communication).

Authentic Audience

Based on the researcher's observation and discussion with the instructor in the interview, for the participants who were teachers, their students were their real audience for their projects. It is evident that having the audience in mind helped participants narrow down the project ideas. As Nina described it: "*Sometimes getting started is the hardest part. After we decided to do*

104

something at the 5th and 6th grade levels we decided on the topic." But for participants who were

pre-service teachers, college students, or graduate students who had not had their own

classrooms and students yet, deciding on a project idea without having the audience in mind was

much more challenging. For example, in team D's second project experience, the two pre-

service teachers and one graduate student designed a PBL unit for high school computer

application subject area for their project 2 group assignment. Team D received a grade of C for

this project. According to the instructor's comment to this project, team D had difficulties such

as addressing standards, identifying audience, applying PBL features, and intergrating adequate

tools. Not having an authentic audience in mind and lacking the experience in classroom

teaching had contributed to team D's overall performance.

Research and Investigation

Participants used the Internet as the primary tool for researching and investigation, as

seen from chatroom archives, reflections, and journals:

> Regina: *I spent some time on the Internet and located some additional websites to use on the Web Quest, so that each of the 7 countries we picked would each have two specific sites to go to for the research.*

> Regina: *I want to get this straight, we each will take an area---using internet, find all info and put in a report type before we come back together again--am I close?*

> Carol: *Brad and Kate also researched the four alternate sources for gasoline powered cars.*

Participants demonstrated sufficient knowledge in using the Internet as a research tool.

For example, in project 3, the WebQuest project, participants were proud of their resourcefulness

for finding a WebQuest template to use. Participants gained confidence in finding excellent

resources from the Internet, and many of them expressed how surprised they were to see "what's

out there". In addition to finding Internet resources, participants sought help from school

technology specialists, family members, or youngsters in their classrooms. It is obviously that

teachers in this study were not used to asking help from others, but in order to complete the

project, they had to expand their learning community to include resource people around them.

This was evident in participants' help-seeking behaviors from their colleagues, family members,

and students. This was a milestone toward becoming a problem solver. A sample quote from

Omar is given below:

> Omar: *A teacher is not the 'owner' of all knowledge in the classroom, students can teach the teacher how to use technology…these kids are so different in talents. Never take them as kids, but do treat them as kids. If kids are allowed to do it themselves they love it in the end and can confidently share with others what they think.*

Sharing resources with each other was very common in the online PBL environment. As

evident in the GMB, participants posted many resources, examples and links they found and

shared with the class. Message such as asking what kind of search or keyword used to find

adequate resources were also found, but with a lower percentage.

Collaboration

According to McCreary (1990), in collaborating with others, "the real challenge lies at

the level of learning how to work and even how to "be together", rather than simply to focus on

getting the job done" (p. 124). Examining collaboration through this lens, teams A, D, F

experienced problems in collaboration might be explained in terms of that they didn't know how

to "be together." As a result, team A was disbanded after project 1; team D members did not

build up a sense reported they were learning by themselves, and team F encountered many

problems in collaboration. The collaboration aspect is fully discussed in Research Question 3, a

complete description of team problems in collaboration are presented in Appendices A–G.

Technology

Technology is clearly an important factor in many technology-assisted PBL environments. Given that the content of this online PBL course was about learning technologies, participants' learning and using different technology tool experiences were investigated in research Question 2. Data analysis of participants' learning experiences and five types of technology tools *(main message board, group message board, chatroom, concept mapping tool, and Web authoring tool)* that participants used most frequently in this study are presented in Research Question 2. f

Artifact

Two major artifacts, a concept map and a webquest, were created by each team; these were used for data analysis. Screenshot examples of these artifacts can be found in this chapter under the headings of "Project 2: Tool Integration" and "Project 3: WebQuest."

Concept map. The concept map artifact was completed in project 2 while participants played the *student role*. Constructing a group concept map provided each group a shared workspace for communicating ideas and constructing their project designs either online or face-o-face. As pointed out in the following examples, constructing a concept map also enabled group members to visualize the entire project, to focus on the project tasks, to be creative, and to make their ideas more understandable. Participants identified the strengths and weakness of creating concept maps as follows:

Strength:

- Rebecca: *The concept map really helped our group focus on the tasks at hand.*
- Beatrice: *Using concept mapping tools was very helpful in visualizing an entire project.*
- Martin: *this could be a powerful tool for students to organize the thoughts in their brain.*
- Ann: *For teachers and students, it is more creative and understandable.*
- Anita: *The concept map is used to help students develop their ideas*

<u>Weakness:</u>

- Beatrice: *I just didn't have enough room on a Kidspiration sheet to do all the links I needed to do). I did verbs.*
- Regina: *Oh, my sheet didn't print the entire concept map, I'll have to go look again*

WebQuest. As triangulated with data from student reflections, journals, chatroom

archives, and surveys, the majority of the participants identified that both the webpage and the

WebQuest would be useful for teaching and learning. Sample quotes are given below:

Martin: *Regarding webquests, I think they have real potential for use in the classroom.*

Carol: *I honestly, believe that this was the most useful project this year. I hope to use web quests in the future.*

Kate: *The webquest project has probably taught me the most as I vaguely remember making one in undergrad. but couldn't really remember all that it involved.*

Regina: *Maybe in my tech. institute this summer I select webquest as a project to do!*

Toby: *I think that having your own personal webpage as a teacher is very important.*

Toby: *it is such a bonus to use in the classroom.*

Ann: It is very creative and meaningful to help me understand how to connect internet with teaching.

Lillie: *I do feel like I have learned a lot about what webquests are and how they can be used in the classroom. They are an excellent way to get students to learn about a topic in a fun and interesting way that promotes higher level thinking. It is my goal to incorporate at least one webquest project with my class of third graders next year.*

These artifacts represented participants' thoughts for their project; these ideas could then

be discussed, reviewed, and revised. In this course, the PBL context provided an environment

for giving and receiving feedback, which was valued by the participants for continual

improvement of their ideas and projects. Creating a group artifact also allowed participant to

contribute and combine different ideas, which are identified by Scardamalia (2003) as two of the

indicators in a knowledge building community, *democratizing knowledge* (all participants are legitimate contributors to the shared goals of the community) and *idea diversity* (different ideas create a dynamic environment).

As discussed in Chapter 2, the similarities and differences between knowledge building (KB) and PBL should be discussed so we can provide scaffolding strategies to support knowledge building activities that are critical in sustaining deeper learning in the PBL community. The similarities include that both approaches require learners to work with authentic problems, engage in constructivist discourse, and contribute to the learning community. The difference is that while KB engages learners in high-level tasks of knowledge creation, students in the PBL environment may easily drop into a habit of focusing only on hands-on activities and may thus fail to sustain the learning. Therefore, incorporating KB activities and tools in PBL environments should be considered as an important scaffolding strategy in the design of PBL experience. In an online PBL experience, the design should consider the limitations of using communication technologies (see Research Question 2) for knowledge building activities. Finally, knowledge-building principles and indicators can be used for observing and evaluating KB activities in a PBL learning community.

Difficulties in Online PBL

Data analysis revealed that group collaboration, time constraint, and technical problems were the most frequently encountered difficulties in online PBL. As the survey data suggested (see Table 11), group collaboration was reported as the hardest part in completing the project (8 responses), followed by time constraints (6 responses) and technical skills (3 responses) needed to produce the projects online.

Table 11. *Participants' most difficult learning experiences (n = 15)*

Participant Comments	Number of Responses
Group collaboration	8
Time constraint	6
Technical skill (no instruction for making webquest)	3
Others (extra work, another one did not specify)	2

As mentioned, collaboration was considered the hardest part among the challenges. For example, team D was frustrated at times because the poor collaboration among the group members that resulted a poor project outcome. As Dr. M commented on this project:

> Dr. M: *I just read all your reflections before completing my evaluation of this project. I have to say that the way you described what you did fits exactly my impressions – you split everything up and went off and did it. You tried to split it evenly among the 3 of you who were working. Then poof, magically it becomes a collaborative project? No, the parts don't fit together.*

Sample quotes from survey and journal/reflection, chatroom archives regarding the difficulties in completing projects are given below:

Collaboration

- Kate: *First group – the group collaboration was the hardest ...Second group – the time constraints were probably the hardest..*
- Beatrice: *It was difficult to find common time for all of us to collaborate.*
- Nola: *The really problem we had was group collaboration and time constraints.*
- Anita: *The group collaboration on every single project was exhausting and at times frustrating.*

Time constraint

- Nina: *I do think we needed more time to complete the larger projects.*
- Regina: *Needing to know programs I had no prior experience with and be expected to create a project, such as the web page that takes longer than we had to learn!*

Technical problems

- Kate: *One thing I didn't like was having download and install some of the programs…*

- Carol: *It seems as though my school district is 'behind the times' when it comes to AVAILABLE technology for teachers and students.*

Some other problems identified were triangulated with data obtained from the KSOL Gradebook, statistics reports, instructor comments, and my observations. These problems include:

<u>Missing class orientation</u>

For the 17 students who attended the course orientation, the average grade (including 60% group grades and 40% individual grades, see Appendix I for types of learning activities and scoring points) was B (3.58); and for the 7 students who did not attend the orientation, the average grade was C (2.85). Note that the group grades were either A or B; most of the low grades were because either the participants failed to submit their individual assignments or they did not participate in their group discussion tasks. Although this research was not intended to find out whether this factor influenced online learners' success, the findings suggest that attending course orientation might contribute to a better online learning experience. An alternate explanation might be for students who attended the orientation were more concerned their performance in class and were more careful about following the course activities needed for the class.

<u>Pre-service teachers' low achievement</u>

For the 4 undergraduate students, the average grade was C (2.0); and for the 20 graduate students, the average grade was B (3.65). Whether the 3 undergraduates' age, inexperience in graduate-level study, lack of teaching experience, or/and different expectations for learning outcomes affected their online learning success will call for more investigation. However, the

findings of this study indicate that undergraduate learners (who were usually younger) might not be ready to put in the required effort toward online learning, at least in a graduate-level couse.

Attitude Problems

Most of the learners in this class were in-service teachers who demonstrated sufficient knowledge regarding learning theories and practices, such as constructivism, collaborative learning, cognitive apprenticeship, learning community, and student-centered learning. This was evident in many discussion postings. However, even the participants who were familiar with the above-mentioned learning theories that usually demand some degree of self-regulated learning, some still showed a "just tell me what to do" attitude. It seemed as though that participants were unable to apply their knowledge of current theories to their own learning, and they seemed to separate school learning (often well-structured) from the learning that occurs in the real world (often ill-structured).

The thick descriptions strengthen our understanding of the learning experiences participants went through with different projects. Teachers in this study identified the need to learn more about classroom technologies they could use for their teaching and for their students' learning. By understanding each project-based experience we have come closer to understanding what we need to consider in order to more effectively implement project-based learning in the online environment. As seen from participants' learning experiences over time, the PBL approach encouraged teachers in gaining first-hand experience in both the content and the new way of learning. Participants gained greater confidence and indicated in higher level of willingness to integrate technology into their teaching.

In this study, the authenticity of projects played a crucial role. It is evident that the terms *plausible*, *doable*, and *useful* for describing projects were found in many chatroom history, project reflections, and journals:

> Martin: *Okay, the first part of part A has promise and the Inspiration project (my assignment) sounds doable.*

> Brad: *I think that on the major group projects this can be very useful*

> Carol: *I honestly, believe that this was the most useful project this year.*

Participants strongly felt that the projects needed to be "real" to make sense to them; otherwise, they felt weak in their arguments. As seen from Martin's reflection, the "realistic" of project implementation would be challenging if working on a totally unfamiliar content area:

> Martin: *Not being a social studies teacher it's a bit challenging to know how realistic the implementation of this will actually be.*

The finding suggests that participants' perceived project relevancy, authenticity, and real-work application is crucial in guiding participants' forming of driving questions, researching information to be used, and constructing artifacts to present their learning outcomes. Having the authentic audience in mind, the participants were more confident to talk about their ideas, to exchange thoughts, and to complete the projects. The authenticity of projects enhanced the interactions among group members.

Overall, participants' learning experiences with different projects within the context of an online PBL community were positive despite there were many challenges during the process. The learning process documented in this study was a complex one requiring participants to work with others, deal with the complexity of PBL, and buy-in to a new way of learning about how to use technology tools that were also new to them. Among the challenges, participants considered collaboration with group members the hardest part. The complexity of the learning process in

collaboration became even more challenging when participants were communicating online. To understand more fully about participants' learning experiences, we will now turn to the next research question: How do participants' online project-based learning experiences affect their use of educational technology tools over the semester? The implications of the findings pertaining to this research question will be further discussed in Chapter 5.

Research Question 2

How do participants' online project-based learning experiences affect their use of educational technology tools over the semester?

In order to understand how teachers' learning experiences affect their use of educational tools over the semester, I started with the embedded tools that were provided by the course management system–KSOL–for this class as the first category for data analysis. The second category then included the technological tools that students were required to explore for designing and creating projects. Two dimensions, the *participation rates* and the *depth of process* based on Henri's (1992) content analysis model, were examined. The interpretation of participants' experience in using these tools was based on triangulation of data from student discussion threads, chatroom archives, interviews, journals/reflections, KSOL statistics reports, and student-created artifacts. In presenting the findings regarding research question 2, I listed these tool categories and provided sample data related to students' learning experiences with these technological tools in the table below.

Table 12. *Data analysis related to students' learning experiences with technology*

Technological Tools	Examples of Student Learning Experience
KSOL	
• Main message board (MMB)	• I saw different ways of doing assignments (especially seeing how the other groups in the class completed their work).
• Group message board (GMB)	• It allowed a central place to post information without having to send out and read through tons of e-mails.
• Chatroom	• I received immediate information for any questions I had and the group was able to formulate ideas relatively quickly.
• Calendar	• Because organization is key to my success, I would like to see what the rest of the calendar contains so that I am able to plan ahead as much as possible.
• File dropbox	• The drop box was also a nice option to have so when we had to critique others' projects, we could see the whole package.
• Profile	• One suggestion for improving social roles would be to

		all post profiles to the class page.
Concept Mapping Tool	•	Maybe we could use the cognitive [concept] mapping idea for students to plan and gather ideas for their powerpoint.
Web Authoring Tool for WebQuest	•	I liked the WebQuest project because it made me learn a little more about how to create a website
	•	We use lots of Internet sources, especially WebQuest Project, to cooperate these useful projects. It is very creative and meaningful to help me understand how to connect internet with teaching.

These tool categories were used for coding data. Although there are many embedded tools in KSOL, not many participants used all of them. The observations and interpretations of data presented in the following sections focus on discussing (1) the five tools–*MMB, GMB, Chatroom, concept mapping tool*, and *Web authoring tool*–that participants used most frequently in this study, (2) four tools including two communication tools (message board and chatroom) and two construction tools (concept mapping tool and Web authoring tool) that were analyzed based on Scardamalia's (2003) technology dynamics for knowledge building, and (3) problems associated with the use of these tools within the context of this study.

Observations and Interpretations

KSOL: Main Message Board (MMB)

Throughout the semester, the instructor created 23 message threads for individuals and/or groups to post their responses. Three types of threads were identified: (a) threads for students to ask and answer questions, (b) threads that required groups to respond, and (b) threads that required individuals to respond. The following sections provide observations of the nature of these threads and how they were used by course participants:

Discussion threads for Q&A

There were two topics for Q & A as listed in Table 13:

Table 13. *MMB postings (for Q&A)*

	Message Thread Topic	Week	Description	Postings
.	Help Section: Ask Qs Here!	1-16	For individual students to post questions to be answered by instructor or other students	25
.	Conversation About Collaboration	4-16	For individuals to post suggestions and comments about how to improve group collaboration	16
Total	**2**			**41**

The "*Help Section: Ask Questions Here!*" was a message thread where students posted topics

including technology concerns and assignment questions. As the instructor stated the purpose

for this thread is:

> *If you have questions about the technology, the course, the location of something, how to do something: ask it here.*
> *The first person to see the question, and who can answer it, please do so. If we share this burden, we will shorten the time between the questions and a solution to the problem. Check this frequently because (a) you may know the answer, or (b) the answer to your own question may be here!*

With 25 postings, 5 students asked 7 questions. The instructor and six students answered

these questions. Sample questions and answers from the instructor and students are given below:

Table 14. *Help section messages*

Message Title	Samples of Questions/Answers
Database Help!	I have spent the last hour trying to figure out how to create a basic database for me to use to enter in books that I read about to my students. I have not been very successful. Anyone have any helpful websites or advice when creating one? I am a little frustrated right now with this whole process. Thanks, *Lillie*
Grades	In the announcements, you talk about viewing our grades. Are you posted yet? If so, mine are not showing. *Doris*
Re: Database help!	What software are you suing and on what system? *Dr. M*
Re: help	It was hard for me, too. (I tried to do a search, and got a zillion 'hits') but since I am here, I called the library and a kind employee "walked" me through. I hope I remember

	how she did it the next time. But I remember it was through e-journal. *Beatrice*
Team B questions about punctuation	Our group just sent our discussion II summary. When we copied from Word some of the punctuation changed after we posted our assignment. Is there something we can do, so this does not happen? Thanks, *Team B*.

Another thread, "*Conversations about Collaboration,*" was created for improving students' group collaborative experience, six students responded to these topics. Under this thread, there were 16 posts in 4 topics created by the instructor, including subjects on *Reflection on reflections, Learning new teaching strategies by being a student, Learning technology skills at a distance, and Group collaboration: Ideas*. Sample questions and responses from the instructor and students are given below:

Table 15. *Conversations about collaboration messages*

Message Title	Samples of Questions/Answers
Group Collaboration: Ideas	Some of you have suggested that group work on different time schedules would work better if we could divide up the tasks or have roles; others are already doing that. What are some good collaboration methods your group has used, or that you have seen work in other places, that might help with some of the time-crunch problems we have working with other busy people at a distance. *Dr. M*
Re: Group Collaboration: Ideas	I won't say that our group won't eventually divvy up the work on a particular assignment, but it has worked for us to take turns posting to the message board after we have chatted and collaborated. Before posting, however, we usually post to the Group E message board so the members can proof and revise. If necessary. I kind of like this way of doing things because the individual assignment has more of a "flow" when one person is putting it altogether for the final post. *Beatrice*
Re: Learning technology skills at a distance	Most definitely, it helps to combine the face to face and the on-line learning using technology. In my group we are far and wide, we can only communicate through chatting or rarely through calls or e-mails, mostly and easily will be group e-mail. But believe you me it may take time to "get together" and work on something. *Omar*

Discussion threads for groups

The discussion thread created for groups usually required each group to post their group discussion summary or group project ideas. As observed, students discussed these topics in their GMB and then posted it to MMB for the instructor and other groups to review. The instructor or sometimes students in other groups asked questions for calcification. As shown in the table below, for the 9 threads that required group response, the total posting was 109; the average posting was 12 per topic ranging from 6-20 posts.

Table 16. *MMB postings (for groups)*

Message Thread Topic	Week	Description	Postings
Group Membership	1	For groups to post membership list	6
Top 3 Tools Ideas	6	For groups to post summary of choices of 3 tools	19
Student-Created Multimedia	9	For groups to post student-created multimedia examples they found	12
Project-Based Learning	10	For groups to post discussions on PBL	16
Tutee Mode	11	For groups to post discussions on the Tutee mode	14
WebQuest and Tutorials – Discussion 1	12	For groups to post ideas for WebQuest	20
Student Web Pages – Discussion 2	13	For groups to post discussions about student Web pages	9
WebQuest About WebQuests	14	For groups to post discussions about webquest	7
WebQuest VS. Website Design: - Discussion 3	15	For groups to post discussions about differences between WebQuest and Website	6
Total	**9**		**109**

Discussion threads for individuals

The discussion thread created for individuals usually required each student to post questions, give feedback, and answer questions from other groups. These threads provided opportunities for students to "see" what other groups' projects. As shown in the table below, for the 12 threads that required individual responses, the total number of postings was 762 posts; the

average posting was 68 per topic ranging from 33-99 posts. The interaction level for this type of

threads was higher than the other two types of threads.

Table 17. *MMB postings (for individuals)*

Message Thread Topic	Week	Description	Postings
Breaking the Ice	1	For individuals to post their introduction	63
NET Standards	1	For individuals to post PPT self assessment	51
Tutor Discussion 1 Summary	2	For groups to post first discussion assignment, and individuals to review and respond	81
Tutor Discussion 2 Summary	2	For groups to post second discussion assignment, and individuals to review and respond	93
Individual Software Review	3	For individuals to post software review	90
Group Software Review	4	For groups to post first group project, and individuals to review and provide feedback	60
Lesson Plan and Integration	5	For groups to post the second part of the first group project and for individuals to post feedback	42
Tool Goals Accomplished	7	For individuals to post reflection on learning a new tool	33
Hypermedia Examples	8	For individuals to post url for the hypermedia examples they found	78
Video Examples	11	For individuals to post summary about the video examples	48
Tool Project Description – Part A	12	For individuals to post discussions about tool project	79
WebQuest URLs and Feedback	16	For individuals to post their group WebQuest URL and to comment on other groups' WebQuests	99
Total	**12**		**817**

Posts read by students

Comparing these three types of threads–for group postings (one student posted discussion

summary for their group), individual postings, and the threads for Q&A–although not many

students (5 and 6 students for each thread) responded to the Q&A threads, 14 and 15 students

120

had been reading these messages for a total of 247 times for the two Q&A threads, for an average of 123.5 times per thread. It is evident that students read these threads from time to time. For threads that were created for group posting, posts were read for 502 times for an average of 55.7 times per thread. And for threads that were created for individual postings, the posts were read 3929 times for an average of 327.4 times per thread (See Table 18).

Table 18. *Posts read by students*

Types of Threads	Total Posts Read	Average (Times/Threads)
Q&A	247	123.5
For Groups	502	55.7
For Individuals	3929	327.4

Comparing quantitative patterns of MMB usage with data obtained from participant self-reports suggested that MMB provided a space for students to learn from others. Asking students to review other groups' work and giving comments provided opportunity for social learning. As one participant reflected that this was a place to learn different ways of doing assignments:

> Beatrice: *I saw different ways of doing assignments (especially seeing how the other groups in the class completed their work).*

KSOL: Group Message Board (GMB)

Not all of the teams used the GMB for communication. From the summary table below, we see that team A is not listed due to the fact that the group space was deleted after project 1. Team G did not create any threads in their GMB. There were no replies in team B's GMB, so it is obvious that they used GMB primary for posting assignments. Similarly, although team D had one reply, the single posting per se did not count as a discussion. In contrast, the rest of the three teams–team C, E, and F–posted messages ranging from 74 posts to 549 posts during the semester.

Table 19. *Group message board posting summary*

	Team B	Team C	Team D	Team E	Team F	Team G
Total number of posts	4	145	10	549	74	0
Number of threads	4	26	9	180	31	0
Number of replies	0	119	1	369	43	0
Average replies per thread	0	4.58	0.11	2.05	1.39	0
Average post length (characters)	1411	699	943	500	1002	0

The lengthy discussion would be a problem in electronic communication, it is evident that the lack of replies in team B and team D's group message boards as shown in Table 19. The observation is consistent with Sorensen and Takle's (2002) finding that the *essay-like* style of comments at length might be the reason that inhibited the evolvement of a spontaneous and dynamic dialog. Based on student comments, the delay-time, waiting for response, in asynchronous communication was the main reason for not using message board as a primary communication tool, especially for groups with members who did not check in on a regular basis. For example, the following comment indicates that the delay time was a contributing factor for not using GMB as a communication tool:

> Toby: *The collaborative process of our group was about as good as can be expected. What is difficult is the speed at which responses to questions come at. Usually it takes a day or so for answers to come back. This is hard because in our group, the times that each member has to work on this assignment is different than what the others have. When members of our group did respond it was usually pretty helpful.*

KSOL: Chatroom

Table 20 displays the Chatroom used over the semester. It is important to note that Team E began to use the Chatroom feature even before they were required to do so for part of the project 2 assignments. As shown in the table, team E and team F increased their chat frequency over projects. Team D, team E, and team F increased accumulated time spent in the Chatroom over projects.

Table 20. *Summary of groups' chat history on frequency and time spent (hh:mm)*

Team	Project 1	Project 2	Project 3	Total	Increased
B	0 (00:00)	1 (01:04)	0 (00:00)	1 (01:04)	No
C	0 (00:00)	3 (03:44)	1 (00:47)	4 (04:31)	No
D	0 (00:00)	5 (02:04)	4 (03:10)	9 (05:14)	Yes (time)
E	3 (02:39)	8 (06:20)	10 (06:10)	21 (15:09)	Yes (frequency)
F	0 (00:00)	5 (03:52)	7 (05:46)	12 (09:38)	Yes (both)
G	0 (00:00)	6 (05:16)	2 (02:47)	8 (08:03)	No

Many participants were new to the Chatroom and some expressed their excitement in using this new tool:

Carol: *wow, this is kinda cool. never done this before. Hello Kate!*

Martin: *wooo hooo, it's getting to be a party!*

Based on my observation, some teams discovered the feature of using a built-in function in the Chatroom: color text. However, color text was only available in KSOL's *Java Applet* mode but not in *Firefox* browser if the users were working on Macintosh computers. Martin described why he preferred using the *Java Applet* view instead of the *HTML* view:

Martin. *Okay, this is better. I like the java applet version better than the html as well. This way I can write in pink :) We should each pick a color so it will be easier to follow the conversation.*

As summarized from the multiple data sources, the *benefits* for using the chatroom include:

- Immediate information
- Getting to know each other
- A solution for not being able to meet face-to-face
- Real-time discussion
- Group members can all "talk"
- More personal than sending email
- Immediate "conversation"

Sample quotes from participants:

Carol: *I received immediate information for any questions I had and the group was able to formulate ideas relatively quickly.*

Nola: *We were able to communicate with each other even though you are very far away.*

Carol: *We are getting to know each other better.*

Kate: *I do like being able to use the chat room to discuss in real time. It may be a good idea to try and do this once in a while – even when not assigned!*

Tonya: *I really like this aspect of the collaborative process because we can all "talk" about what is going on and it is in real time.*

Tonya: *It is so much more personal than just sending an email and waiting for a response.*

Beatrice: *I have really enjoyed learning with others long-distance, and I really like the chat room for immediate 'conversation'. The lag time in the comments being put on the chat board is sometimes a problem, but over all it has worked well.*

The *challenges* for using the chatroom include:

- Hard to visualize
- Hard to tell the tone from text-based message
- Hard to follow the conversation
- Topics changed rapidly
- Hard to stay focused
- Hard for group members to schedule the time
- Copy and paste changed the format

Sample quotes from participants:

Beatrice: *Chat was frustrating at times. It is hard for us to visualize what the other is talking about.*

Rebecca: *The chat room was difficult because I had a difficult time following the conversation between several different people. About the time I though of how to respond, the topic was changed before my though was posted.*

Doris: *The chat room with four people was very difficult. The topic changes so rapidly, while you are responding the next question had already been asked.*

Kate: *When using the chatting option, it was hard to tell the tone of group members and was also hard to keep up if you started typing an answer to one question and then someone would ask another question before your response was posted.*

Martin: *I was least impressed with chat which was also the tool that I was least familiar with, so maybe it's just a matter of spending more time with it, but with 5 people all*

throwing out their thoughts at the same time, it was pretty difficult to carry on a
worthwhile conversation.

Martin: *I think it could work really well, we would just need to find a time when we could*
all sit down and do this.

Tonya: *The chat room is a wonderful option if we stay focused!*

Beatrice: *cutting and pasting something onto the chat line or the message board, the*
formatting got all messed up.

As seen form the multiple data sources (students comments in reflection/journals,

interview, survey, and chatroom archives), setting a time for every one to meet in the chatroom

was a major challenge. In addition, the more people entered the chatroom, the harder it was for

them to follow the conversation. Accordingly, some students suggested chatroom might work

better in a smaller group:

Martin: *I still would like to give chat another try, but maybe in a smaller group.*

Beatrice: *So I really think groups of three would be better than groups of 4 (although that*
increases the work of the instructor when it comes to grading); it is easier to get three of
us together to chat.

Concept Mapping Tool

In addition to the communication tools discussed above, students experienced some tools

for group projects and for individual assignments. In project 2, students worked with a concept-

mapping tool, and everyone chose either *Inspiration*® or *Kidspiration*®. The literature reviewed

in Chapter 2 suggested that making thinking visible was the most difficult part in distance

learning. Although the KSOL Chatroom has a whiteboard function that allows for drawing and

making chats, none of the students in this class actually used this feature. The concept mapping

tool was integrated into this online PBL environment to help participants visualize what other

students' ideas were. Some participants expressed that the *Inspiration*® tool was useful for

organizing thought, as described by several students:

> Beatrice: *Using concept mapping tools was very helpful in visualizing an entire project.*

> Anita: *The only thing that was really new to me was the concept mapping tool. I had never used it before but it has a lot of useful applications in my teaching.*

> Debra: *The concept mapping was new to me, I can see where it could be a very useful tool for students to use to organize their thoughts.*

> Ronda: *I'm sure after I have practiced more with the concept mapping I will implement it within my classroom. I think it is neat how you can organize your thought in this way.*

For Martin, who was not new to *Inspiration*®, the opportunity to experience this tool once more

changed his initial thought about this tool:

> Martin: *I have been exposed to Inspiration before and had other teachers tell me that it was great, but I wasn't all that impressed initially, but my recent experience using it for this class together with recent success using pen and paper concept maps in the classroom leads me to believe that this could be a powerful tool for helping students to organize the thoughts in their brain. I think the most powerful part about it is going back and forth between the concept map and the outline.*

The figure below includes 8 examples of participants' concept maps for an individual

assignment. All maps were created in *Inspiration*® or *Kidspiration*®:

| Omar | Kate |

Beatrice

Dora

Anita

Matt
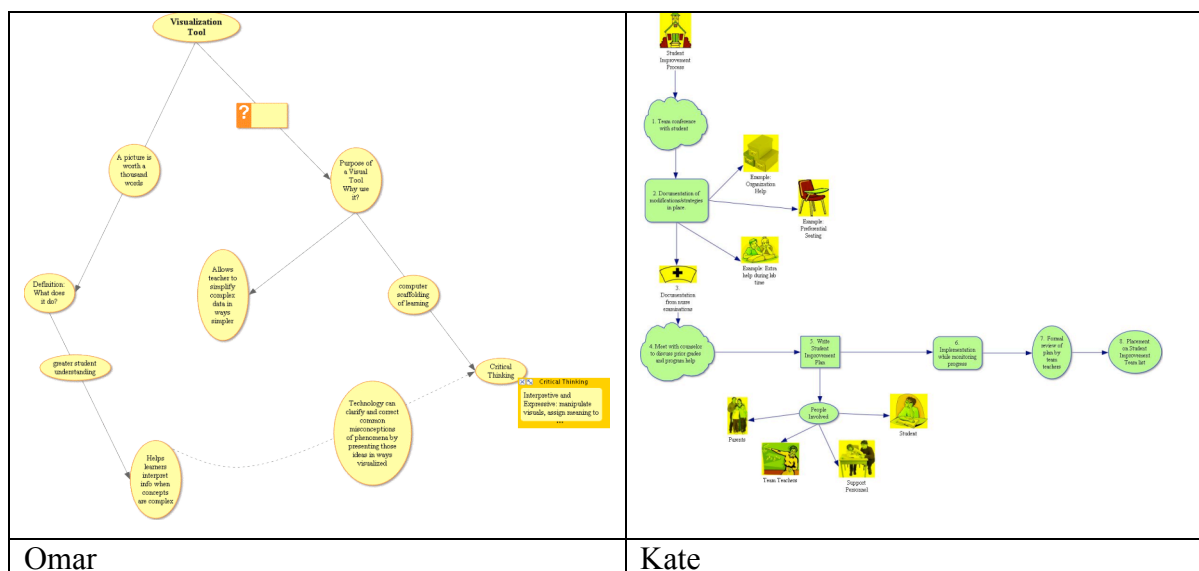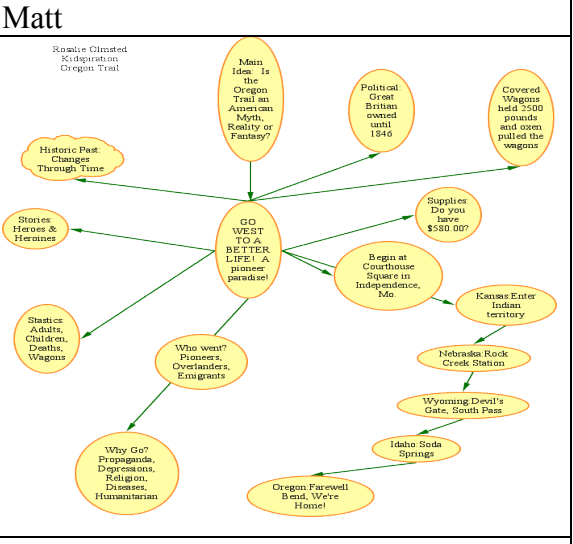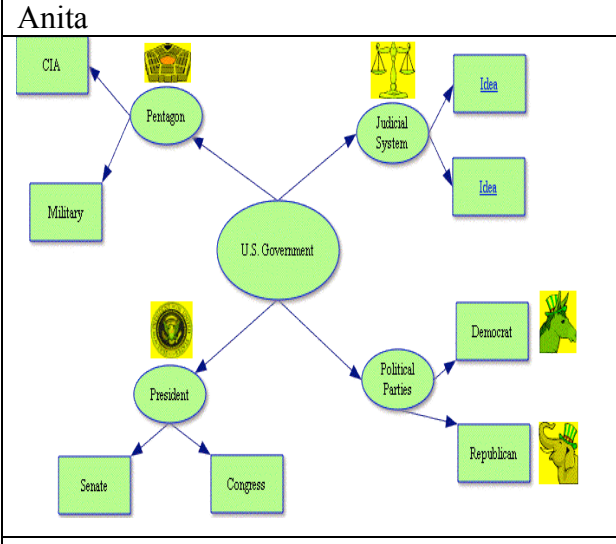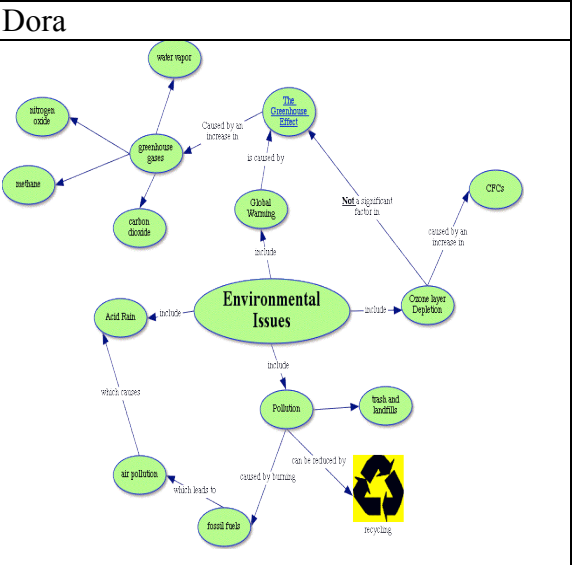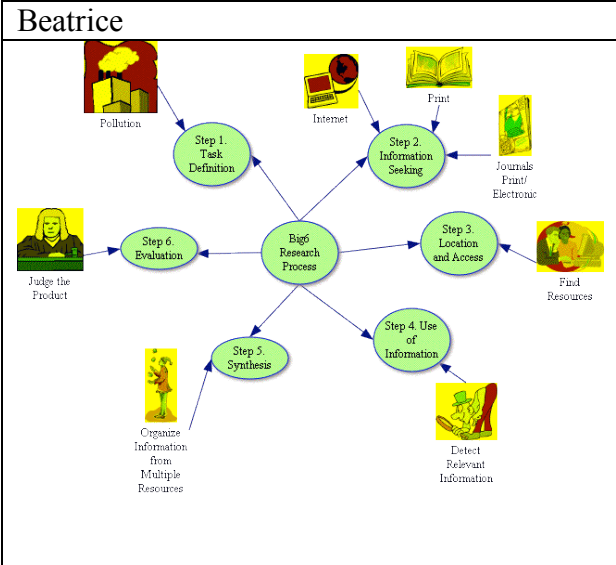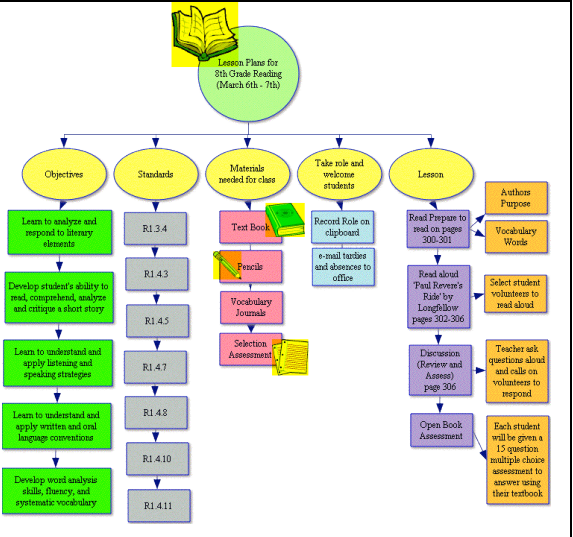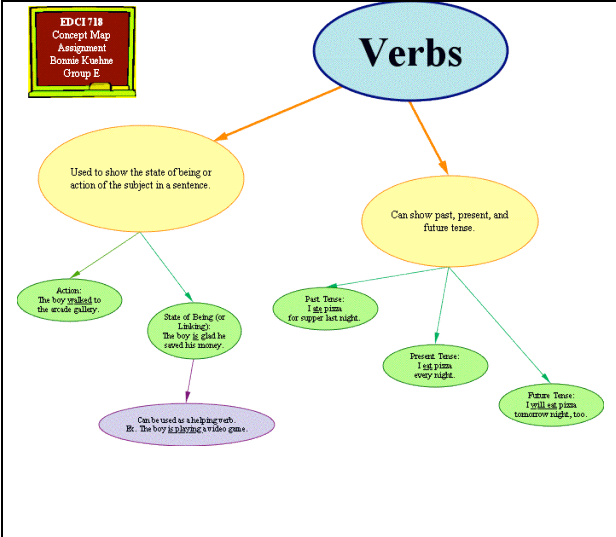
Toby

Regina

Figure 10. Individuals' concept maps

Web Authoring Tool

In the project 3 phase, students experienced using a Web authoring tool to create a simple webpage (an individual task) and for a collaboratively designed WebQuest by each team. While constructing the WebQuest project, one of the problems was associated with the Web authoring software. Considering that not many schools and/or students have purchased professional Web authoring software, an open source version of Web authoring software (NVU: http://www.nvu.com/) was introduced to students during the open lab session. Seven students attended the open lab section for help, including 2 participants from team C, two participants from team E, one participant from team F, and 2 participants from team G. After the lab session, most of the participants were able to create a simple webpage and uploaded it to the university server. However, one student was frustrated with her school laptop because the school did not allow for downloading any software, and the other one was frustrated by her unfamiliarity with the Macintosh laptop that was provided in the webpage workshop.

It takes a certain amount of experience to be knowledgeable enough about the Web authoring tool to be able to adequately create the Webquest. For team B students who were not able to attend the open lab section, they felt most frustrated with using the Web authoring tool. For example,

> Doris: *The web authoring tool was the most difficult..*
>
> Rebecca: *our group experienced a lot of frustration when putting it together. When posting the final product, there were several items not coming together as planned. This also made revising our webquest difficult since we were "fixing" something that we had already done.*

As triangulated with data from student reflections, journals, chatroom archives, and surveys, the majority of the participants identified that both the webpage and the WebQuest were useful for

teaching and learning but they frustrated at times for using adequate software to construct the final artifact. It seems that a good Web authoring tool would be useful to teachers and students.

Tools for Knowledge Building

In this section, observations based on features of the four most highly used tools in this online course–two communication tools (message board and chatroom in KSOL) and two construction tools–were analyzed based on Scadamalia's (2003) technology dynamics for knowledge building. The table below provides the data analysis pertaining to these evaluated tools:

Table 21. *Data analysis pertaining to technology tools used for knowledge building*

KB Technology Dynamics	Tools Used			
	Message Board	Chatroom	Concept Mapping	Web Authoring
Support a culture for creative work with ideas	√	√	√	√
Provide opportunities for continual improvement	√		√	√
Provide opportunities for diversity ideas	√	√	√	√
Support emergent goals rather then fixed goals	√	√		
Provide open, collaborative workspace for reading and building on others' messages	√	√		
Allow participants to assess evenness of contributions	√	√		
Provide knowledge exchange across the community	√	√	√	√
Encourage knowledge building as central to the community's mission	√	√		
Encourage contribution from new information, referenced resources	√		√	√
Allow revision, encourage identifying shared problems and gaps in understanding	√		√	√

Advance understanding beyond the level of the most knowledgeable individual			
Increase literacy, 21st century learning skills, and productivity are by-product of mainline knowledge work	√	√	√

Using PBL in the online environment provides a "virtual space" for knowledge building–where participants add contributions to a shared knowledge base through conversation, negotiation, and authentic activity–as suggested by Brown (1989). To some extent, the four tools discussed so far provided participants a means to think cognitively and talk about their projects with others socially. In other words, these tools provided a *content space* and a *relational space* (Barron, 2003; see Chapter 2), required for collaboration and collective thinking. In particular, electronic dialogues in the message board can support the process of knowledge building because participants were required to make their ideas and thinking visible to their group members. Furthermore, it allowed participants to observe and reflect on others' thinking processes or alternative points of view. As an example, the following paragraph provides evidence of this process.

Stahl (2000) provides a sequence of distinguishable phases that constitute a collaborative knowledge building environments. These phases of knowledge building and the resulting forms of knowledge building along with examples are listed in the table below. These phases were used as part of the criteria to examine the quality of messages posted by participants within the group message board.

Table 22. *Phases and forms of knowledge building (Stahl, 2000)*

Knowledge Building Phases	Knowledge Building Forms	Examples of Student Comments
Articulate in words	Public Statements	*Learning communities are a form of*

		cooperative learning in which each student in their "community" has the opportunity to learn from, and teach others in their group. - Kate
Discuss alternatives	Argumentation & rationale	*I agree with your agreement. But seriously this is what it is...Here is what I can add, or an alternative way to look at it:* - Omar
Clarify meanings	Shared understanding	*For example, I teach a computer programming in my local High School. As the teacher my goal is to teach my students how to build a computer program step by step through problem solving techniques.* – Tina *Obviously PBL could take this concept one step further and set these up on an even smaller scale within the classroom, where students learn from each other while they are completing a group project and then again while they are watching presentations from others in the class.* - Tina
Negotiate perspectives	Collaborative knowledge	*You both did a good job of describing the tutee mode. I think it's a great idea, but the teacher would have to be pretty comfortable with the programming to be able to simplify it in a way that students could use it. It's not computer programming, but it's kind of the same thing if you're having students use productivity software like powerpoint, or excel to teach grade-school kids about a topic, don't you think?* - Martin
Formalize and objectify	Cultural artifacts and representations	Group and individual created projects, posted summaries.

It is important to note, however, that to be used for true knowledge building, the four tools are limited in providing the cognitive and social scaffoldings that are built into tools designed specifically for knowledge building purposes (e.g., CSILE and Knowledge Forum). The implications for improving the design of course management tools will be discussed in Chapter 5.

Technical Problems

The technical problems addressed by the participants were also examined from the collected data including student journals/reflections, chatroom archives, discussion board threads, observation from the open-lab section, follow-up emails for webpage workshop, and survey. These issues include:

- School computers were limited
- Software was not available
- Files were not shareable among some computers
- Formatting problems occurred among different computers
- Formatting problems occurred among different browsers
- Internet connection problems
- Operating system upgrade problems
- Unable to access library's articles from home computers

Also, the technical problems associated with KSOL include:

- Email account default setting
- Message board formatting problem
- Loss of the format when copying text from Word document and pasting into KSOL message board
- File Dropbox receipt problem
- Public and group chatroom are not readily distinguishable
- All the postings in the group section was gone when the group section was deleted

Sample quotes reported for the problems associated with KSOL:

Dora: *I hated not knowing if it had been received or if I should send it again to make sure it was submitted on time.* [Researcher note: Submit file to Digital Dropbox]

Martin: *I didn't really sign off…that was the other me from Firefox…nobody fret.*

Ann: *Please don't create two chatrooms.*

Kate: *I would like to learn more about the options when building a web page. I built the simple web page for our assignment but would like to find out more of the add-ons that can be incorporated. I would like to have a class webpage next year for my math students to go to.*

Regina: *KSU online message board could use some revamping, it is very frustrating to spend time typing or whatever and then transfer to message board and see all the format changes that makes answer look like 3rd grade work!*

Overall Experience with Technology Tools over the Semester

To understand more specifically about participants' perception of each tool, the table and sample data below show participant's preferences over the two communication tools (message board and chatroom) and two construction tools (concept mapping tool and Web authoring tool) used in this course. Note that some participants had more than one preference because they identified different strengths for different tools.

Table 23. *Tools that participants liked and disliked (n = 15)*

Tools	Number of Responses	
	__Liked__	__Disliked__
Message Board	7	2
Chat Room	7	6
Concept Mapping Tool	4	2
Web Authoring Tool	1	4
None of the tools	0	2

Sample quotes:

Tools participants liked the most:	Tools participants liked the least:
Beatrice: *I really preferred chat room, but the message board provide to be helpful too, when we each had components to contribute and needed a place to put them to be critiqued.*	Rebecca: *The chatroom was difficult because I had a difficult time following the conversation between several different people.*
Dora: *The message board was useful to see how others in the class responded to the various questions. My group used the chat room the most and found it to be the most useful tool used this semester.*	Tonya: *The message board is a good tool but it does not showcase what you are learning as effective as I would have liked.*
	Kate: *I can't think of a tool that I liked the least. I learned something new about all of them.*
Nina: *I liked the concept mapping tool the most. I liked this tool the best because I will be able to use this tool in other situation and in my own classroom setting.*	Beatrice: *I really didn't dislike any of them. I wanted to learn something about every one of them, and I did.*
	Nola: *Web authoring tool and concept mapping tool.*

An interesting finding is that participants either liked the chatroom or disliked it strongly. Seven participants loved the chatroom for its synchronicity feature that they could get instant feedback from their teammates. Six of the participants reported that they did not like the chatroom because it was too hard to follow the conversations, especially if the group had more than three members. However, at the end of the course, students expressed their overall positive attitudes toward using technologies in their classrooms, as many of the participants reported:

Kate: *My overall learning experiences were positive as I was learning not only about new tools, but learning about the experience that technology can give you within a classroom.*

Martin: *I have a better perspective on what I want to do with technology in my classroom.*

Beatrice: *It has been exciting to get acquainted with so much technology that is conducive to classroom work and higher-level thinking.*

Beatrice: *I will be better informed as a teacher and technology lead teacher after this course.*

Rebecca: *I learned many different ways that technology could be implemented in the classroom. Technology does not have to be an add on, but can be used to motivate students to do classwork in a fun and creative way.*

When asked if the participants would continue to use these tools in the future, 13 participants reported yes and two participants reported no. It was not that they didn't want to use them, but these two were considering the circumstances they were in. One teacher was concerned about the limited hardware and software available at her school, and the other teacher thought there might not be enough time to for her to incorporate these tools. Sample quotes are given below:

Doris: *I did talk to our tech person about purchasing the software, but we have so many critical issues that need to be attended to that I don't think Inspiration will be a possible purchase. We still have many computers operating with Windows 95 so that is more of a concern than new software.*

Carol: *The course I teach is a required developed to cover all state science standards, so there is not much time to incorporate a well developed web quest. If I ever teach a course that is not a "required" course, then I would like to use Web Quest.*

PBL and tools used. The online PBL environment required students to use a number of communication and construction tools as described above. For the first project, Tutor Software, the primary tools used were Internet and asynchronous communication tools such as message board and email. The real-time communication tool, chatroom, was seldom used. For the second project, the Tool Integration Project, participants learned to use a new tool (e.g., creating database or learning to use a Web cam) or a tool (e.g., *PowerPoint, Word, Excel*) that helped to advance their skills. Then they created project lessons for their target students by following the PBL requirements. To speed up the interactions among group members (teams C, D, E, F, G) chose to continue using the Chatroom after they had tried it out in Project 2. Although some participants had problems either using new tools or new functions of a familiar tool, they sought help from their group members or posted help message on the GMB.

In the third project, WebQuest, teachers created a webquest for their targeted students. Many participants felt that this project "forced" them to step out of their comfort zones and, consequently, some participants learned how to use the new tool (although it was painful at times). Some participants stated that this tool was hard to learn in a short time; however, they indicated that this tool was useful both for teaching and learning and they would like to learn more about using this tool in the future. Constructing a collaborative project from a distance was not easy, especially for most of the teams that had never done a webpage before. Consequently, four teams (teams B, C, D, G) met face-to-face at least one time to communicate on the project and to get most or part of the project done. For team E, the only team that did not meet face-to-

face throughout the semester, they relied on one member who knew the tool and had experience with it.

Use of the project method assured that students would gain first-hand experience in using tools for communication and project construction. Over the semester, some participants developed their skills and some changed their perspectives toward learning new tools. Sample quotes regarding participants' perceptions of using the project method to develop skills in using technology tools were from student journals/reflection, survey, and interview:

> Nina: *The project method made me learn these new tools even though I did not have a clue as to what I was doing at times. It forced me out of my comfort zone and forced me to learn something new.*

> Kate: *Because of the time constraints, I do not feel like I gave myself the opportunities I could have had using some of the other tools when split up the work because I really only had time to work with mine.*

> Anita: *however, I think others in my group were definitely hindered because instead of trying to learn a new skill they just relied on those who already knew how to do it.*

> Martin: *The project method was helpful because we were introduced to the tools in stages, but we were also USING them to complete a bigger project which allowed for repeated exposure, which helped to reinforce the skills.*

Note that the project method could, if students let it, limit students' learning of new technology tools because the tasks were divided up by group members. However, as pointed out by Martin in the above quotes, students would benefit from the PBL approach because they are not only *learning* the tools, but also *using* them. In addition, PBL is helpful for introducing new tools to students in different stages of the project. Finally, the *repeated exposures* to the tool reinforced the skills to be learned. As participants gained more confidence in using new tools, they become more resourceful and comfortable in using technology and they showed a positive attitude toward integrating technology into their teaching in the future. As their ability in using technology increased, some participants overcame their fears toward learning new technology

tools. For example, Omar, who rated his PCC self-assessment as entry level, by the end of the

semester, indicated that *"I feel this was a very good course for me and I can walk tall amongst*

those who can use technology." Omar further commented:

> *I have started trying out my new found skills without the pressure for*
> *homework/submission that gets involved at times…and I am loving it. They are really*
> *cool. Not that you will be the guru of technology integration but that you are confident of*
> *the use of such technologies. I bet with this knowledge you get the respect you so deserve*
> *as a teacher, not only with kids but also with your district and parents in general.*

> *I learnt quite lots. It's not a matter of having the learning technologies in classrooms*
> *that's important, it is what you do with them for students to have a deep learning*
> *experience that is authentic, and carries a lot of meaning for them. A teacher is not the*
> *'owner' of all knowledge in the classroom, students can teach the teacher how to use*
> *technology…these kids are so different in talents. Never take them as kids, but do treat*
> *them as kids. If kids are allowed to do it themselves they love it in the end and can*
> *confidently share with others what they think.*

The implications of the findings pertaining to this research question suggest that adult

learners need to be provided with sufficient time for them to explore and become familiar with a

new tool. For example, Martin's second experience with the concept-mapping tool changed his

initial thoughts about this tool. Even for some participants who rated their technology skills at

the transformational level, when it was something new that they either hadn't heard about it or

used it before, they were hesitant to use it. In addition, variations in the six teams' attitudes

toward adopting new tools such as the different patterns in using the Chatroom (see discussion in

Research Question 3) could be a topic for a further study. The implications will be further

discussed in Chapter 5.

Research Question 3

What are participants' group collaborative experiences in communicating and constructing projects online?

As it was discussed in chapter 2, Henri's (1992) model of content analysis of CMC suggests five dimensions (participation rates, interaction patterns, social cues within messages, cognitive skills, and depth of processing) to be examined. Among the five dimensions, I started with using *interaction patterns* as the main category for data analysis directly associated with collaboration. Under this category, I used *interactivity, synchronicity*, and *negotiability* as sub-categories based on Dillenbourg's (1999) three aspects of interactions. To find out how groups functioned, I added *working patterns* as the second category. During the coding process, as I began to look for patterns of group functioning in the online environment, three sub-categories related to groups' working patterns emerged: *rotating leadership*, *core leadership*, and *lack of leadership*.

In presenting these findings regarding research question 3, I first classified all relevant data from student discussion threads, chatroom archives, interviews, and journals/reflections. This allowed me to look for patterns of behavior and triangulate observed behavior with what students *said* about themselves in interviews with the researcher and in their reflections required by the instructor. The initial coding categories and sample data related to research question 3 are listed in the table below:

Table 24. *Initial coding categories and examples of student comments related to research question 3*

Coding Category	Examples of Student Comments
Interaction patterns (Dillenbourg, 1999)	
• Interactivity	• What did you ladies do for the learning something new assignment?
• Synchronicity	• Chat time next week? When are you all free?

• Negotiability	• You both did a good job of describing the tutee mode. I think it's a great idea, but the teacher would have to be pretty comfortable with the programming to be able to simplify it in a way that students could use it. It's not computer programming, but it's kind of the same thing if you're having students use productivity software like powerpoint, or excel to teach grade-school kids about a topic, don't you think?
Working Pattern (Nemiro, 2004)	
• Rotating Leadership • Core Leadership • Lack of Leadership	• Maybe we could take turns each time taking the managerial role and keeping us on task :) • Regina usually initiated the process by posting to the message board, and then I was usually the one who would respond next. • (Group that experienced collaboration difficulties)

I started coding the raw data that printed from its original formats, such as reflections, journals, survey, interviews, and discussion messages. Some of the themes began to show. I made notes for the new themes and organized the categories each time I finished one type of the raw data. After coding all the raw data, I made electronic files and organized the files according to each team. Then, these themes emerged were used as categories for a second time coding that was team-based to help me understand the nature of collaboration issues in each team. The emerged themes including *a sense of community*, *social learning*, and *problems in collaboration*. The emerged categories, sub-categories, and examples of student comments are listed in Table 25 below:

Table 25. *Emerged categories and examples related to research question 3*

Coding Category	Examples of Student Comments
A Sense of Community	
• Trust • Camaraderie • Sharing	• I trust my group members enough that we will continue to be professional through out the semester. • I did not stay with my first group but I would definitely stay with my second group. • I use the internet mostly for communication. I love

	email and I just purchased a web cam. (Sharing communication tools in the Chatroom)
Social Learning	
• Providing feedback • Perspective taking	• Thank you for your compliments. We want to let you know that the webquest is missing lots of information we though we sent in. We are frustrated that you can not view our completed project. Thanks, Group B. • I really enjoy hearing each person's opinion on a given topic. I feel we each have strengths that benefit our group members, and at the same time our weaknesses become less obvious since we see other ways of accomplishing a given task.
Problems	
• Lack of responses • Lack of social cues (Misinterpretation, anonymity problem) • Lack of real-time face-to-face, or videoconferencing • Group size & time • Other life commitments issues	• Collaboration on pertinent issues, which is the core of this type of learning has always been a challenge in this group, since it's inception/formation. For instance back then (and even now, although it is the same individuals) there were cases when other group members chose not to respond to either e-mail or chat, or such communication on time, yet the deadline would be clearly stated on our website. • I feel like the interaction on the main message board is somewhat contrived, I think for some people don't feel comfortable giving criticism to people that they don't know. For some reason, the anonymity seems to have the opposite effect on me. I find myself being more curt and critical in my replies than I would normally be, but perhaps this is just my reaction to my perception that many of the other replies are empty praise. • I think this format has potential, but I think it would be better served to be more of a combination of online and face-to-face. I definitely miss the face-to-face real-time discussion. Maybe monthly meetings, or even video conferencing could address this issue? • I feel that more than three members in a group is just too much. I think with fewer members, the collaborative process would be more effective. Less time would be wasted on trying to get the thoughts of everyone in the group. • Well guys, I think I may need to head home since I have to back here in less than 12 hours! Conferences are a pain and I don't even officially

	have any tomorrow!

Collectively, the main themes and sub-themes of online groups' collaborative behaviors give us a picture of the groups' interaction patterns, working styles, social learning, issues, and sense of community based on participants' perspectives. The observations and interpretations of data are presented in the following sections.

Observations and Interpretations

Interaction Patterns

According to Dillenbourg (1999), interaction patterns for collaborative learning include interactivity, synchronicity, and negotiability. *Interactivity* should not be considered in terms of counting the frequency of interactions but one should be looking for those interactions that influence the group members' cognitive process. *Synchronicity* implies doing something together at the same time while *negotiability* yields dialogues that are usually more complex, such as group members arguing for their viewpoint, justifying, negotiating, and attempting to convince others.

Interactivity

In this study, cognitive processes, such as reasoning, planning, and problem solving, were found in many discussions within the groups' virtual working space, including the group message board (GMB) and the chatroom. As seen from a chat example, team C was discussing a class assignment on how to improve online interaction in this course considering their experience and the four roles (technical role, social role, managerial role, and pedagogical role) for completing their discussion task. This example demonstrates the interaction among group members while planning for a chat meeting:

Carol: *Social role deals with us getting to know each other…If we do a chat room once a week, or when ever a project is due it could be beneficial. I'm concerned that we won't all have the same schedules.*

Kate: *That's a good point about the social role- we need to make sure we are all available.*
The book makes a good point about interacting with someone you've never met but
have to collaborate with. It can be challenge.
Martin: *The schedule thing is definitely an issue, but I also think they wouldn't have to last*
longer than 15 min or so.
I can tell already this is going to be difficult to follow all the threads of the
conversation at the same time :)
Kate: *How did you do that face?*
Martin: *Just with a colon and an end parenthesis*
Carol: *Obviously, this chat session is helping us in the "social role". We are getting to know*
each other better.

Synchronicity

Many participants indicated they liked online learning for its flexibility that they could

study anytime and anywhere. However, a consistent finding from multiple data (discussion

threads, chatroom archives, surveys, and journals/reflections) suggests that group members still

preferred to meet and work together–virtual or physical–when collaborating in an online PBL

environment. For group B, three of the teachers worked at the same building, so arranging a

face-to-face meeting was easier. The need for synchronicity was evident in that they met

frequently during the semester. But for groups that could not meet face-to-face or had

difficulties to schedule face-to-face meetings, collaborating online clearly created an issue and

increased the complexity of the learning process. For team E members that could not meet face-

to-face at all during the semester, they posted more messages in their GMB (549 posts) and spent

significantly more time online in the chatroom (21 chat histories for 909 minutes) as discussed in

Research Question 2.

A sample chat history from the 3 team members in team E can be found in Appendix N.

Note that the dates, times, formats, text colors set by the participants, and typos are kept the same

as the original file with the exception of the participants' names changed to pseudonyms for

confidentiality.

One participant indicated that they had very hectic schedules and it was hard to find time for everyone to meet together. The need to meet together and work together (online or face-to-face) was a major concern for groups' collaborative experience in communicating and constructing projects. For more detailed description and examples of quotes on the groups' collaborating experiences, see Appendices A–G.

Negotiability

Group negotiation was often found in discussion threads, and seldom appeared in the chatroom histories. A very typical method participants used was saying something they agreed on and then pointing out their contrasting or alternative perspectives. The discussions were usually complex while the group members stated their viewpoints, and then justified, negotiated and attempted to convince others.

For example,

"*I will agree with that, although I will make additions or variations to your points*".

"*I would be inclined to agree with your observation*".

"*Well, I like it. In the same vein, how about if students would consult even the experts in this field just so as to triangulate their findings*".

"*I agree with your agreement [sic]. But seriously this is what it is…like she has already pointed out to Do a webquest is a little less motivating to CREATE a webquest. Here is what I can add, or an alternative way to look at it:*".

Apparently, there was no strong "arguing" or "debating" in online communication. Triangulating chatroom and discussion boards data with survey data revealed consistent results suggesting that none of the participants reported using "arguing" as a way to negotiating with their group members.

Working Pattern

The majority of participants felt the teamwork responsibilities were shared among team members. However, there were variations in group's working pattern. The table below summarizes the patterns of group leadership for each group based on my observation from the groups' postings in the discussion board, interviews with some team members, and also compared with the chatroom archives. Based on my observations, team C was the only team that used rotating leadership from project to project. Teams A, B, E, and G demonstrated core leadership consistently from project to project. While team D did not show strong leadership from project to project, team F's leadership pattern kept changing from project to project due to Kate's leaving after project 1, and Lillie's joining the team during project 2. Overall, there was no strong leadership found in team F.

Table 26. *Patterns of group leadership*

Team	A	B	C	D	E	F	G
Rotating Leadership			√				
Core Leadership	√	√			√		√
Lack of Leadership				√		√	

As one participant in team C suggested: "*We used the turn-taking the most. Our group/team always make sure the work load was shared equally*". Other examples are provided below:

Rotating Leadership:

Carol: *Our current mode of operation is to take turns posting information on the main message board after we reach a consensus on the group message board. The main way we reached a consensus was either by taking a "majority rules" approach or, because we take turns posting on the main board, the person who posts the information makes the final decision.*

Core Leadership: sample data from the teams B, E, and G are given below:

Beatrice: *Regina usually initiated the process by posting to the message board, and then I was usually the one who would respond next.*

Nina: *Each person had her own job. We found it works best when we take turns with the different responsibilities, that way no one is stuck with a job they do not like for a long period of time…. We each had our own duty.*

Rebecca: *Our group is aware of each person's strengths and weaknesses. So, job assignments were assumed.*

Doris: *We divided the task of reviewing the software as follows…*

Beatrice: *So Regina and I sort of took the lead in the assignments.*

Beatrice: *Regina and I would get things done ahead of the others. We seem to have the best schedules for posting of the four of us.*

Team D did not show a strong leadership. Although Nola initiated a lot of meetings, they divided up tasks, working on their own parts, and then putting the individual parts together as a unit. Sample data from reflection/journal, chatroom histories, and survey are given below:

Lack of leadership:

Nola: *So let's pick a topic that will be easy for all of us to input into and put a unit together*

Toby: *For the article summaries, each member would submit their responses to one person, and that person would compile the information and post it on the message board*

Team F was another story, this team experienced many difficulties that might be attributed to the lack of strong leadership in the team. The lack of strong leadership seemed to be related to the ambiguity of role definition in the group as evident in following example:

Omar: *In this project we split roles and thanks to the managerial skills of Lillie who instantly came and took the leading role, although initially I was skeptical, as I was in this role of 'leading' sort of.*

A more complete description of team F's problem is provided in Appendix F.

Social Skills and Roles

The next table provides the data categories pertaining to social roles that participants

played throughout the semester.

Table 27. *Data categories and examples of student comments related to social roles*

Social Roles (Nemiro, 2004)	Example of Student Comments
• Leader	I prefer to be in control.
• Follower	I was a follower. I did what I was told and also contributed my part to each project.
• Coordinator	Since most of the projects had to be completed using multimedia or web applications (which no one else in my group were really familiar with) I was the technical coordinator. Synthesized information and developed most project materials.
• Facilitator	I ended up being the web page guy and the facilitator, which worked out pretty well I think.
• Equal Partner	I felt as though everyone contributed equally.
• Initiator	I have initiated posts when there were questions or comments I had.

The survey results on participants' perceptions of the roles they played are listed below:

Table 28. *Roles that participants played (n = 14)*

Participant Comments	Number of Responses
Coordinator	4
Equal Partner	4
Facilitator	3
Initiator	2
Follower	1

The survey data also revealed that the most frequently used social interaction skill was

turn-taking. The second skill used was repairing misunderstanding. Not many of participants

used persuasion when there were different opinions. All participants reported no arguing in

groups. Sample quotes from the survey regarding the social skills used within group are given

below:

146

Regina: *My take on the groups: we took turns talking, voice opinions, how to's, what to do and came to consensus 99% of the time – no arguing.*

Martin: *I feel like I spent a lot of time clarifying/repairing misunderstanding within the group.*

Sample quotes regarding participants' perceptions of the roles they played are given below:

Anita: *Since most of the projects had to be completed using multimedia or web applications (which no one else in my group were really familiar with) I was the technical coordinator. Synthesized information and developed most project materials.*

Martin: *I think most of the time I was a facilitator/idea man and tried to direct the group to a feasible project.*

Nina: *I was a follower. I did what I was told and also contributed my part to each project.*

Dora: *My role was an equal partner! With only two in our second group we counted on each other to be dependable and supportive of the other.*

I analyzed the relationship between team leadership styles (based on message board records) and participants' social roles (based on participants' self-reported from the survey, see Table 19 above), the findings are included in the summary table in Table 21 at the end of this section.

Social Learning

According to Ackermann (1996), one of the features of social learning is that we can learn from other's perspectives. Participants appreciated the opportunities to review other groups' discussion summaries and their project artifacts. In addition, they gave opinions as well as gathered feedback from other group members for the revision of their projects. This is also evident in the survey finding that 12 out of 15 participants reported that they either learned both by themselves and with others or more from their group members. Not surprisingly, the three

responses indicating "learning by themselves" were team D members. It is evident that team D

did not build up a sense of trust and resulted in each member learning individually.

Below are sample quotes regarding participants' perception of learning with group

members:

Rebecca: *I believe I learned both by myself and with my group.*

Kate: *I learned a lot more with my group members. We all teach from the middle level up but it was interesting to think at different grade levels when creating a project for that level. I learned a lot more about the learning styles of high school students!*

Anita: *It was a struggle for me at times to take myself out the teaching zone where I am comfortable and step into the unfamiliar territory of elementary and middle school. However, I learned a great deal and while the actual products of this course may not be ones that are directly applicable, the principles and techniques can transfer anywhere, which is invaluable.*

A Sense of Community

Since most of the group members did not know each other before the class began, it took

a certain amount of time for them to get to know each other in groups and gradually built the

trust and *camaraderie* online. According to Nemiro's (2004) distinction between task

connection and interpersonal connection, interpersonal connection requires "regular

communication" and a "family-like" feeling. In this regard, team A, C, D, and F demonstrated

task connection while team B, E and G showed an interpersonal connection. However, as seen

from the descriptions of group problems in Appendices A–G, most frustrations in group

collaboration were related to interpersonal skills. In this study, members in the two groups that

included international students all had difficult moments working with each other. For Ann from

group D, the difficulty was primarily a result of her lack of involvement that caused the group's

frustration at times. However, Omar worked so hard in his group throughout the semester, but in

the end, he could not earn the group's gratitude at all. One of the problems was the "strange"

written language he used all the time. For Omar, he was just trying to be friendly and to use humor; unfortunately, his teammates got confused and even felt offended at times. Because the problems were directly reported to the instructor via personal email, the sample data are not presented here.

Overall, participants gradually built a sense of trust–at least with the groups they worked with in the last two projects; 12 participants reported that they would stay with the same group in the future while one did not want to stay in the same group and two participants were uncertain:

Regina: *Hard to answer, since we did well on projects, one never knows what one new member could or could not do.*

Anita: *I don't know. At times it was frustrating to not have others at the same level technically because it left me with a lot of busy work to do. On the other hand, my strength did not lie in lesson development, which all the other members of group were strong in, so we kind of balanced each other out.*

Team B members knew each other before the class, for teams E and G, they developed a sense of friendship within this class, sample data could be found in their reflections after the class:

Anita: *I enjoyed this class and my group in particular. We really seemed to work well together, with each of settling early into our specific roles. The dynamics remained positive throughout and I can't wait to actually put a face to names when we get together for a drink at the end the semester.*

Dora: *I believe Tonya and I made a great team and am looking forward to working with her again.*

Sharing perspectives and proving feedback for other group members helped to build a sense of community. Below are sample quotes regarding giving feedback for group projects:

Beatrice: *It was fun to collaborate--get others' perspectives on things. It was great having someone to e-mail for extra help.*

Regina: *This is a good project to learn about your community, but will each group have a particular part of their communities history will research i.e., pioneers, housing, schools, parks or will all students be searching or he same information?*

Doris: *Thanks for you compliments! This project has the ability to group that is for sure.*

Martin: *Thanks for good feedback everyone!*

Problems in Collaboration

Other emerged categories related to problems in collaboration included the lack of responses from group members, not being able to meet face-to-face, lack of social cues, empty praise, group size, and time constraints.

<u>Lack of responses and not being able to meet face-to-face</u>

The lack of responses from group members was related to the desire for synchronicity in online communication as discussed above. Asynchronous communication usually required the wait-time that can discourage social interactions and make negotiation and co-construction of ideas difficult. Participants expressed that waiting for persons to post their responses is not only difficult but also frustrating. Evidently, active communication by the participants is essential for building up a sense of community. Lack of participation from group members or lack of immediate responses can all increase the online frustration. Paradoxically, while participants liked online learning for its flexibility, they still preferred to meet and work together virtually or in-persons, as evident in the following example:

Martin: *I definitely miss the face-to-face real-time discussion. Maybe monthly meetings, or even video conferencing could address this issue?*

Only one group did not meet face-to-face; other groups, whether they lived in the same town or not, met at least once for the semester.

Table 29. *Face-to-face meeting over projects*

Teams	A	B	C	D	E	F	G
Project 1		√				√	(N/A)
Project 2	(N/A)	√					
Project 3	(N/A)	√	√	√			√

In an email follow-up interview with a team B member, Doris referred her team's success

as being able to meet face-to-face. The quote from the interview email is given below:

> *Doris: I do think we have a distinct advantage. Not only do we live in the same town, 3 of us work in the same building. We are constantly talking in the hallway or asking questions when we need help.*

Evidently, to make the online PBL environment more effectively, how to incorporate the

"human touch" (Shotsberger, 2000) such as including videoconferencing in the online

environment remains to be an important area of research (see Chapter 5 for further discussion).

Lack of social cues and empty praise

Due to lack of facial expressions and body language, many participants used emoticons–

punctuation to represent their emotions. The smiley face ":)" was the most used emoticon in the

chatroom histories, the second most used was an end punctuation, the exclamation mark "!".

These norms are usually known as Netiquette - the set of rules for acceptable behaviors online.

In one of team B's chatroom archives, the team was discussing using chat for their classrooms,

and they identified this issue and suggested the need to teach Netiquette before having their

students use the chatroom.

In addition, the lack of social cues described above can cause messages to be

misinterpreted. Shotsberger (2000) pointed out "There is a nature informality in synchronous

dialogue that is difficult to replicate in asynchronous communication. In a sense, much more is

expected of asynchronous experiences in terms of both content and format" (p. 56). This is

evidented in the following example, in which asynchronous interaction is regarded as contrived,

especially when the comments were superficial or irrelevant to the discussion:

> Toby: *I feel like the interaction on the main message board is somewhat contrived, I think for some people don't feel comfortable giving criticism to people that they don't know. For some reason, the anonymity seems to have the opposite effect on me. I find myself being more curt and critical in my replies than I would normally be, but perhaps this is just my reaction to my perception that many of the other replies are empty praise.*

Group size and time constraints

Some participants believed that with fewer members, the collaborative process would be

more effective. Two participants suggested that no more than three members in a group would

work better because less time would be wasted on trying to get the thoughts of everyone in the

group. For full-time teachers, many of them had sports coaching duties after school. Other life

commitments identified in this study including family responsibilities, family emergencies,

parent/teacher conferences, vacations, entertainment, and illness.

One participant stated, "*The nature of the projects really weren't that difficult and neither

was the technology skills. The really problem we had was group collaboration and time

constraints.*" Although participants acknowledged the need for group work in online PBL

setting, one participant thought, "it is very demanding". The fact that it was hard to find time to

meet as a group virtually or physically was a common concern in this study, as another

participant commented that "time really become the defining factor."

Below are sample quotes regarding participants' most difficult experiences in

communicating with group members online:

> Doris: *The chat with four people was very difficult. The topic changes so rapidly, while you are responding the next question had already been asked.*

> Carol: *Waiting for a response or for persons to post their responses.*

Tonya: *The most difficult experience was in the previous group and it dealt with making my "voice" heard.*

Anita: *People got defensive at times based on misunderstandings of what was written, which I don't think would have happened in the face to face where you could facial expression, etc. Plus it took a huge devotion of time as we were communicating in "chunks".*

Beatrice: *One time, one of the group members was having trouble with her keyboard and we couldn't make out anything she was saying.*

Ann: *I was not very familiar with this online learning tool in the beginning. It takes time for me to get used to this system but sometimes I might have missed many important assignments.*

Other example from reflection/journal and survey are given below:

Nola: *There are lots of information we need to know and read before we get the good job done. And there is no certain time to hand in it, we need to check the website everyday or anytime.*

Kate: *The time constraints were probably the hardest with the second group because we all work, are taking multiple classes and/or coach a sport at our school.*

Dora: *I believe that smaller groups worked better for all of the proects.*

Clearly, collaboration and communication in an online PBL environment is a complex issue. To answer the research question on participants' group collaborative experiences in communicating and constructing projects online, a summary of findings from multiple data sources is presented in Table 30:

Table 30. *Summary of findings on collaboration experiences in online PBL*

Team	Leadership	Collaboration/Roles	Communication	Positive & Negative Experiences
A	Core leadership	- The tasks were not evenly shared. - Demonstrated task connection	Struggled with meeting virtually as a group **Number of post=0** **Number of chat=0**	***Negative:*** TV show was so important to one of the participants
B	Core	- Shared responsibilities	Face-to-face mostly	***Positive:***

	Leadership	Roles/Working Pattern	Communication	Experience
	leadership **All reported learning by others and oneself**	- Demonstrated an *interpersonal* connection **One participant reported her role as a coordination, one as an equal partner, and one as a follower**	**Number of post=4** **Number of chat=1**	Success experience due to face-to-face meeting. ***Negative:*** Fear of learning new technologies
C	Rotating leadership **Two reported learning by both others and themselves, one reported learning more by others**	- Enjoyed the collaborative working pattern & sharing of ideas - Demonstrated task connection **All participants reported their roles as facilitators**	Projects 1 &2 online, project 3 face-to face **Number of post=145** **Number of chat=4**	***Negative:*** - Frustrated at time because none of the team members were familiar with the topic for project 2 - Struggled with the wrong decision made for project 2.
D	Lack of strong leadership **All reported learning by themselves**	- Divided up tasks, working on their own parts, and then putting the individual parts together as a unit. - Demonstrated task connection **One participant reported her role as an initiator, and two reported themselves as equal partners**	Projects 1 &2 online, project 3 face-to face - Struggled with chat scheduling. - One participant was confused between group chatroom with public chatroom. **Number of post=10** **Number of chat=9**	***Negative:*** - Did not build up a sense of trust from the beginning - lack of involvement from one group member (Ann) - No one cared about revising project 2. - Lack of classroom teaching experience - lack of authentic audience.
E	Core leadership **All reported learning by others and by themselves**	- Accommodated individuals' strengths - Demonstrated an *interpersonal* connection **All participants reported their roles as coordinators**	100% online Started using chatroom from project 1; kept in touch with the team on a daily basis **Number of post=549** **Number of chat=21**	***Positive:*** Developed a sense of friendship and looking forward to meeting each other.
F	Lack of strong leadership New members took over the leadership **One reported learning by himself** (The other 3 did not	- Tasks were not evenly shared, roles were not well-defined. - Demonstrated task connection **One participant reported his role as an initiator** (The other 3 did not report to this question)	Project 1 face-to-face, projects 2 & 3 online Struggled with meeting time in the chatroom. Two students were not responsive at all. **Number of post=74** **Number of chat=12**	***Negative:*** - Collaboration and communication did not proceed smoothly. - Language and humor problem (Omar)

	respond)		
G	Core leadership **One reported learning more by group, one reported learning more by both others and by oneself**	- Established friendship after leaving team A - Demonstrated an ***interpersonal*** connection **One participant reported her role as a coordination, one repartedas an equal partner**	Project 2 online, project 3 face-to face Used chatroom frequently and cell phone during weekends. **Number of post=0** **Number of chat=8**	***Positive****:* Developed a sense of friendship

Consistent with Trentin's (2000) observation, in the current study most frustrations in group collaboration were related to interpersonal skills. In addition, asynchronous communication usually required the wait-time that can discourage social interactions and make negotiation and co-construction of ideas difficult. For this reason, it is difficult to construct projects totally online when collaborating with a group. The results of this study suggest that the collaborative aspect of PBL in the online environment provided participants opportunities to interact with others, to learn from others' perspectives, to depend on each others' expertise, to help each other, to build leadership, and to be responsible for one's own project portions in order to achieve group goals. However, active communication by the participants is critical for building up a sense of community.

One of the advantages of the online learning environment is its extendibility to provide ample resources to engage learners in constructivist learning such as the PBL approach described in this study. Using PBL in the online environment provides a "virtual space" for knowledge building (see the sections on Research Questions 1 & 2) –where participants added contributions to a shared knowledge base through conversation, negotiation, and authentic activity–as suggested by Brown (1989). This space allows for individual participant to think cognitively and metacognitively and to talk about their projects with others socially. As reviewed in Chapter 2,

Barron (2003) identified a dual-problem space when learners are involved in collaboration, "a *content space* (consisting of the problem to be solved) and a *relational space* (consisting of the interactional challenges and opportunities)" (p. 310). He suggested the need for a better understanding of how social and cognitive factors intertwine in the accomplishment of collective thinking. This strength of an online PBL environment can also be its greatest challenge not only for the online course designers and instructors, but for the online learners as well. In addition to the design of content space, how to provide relational space that supports interactivity, synchronicity, negotiability, and other needs (social and cognitive) is an important topic in light of the findings of this study. The implications for online course and PBL design will be discussed more fully in Chapter 5.

Research Question 4

What are the instructor's experiences in structuring this online PBL course? What are the difficulties in meeting the six PBL criteria in an online PBL environment? And what are the strategies used to manage class virtually?

The data triangulated to answer this question included: course syllabus, course description, student journals, discussion messages, researcher observations, and a chatroom interview (text-based) with the instructor. In addition, there was an ongoing discussion between the researcher and the instructor during the research period and the writing up of the final report to clarify interpretations made by the researcher. This "member check" technique was suggested by Lincoln & Guba (1985) to judge the accuracy and credibility of the data, analyses, interpretations, and conclusions.

The interview question started with why Dr. M used a PBL approach for an online course structure. Dr. M pointed out the problem with today's teacher education program is that everyone talks about constructivism, but faculty themselves remain largely unchanged, continuing to use the traditional method to teach. Being a constructivist, Dr. M believes the best way to promote students in learning and understanding of the ideas is through learning collaboratively around projects. And when the content to be learned involves technology, the best way to learn it well is by actually doing it.

In the following sections, the instructor's experience in structuring online PBL course, strategies used to manage class virtually, and difficulties in meeting the six PBL criteria in an online PBL environment are presented first; this is followed by the researcher's observations and interpretations. Sample data from iChat interview archive, follow-up emails, syllabus, project descriptions, and message board postings that were analyzed and triangulated for this research question are provided in the table below:

Table 31. *Data analysis pertaining to research question 4*

PBL Features	Strategies and Considerations	Difficulties
• Driving Question	• Encourage in depth discussion before forming the driving question	• Identify students' interests
• Research, Investigation	• Encourage students using library, virtual library, Internet to access credible resources	• Finding time to extend the investigation
• Collaboration	• Team membership needs to be guided • Changing team membership needs to be made available • Encourage each group to include different expertise • Encourage group tasks evenly shared	• Some problems cannot be foreseen • Finding time to meet virtually • Extending collaboration because time constraints
• Technology	• Create a *Help* section • Encourage students to help each other • Provide optional on-site lab • Provide additional links	• Some students might not be able to attend the workshop
• Artifacts	• For Web-based artifact, include at least one technical expert in each group • Encourage constructive feedback for other groups • Encourage revision	• Producing the artifact at a distance • Time constraints
• Authentic Audience	• Encourage students to present their work to outside audience • Encourage using Web as a means to present group work • Required each other student in the class to give feedback to another group's project, thus making sure there is another audience of teachers • In the Webquest, encourage the best projects to be submitted to Bernie Dodge Webquest site	• Hard to find outside audience • Need to find a server to host Webquest
Online Learning	• Check in often • Use private email to remind slow students • Post the grades on a timely	• Time constraints • Students might get upset • Too many

		manner			students
	•	Use *Announcements* section to provide instant reminders		•	Students might not log on to read the reminders
Online PBL	•	Individual tasks and group tasks need to be properly considered		•	Group work requires more working time
	•	Both flexible deadlines and absolute deadlines need to be available		•	Increase instructor's working hours
	•	Learning and doing need to be balanced		•	Need experience

Instructor's experiences

Dr. M had had taught this course online five times. Every time, she heard students complaining about the class toward at the beginning of the course, yet appreciating the opportunity to learn this way at the end, as she described:

Although I try to explain my motives to them, until they have experienced this kind of learning, and particularly until it is over (!) they generally do not appreciate it.

Dr. M explained her inspiration for teachers to learn this way:

I am trying to deal with teacher fears about using new technology and/or new software by helping them to see that there are many resources available to them. I tell them when they don't know how to do something, go to the technology coordinator, read an online tutorial, ask a team member, or use the best option: ask a kid.

The point is to get to increase the teacher's resourcefulness and confidence that this is something s/he can actually do after the course is over.

As for the course structure, it required three collaborative projects, one individual short paper about technology issues, and one individual final exam. For each project, Dr. M set up a format that requires every participant to:

- learn a new skill or become familiar with a new piece of software
- discuss with group about readings
- read other groups' discussion summaries and respond to them
- research Internet/library/virtual library
- practice tasks that lead toward the big project

- conduct the big project with group members
- give feedback to other groups' projects
- hand in a project reflection
- hand in a journal for each project

It is in this manner that teachers do their own work independently and also work with their group collaboratively.

The difficulties

Consistent with one of the key findings regarding the time issue, Dr. M perceived that *"the online environment for teachers presents some difficulties that might not be so hard for people who are not also working full time."* Under the topic of time constraints, the difficulties to meet PBL criteria include:

- Finding time to meet virtually -
  For a group, finding time to meet virtually for everyone is difficult.
  Waiting for response by using asynchronous communication tool is time consuming.

- Extending collaboration -
  Discussions among group members using message board is difficult, it usually becomes a place for posting individual comments rather than a place for meaningful dialogues to occur.
  Some groups just did not work well together. Regrouping should be allowed for this reason.

- Producing the artifact at a distance -
  Not everyone has working knowledge for some kinds of technology.
  During the group formation, it is important to include one technologically savvy person in each group.

Course Management Strategies

The strategies Dr. M used were focusing on using the course management system, KSOL:

- Check in often
  - Check in daily or even several times a day for answering questions, identifying problems, and giving feedback

- Encourage each group to include different expertise
  - o Allow group to choose 3 to 4 members
  - o Encourage the group to include at least one in-service teacher, and one technologically skilled person

- Provide optional on-site lab
  - o One session of on-site lab was offered to provide training on making a simple Web page.

- Use private email to remind slow students and to understand problems
  - o For slow students or group conflicts, use private email to remind the tasks to be done and to solve problems

- Post the grades in a timely manner

- Use *Announcements* section to provide instant reminders
  - o Use announcements section to give project ideas, mention problems and solutions, direct to resources, and remind deadlines.

Observations and Interpretations

The observations and interpretations were based primary on the data (e.g., course syllabus, announcement messages, discussion messages, and my observational notes) from course documents that were either downloaded and/or printed from KSOL. In this section, the observations and interpretations focus on the instructional strategies and learning assessments used for this online PBL course.

Instructional Strategies

Provide a collaborative learning environment

The syllabus (see Appendix H) showed that the instructor laid great emphasis on building a collaborative learning environment based on a constructivist's approach. For example, under the heading *Learning Environment*, Dr. M stated:

- Understand ways to make cooperative and collaborative learning successful
- Understand ways to encourage a community of learners
- Understand ways to motivate learners to take responsibility for their own learning and to increase student engagement in learning

161

Another example was the two Q&A topics created by Dr. M in the MMB that encouraged students to ask questions and to help each other. As discussed in research question 2, these two topics were read by students for a total of 247 times.

These two examples are consistent with Dr. M's belief that to be a self-regulated and life-long learners, students need to take active control in their own learning.

Encourage time management

Two technological tools in KSOL that attempted to help students manage time were used: the *Announcement* and the *Calendar*:

Announcement. When students logging in to KSOL and enter the course space, the announcement message was appeared on the main page, what we referred to as the "Home Page". As observed, Dr. M used different colors to format text to catch students' attention. Sample example are given below:

04/11/2006

Issue Paper Due May 8. Information about the paper is under CONTENT → Issue Paper → Issue Paper Instructions & Grading

05/08/2006

Everything is Due by 9pm tonight, Monday, May 8.
Because this is the time of the final exam, it is also the last moment that I will accept any work for EDCI 718. I will accept only the issues paper or anything associated with Project 3, the Webquest activities.

Calendar. Also to help manage time, Dr. M used the *Calendar* in KSOL to mark the dates that had tasks due. An examination of the postings and students journals suggested that students who checked in on a regular basis and/or read class announcements and used the Calendar function to check deadlines had less confusion. Some participants appreciated using

the Calendar feature as a time management tool, as is evident in students' reflections and surveys. The examples are given below:

> Rebecca: *Because organization is key to my success, I would like to see what the rest of the calendar contains so that I am able to plan ahead as much as possible.*

> Toby: *The deadlines (Calendar) were nice so you didn't get left behind.*

The screenshot below illustrated the monthly calendar view in KSOL:

February 2006						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	31	1	2	3	4 ✎ Tutor: Individual Software Review Due
5	6	7	8	9	10	11 ✎ Tutor: Group Software Evaluation Due
12	13	14	15	16	17	18 ✎ Tutor: Lesson Plan & Integration Justification Due
19 ✎ Tutor: Final Reflection Due	20	21	22 📌 Start Journal on Project 2 ✎ Top 3 Tool Ideas Due	23	24 🔍 Chat Due	25
26 ✎ Tool Goal Accomplished Due	27	28	1	2	3 ✎ Student-Created Multimedia Discussion Due ✎ Hypermedia Examples Due	4

Appointment: ⊙   Assignment: ✎   Chat Session: 🔍   Class Schedule: ⚖   Note: 📌   Office Hours: ●   Task: ☑
Indicates today: Indicates selected day:

Figure 11. KSOL calendar screenshot (Source: copyright © 2005, Kansas State University. Used by permission of Kansas State University)

One particular issue regarding time management from this study was about the time differences and holidays. Some participants suggested not having projects run across holidays such as spring break. But, for an online course, students might be enrolled from different school districts, different states, or even different countries; it would take considerable planning to align the time zones and the holidays to meet individual needs. For example, what if three group members have their spring breaks during the 2nd week in March and the 4th group member has it

during the 3rd week? And what if one group member tries to catch up during the spring break, but the other three group members plan to get out of town? How do these online collaborators manage their time to meet the deadline would be challenging.

Provide scaffoldings

The instructor provided scaffoldings for projects. For example, in project 3, WebQuest (see Appendix J), Dr. M provided online training information for participants to look up webquest examples, tutorials, and how to build personal webpage and webquest. The information is provided below:

A. Build your own website: There are no required readings, but we will use several excellent "Reading and Training Resources" developed by Bernie Dodge at San Diego State University as a framework for developing and evaluating the webquest:

- Go to http://webquest.sdsu.edu/.

- Browse and read the training materials, focusing particularly on **Building Blocks for WebQuests** and on **A Taxonomy of Tasks.**

B. Build your own website using trackstar:

- Go to http://www.hprtec.org.

- Click on trackstar focusing particularly on **Build a Webpage for your Track** and on **Make a Quiz for your Track**.

For team B participants who suggested that the instructor should provide more instructions for completing projects, it might be attributed to the fact that this group met face-to-face throughout the semester and seldom logged in to check instant announcements or instructor comments.

Provide strategies for successful online learning

164

Although some students indicated that they had had prior experiences in online learning, not many of them had had collaborative experience at a distance. The only example found was in Omar's introduction: "*I have tried working with some guys in Turkey, Cambridge, and U Penn collaborating on papers, some of which are still pending*". As Dr. M said in the chatroom interview, she had taught this course online for five times, and she recognized that the time and efforts required in this course were not as "easy" as students usually expected before the class began. This is evident that in the course syllabus, Dr. M laid great emphasis on how to be successful online learners, especially in the tips that she provided for this course:

How to be successful online learner (tips for this course)

Graduate Level Coursework: Time Considerations. In general, in a 3-credit graduate level course, you should expect to put in about 12 hours per week in order to be successful and to get the most out of the learning experience.

Lab Time: You must plan on spending a good deal of "lab" time on a computer in order to complete your work. You must also plan time to collaborate in person (face-to-face or on the phone) and/or virtually (that is, by e-mail, online discussion board, chat or other electronic means) with your assigned or chosen group.

Collaboration from a distance: It is our intention to have collaboration that is meaningful and helpful to participants. You will have three group projects. It is a good idea to collaborate with people who are near to you in distance, in case you should want to meet face-to-face. This is particularly important for the third project. You may also switch groups after each project if you like. Finally, let me say that you do not need to meet face-to-face, but neither is it prohibited. Use whatevers collaboration strategies work for your group.

Software availability: It may be difficult for some of you to locate software depending on the resources you have available for your use. You should spend some time at the beginning of the course finding out what educational software might be available at a local school, library, or at a regional educational service center for you to use for browsing and studying. Alternative ways of finding software will be described; either (1) as full software or downloadable demo software, or (2) requesting software for preview from publishers with the intention that if you like it you might ask your school to purchase it. If you choose preview software as an option, you will need to move quickly because it will take a while to receive it. Usually companies give you 30 days to preview software.

Assessment of Learning

Dr. M evaluated students' work in a variety of ways. The table below lists the types of assessment and the percentage of scores for each assignment:

Table 32. *Assessment of learning*

Types of Assessment	Percent Scoring (Total: 100%)
Participation/Discussion/Preliminary activities	15%
TUTOR Software Project	15%
PBL Project/Presentation	25%
Quest Project/Presentation	20%
Individual Paper	10%
Final Exam	15%

The three group projects contributed to 60% of the total grade, while participation, discussion assignments, individual small-task assignments, issue paper, and final exam contributed 40% of the total grade. The KSOL *Gradebook* revealed that for students who received low grades were mainly due to their failures in completing individual assignments. In a collaborative learning environment, assessing individuals' contribution is challenging due to the nature of group work, because individual contributions might not be divided evenly. As shown in Omar's concern below, even for group members that did not contribute to group project, they might still get the same group grade:

> *Perhaps due to the fact that the grades are common for the group they know whatever happens they still get the same grade as everybody in the group.*

In this course, this concern had been considered by the instructor. As evident in participants' final grade for this class revealed, participants in teams B, C, E, and G, all received their final grades as an "A". However, participants in team D received two "B"s and one "C" while participants in team F received one "A", one "B", one "C", and one "D". As mentioned above,

166

participants' lack of involvement in discussions and failure to submit individual tasks resulted in different grades from those of their team members.

In the proceeding sections, observations and interpretations of data related to research question 4 were presented. By teaching the same course five times, Dr. M was able to provide specific course management strategies as well as instructional strategies in meeting the challenges of teaching an online PBL course.

Course management strategies used include:

- Check in the course management system often.
- Encourage each group to include different types of expertise
- Provide optional on-site lab
- Use private email to remind slow students and to understand problems
- Use Announcements section to provide instant reminders

Instructional strategies used include:

- Provide a collaborative learning environment
- Encourage time management
- Provide scaffoldings
- Provide strategies for successful online learning
- Use a variety of assessments

The implications of these findings and recommendations for designing an online PBL course will be provided in the next chapter.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

Research Goals

The purposes for this study include (1) to understand the dynamics of using PBL to guide online collaborative learning around projects, and thereby, to fill the gap in current knowledge on the impact of online PBL on students' learning experience; (2) to understand participants' learning experiences within KSOL, and to find out how participants deal with difficulties such as technical problems, time constraints, and group conflicts; and (3) to understand the instructor's experiences in structuring online courses that meet the PBL criteria and to meet a personal interest in designing better online learning environments that enhance quality teaching and learning for distance education.

This study provided specific descriptions about the nature of learning in an online PBL environment as experienced and perceived by a group of adult learners (11 in-service teachers, 2 substitute teachers, 1 college instructor, 1 university librarian, 3 pre-service teachers, and 1 on-campus graduate student). The findings of this study provide valuable insights for online educators and course designers to design and facilitate satisfying and successful online PBL learning experience. Although the findings of this study might not be generalizable to other settings, they may help us understand better what is going on in an online learning environment and may provide ideas for additional research on online learning.

Conclusions and Needs for Future Research

Research Question 1

> What are the quality and nature of participants' learning experiences over a series of different projects (as gleaned from their perceptions as well as their performance in three different projects) within the context of an online project-based learning community? What are some difficulties/problems associated with participants' learning experiences?

The participants in this study recognized the projects that they worked on were "real", "doable" and "useful", which made their learning meaningful and helped them to align their learning to teaching. These understandings motivated teachers and led them to go beyond many constraints such as the lack of time. This research provided empirical evidence suggesting that online PBL can foster learning around projects that are meaningful and relevant to teachers' classrooms. As a result, teachers were willing to step out of their comfort zones, to embrace change, and to conquer the time constraints. Although the lack of social cues in online communication may cause participants' viewpoints being misinterpreted by their peers, it was encouraging to see that participants often learned from their peers, not only about the course content but also about learning to use new technology tools.

Overall, participants' learning experiences with different projects within the context of an online PBL community were positive. The learning process documented in this study was a complex one requiring participants to work with others, deal with the complexity of PBL, and buy into a new way of learning about how to use technology tools that were also new to them.

Teachers in this study identified the need to learn more about classroom technologies they could use for their teaching and for their students' learning. As seen from participants' learning experiences over time, the PBL approach encouraged teachers in gaining first-hand experience in both the content and the new way of learning. Participants gained greater confidence and indicated in higher level of willingness to integrate technology into their

teaching. The finding from research question 1 suggests that participants' perceived project relevancy, authenticity, and real-work application is crucial in guiding participants' forming of driving questions, researching information to be used, and constructing artifacts to present their learning outcomes. Having the authentic audience of their own students in mind, the participants were more confident to talk about their ideas, to exchange thoughts, and to complete the projects. The authenticity of projects enhanced the interactions among group members.

Participants felt frustrated when the learning materials were complex or when they were not familiar with the topic of their group project. The findings suggest that the project *relevancy and authenticity* are crucial in forming driving questions, researching and investigating information to be used, guiding group collaboration, and making the project meaningful to participants. As discussed in Research Question 1, a group of science and math teachers had difficulties in forming a driving question relevant to their content areas and decided to do their project on a social studies topic instead. This made their learning and group experience more problematic in that particular project. How to help participants decide on a topic that is relevant and authentic to *all* group members would be an important topic for future studies.

Technical problems, such as navigation within the courseware, instances when group members did not respect deadlines or follow assignment guidelines, the lack of participation from certain group members, and lack of immediate responses to participants' discussion entries all contributed to the negative aspects of the online PBL experience. In addition, participants often felt frustrated with comments that lacked of clarity, were written with poor English skills, or were too long, superficial, or irrelevant to the discussion.

Research Question 2

How do participants' online project-based learning experiences affect their use of educational technology tools over the semester?

Participants' learning experience with four types of tools was observed within the online PBL context and documented. These tools included two communicational tools (message board–asynchronous tool and chatroom–synchronous tool) and two construction tools (concept mapping tool and Web authoring tool).

The biggest problem in asynchronous online communication reported by the participants was the lack of immediacy in their social interactions. A number of participants who worked at the same school decided to meet face-to-face instead. The context described in this study, although lacking the desired immediacy in social interactions, did provide a sense of intimacy and intense involvement for some groups to form friendship that was important for their feeling of a sense of community in the online PBL environment.

In this study, the synchronous tool–chatroom–was frequently used. An interesting finding is that participants either liked the chatroom or disliked it strongly. Participants loved the chatroom for its synchronicity feature that they could get instant feedback from their teammates. They did not like the chatroom because it was too hard to follow the conversations, especially if the group had more than three members.

The difficulty to find time for adult learners to meet as a group virtually or physically was a common concern, as one participant commented that "time really become the defining factor" in their project experience. Besides, participants reported that too many directions in the chatroom made the discussions superficial or hard to follow. Studies on chatting patterns or strategies used to manage chatroom would contribute to our understanding as to how this tool could be better used in online communication. Evidently, how to incorporate the "human touch"

(Shotsberger, 2000), as for example including videoconferencing in the online environment remains to be an important area for future research studies focusing on virtual meetings on the Web. Such studies would contribute to our understanding as to whether the lack of social connection via text-based communication tools could be improved. Research is needed with regard to the issue of online success, considering the high dropout rates in online courses (Frankola, 2001) and the motivational problems in online learning (Cornell & Martin, 1997).

In using the construction tools to create artifacts, participants expressed that these tools are useful for both teachers and student. However, many of the adult learners today are *digital immigrants* (Prensky, 2001), as opposed to today's young learners who are referred as *digital natives*. In this study, it was found that adult learners need sufficient time for them to become familiar with a new tool. Sometimes, it takes several attempts. For example, Martin's second experience with the concept-mapping tool changed his initial thoughts about this tool. He demonstrated a constructivist view of learning, that is, learning is not only uniquely constructed based on prior knowledge, experience (either good or bad) but also is an adaptive activity; learners either reject or adapt the learned objects based on their perceptions as to whether the objects are viable and functional or not. Furthermore, when teachers gain more confidence in using new tools, they showed a positive attitude toward using these tools in the future as evident from multiple sources of data in this study. This finding also indicates that students need more time to "buy in" to the content to be learned and the new way of learning in a constructivist learning environment (Perkins, 1991b). As Martin reflected, students would benefit from the PBL approach because they are not only *learning* the tools, but also *using* them. The *repeated exposures* to the tool reinforced the skills to be learned.

Martin: *The project method was helpful because we were introduced to the tools in stages, but we were also USING them to complete a bigger project which allowed for repeated exposure, which helped to reinforce the skills.*

Guzdial (1998) indicated that classroom teachers' comfort with technology is a critical factor for the success of their students. How the online PBL experience affects teachers' use of technology in their classrooms will need to be investigated in a longitudinal study.

This online PBL course required students to use a number of communication and construction tools as described above. Use of the project method assured that students would gain first-hand experience in using tools for communication and project construction. Over the semester, some participants developed their skills and some changed their perspectives toward learning new tools. Note that the project method could, if students let it, limit students' learning of new technology tools because the tasks were divided up by group members. Students would benefit from the PBL approach because they are not only *learning* the tools, but also *using* them. In addition, PBL is helpful for introducing new tools to students in different stages of the project. Finally, the *repeated exposures* to the tool reinforced the skills to be learned. As participants gained more confidence in using new tools, they become more resourceful and comfortable in using technology and they showed a positive attitude toward integrating technology into their teaching in the future. As their ability in using technology increased, some participants overcame their fears toward learning new technology tools.

Research Question 3

What are participants' group collaborative experiences in communicating and constructing projects online?

To understand group collaboration, three interaction patterns were used to examine group interaction: interactivity, synchronicity, and negotiability. Among the three, synchronicity was the most demanding factor for group collaboration. Synchronicity also affected the extent of interactivity. Negotiation was not obvious in the six learning groups. Three leaderships were also identified: rotating leadership, core leadership, and no strong leadership. Three groups that had core leaderships seemed worked well in the online context. It included one or two active learners to take control for the holistic project while passive (or slow) learner(s) contribute their own portions. Rotating leadership depends on equal contribution. And for groups that don't have strong leadership, they suffered the most. It took a certain amount of time for group members to get to know each other in groups and gradually built the *trust* and *camaraderie* online. Sharing perspectives and proving feedback for other group members helped to build a sense of community. Problems in collaboration included the lack of responses from group members, not being able to meet face-to-face, lack of social cues, empty praise, group size, and time constraints.

The need to meet together and work together (online or face-to-face) was a major concern for groups' collaborative experience in communicating and constructing projects. According to Ackermann (1996), one of the features of social learning is that we can learn from other's perspectives.

Consistent with Trentin's (2000) observation, in the current study most frustrations in group collaboration were related to interpersonal skills. In addition, asynchronous communication usually required the wait-time that can discourage social interactions and make

negotiation and co-construction of ideas difficult. For this reason, it is difficult to construct projects totally online when collaborating with a group. The results of this study suggest that the collaborative aspect of PBL in the online environment provided participants opportunities to interact with others, to learn from others' perspectives, to depend on each others' expertise, to help each other, to build leadership, and to be responsible for one's own project portions in order to achieve group goals. However, active communication by the participants is critical for building up a sense of community.

Initial evidence from this study suggests that the collaborative aspect of PBL in the online environment provided participants opportunities to interact with others, to learn from others' perspectives, to depend on each others' expertise, to help each other, to build leadership, and to be responsible for one's own project portions in order to achieve group goals. In this study, participants conceptualized group collaboration as *working together*. The finding is consistent with previous studies on collaborative learning suggesting that *synchronicity* plays an important role (Roschelle and Teasley,1995; Dillenbourg, 1999). Learners could be at different locations, but in some situations, they were keen on working together at the same time. Within the global society, distance learning includes learners from other countries who live in different time zones; in such cases synchronicity would be a challenge for distance educators in planning using synchronous communication tools. As for the use of construction tools in a collaborative way, an online concept mapping tool (or the whiteboard tool that embedded in KSOL chatroom) that allows group members to work together concurrently from different locations would provide a space for learners to exchange ideas, to talk about their thinking, and to make the plans for their project. Questions such as "Will the group members accomplish more group work if they are

provided with tools that can enhance their feeling of *working together*?" would be an interesting topic for future research.

Looking closely into collaboration in the context of this online PBL environment, it appears that participants felt most engaged when learning from and interacting with others. Early in the semester, there seemed to be a need to help participants develop bonds and relationships with their peers. Providing a *social space* or what Barron (2003) referred to as a *relational space* for participants to share their profiles and personal information at the beginning of the course would be very helpful for developing online social relationships.

Research Question 4

What are the instructor's experiences in structuring this online PBL course? What are the difficulties in meeting the six PBL criteria in an online PBL environment? And what are the strategies used to manage class virtually?

The instructional strategies used for this online course include: (1) provide a collaborative learning environment, (2) encourage time management, (3) provide scaffoldings based on the nature of projects, and (4) provide strategies for successful online learning. As the instructor pointed out, most of the difficulties in meeting six PBL criteria fell under the topic of time constraint. Because of limited time, students had difficulty finding time to meet virtually, to extend collaboration, build relations among group members, and to discuss reading assignment deeply. Time difference also made scheduling virtual meetings more difficult. And finally, to produce the artifact at a distance was also difficult.

Without doubt, a successful online PBL experience begins with a well-deigned online course. Swan (2000) and her colleagues suggested that (1) consistency in course design, (2) contact with course instructors, and (3) active discussion by the participants are crucial for online student success. Among these factors, active discussion should be considered as the most important factor for student success since frequent participation in discussion is typically required by most asynchronous online courses (Swan et al, 2000). Based on the results of this study, these factors would also be important for developing online knowledge building communities. To support learning that results in greater levels of student effort, satisfaction, and higher levels of cognitive engagement, course designers must find ways to structure learning activities to encourage an intentional, collaborative, and sustained knowledge building community. As mentioned earlier, the ideas of social learning and providing learners with the "social space" are important for us to consider regarding the nature of online learning

(Shotsberger, 2000).

One of the advantages of the online learning environment is its extendibility to provide ample resources to engage learners in constructivist learning such as the PBL approach described in this study. Using PBL in the online environment provides a "virtual space" for knowledge building–where participants added contributions to a shared knowledge base through conversation, negotiation, and authentic activity–as suggested by Brown (1989). This space allows for individual participant to *think* cognitively and metacognitively and to *talk* about their projects with others socially. Barron (2003) identified a dual-problem space when learners are involved in collaboration, "a *content space* (consisting of the problem to be solved) and a *relational space* (consisting of the interactional challenges and opportunities)" (p. 310). He suggested the need for a better understanding of how social and cognitive factors intertwine in the accomplishment of collective thinking. This strength of an online PBL environment can also be its greatest challenge not only for the online course designers and instructors, but for the online learners as well. In addition to the design of content space, how to provide relational space that supports interactivity, synchronicity, negotiability, and other needs (social and cognitive) is an important topic in light of the findings of this study.

Many questions remain to be investigated regarding how students experience online discussions/interactions and how the nature of this experience may affect their motivation to participate and learn online. Future studies should continue to observe adult learners' perceptions of online learning in the PBL context and identify factors that either help or hinder their learning and participation online. For example, in this study, although participants appreciated the opportunities to learn from others' perspectives and working styles, many believed that small group size would work better for online PBL. Studies that investigate group

collaboration factors, such as group size, leadership, or working styles would help identify important factors that contribute to a successful online collaboration.

As more and more students gain experience with online instruction through CMC, the use of the Web as a medium for the delivery of traditional instruction is no longer enough. Today, within the global society, when the boundaries for learning have come to be more fluid, how to improve online communication that embraces culturally diverse backgrounds would be a challenge for instructional designers and online instructors who will need to plan ahead and be more aware of such issues themselves.

On the other hand, adult online students need to be equipped with new skills to become more effective online learners, as well as facilitators and leaders. This is particularly important as problems inherent in asynchronous online communication such as lag time in peer feedback may have negative effects in sustaining student motivation and participation online. While much of the current literature on online learning has focused on the required competencies for online teachers, there is a growing need to provide specific design guidance for developing online PBL tasks and interactions that target higher level of cognitive engagement and encourage active learning for all participants. Based on this study, how to support high-level learning in the online PBL environment is an area of research that will have a significant impact on the future of online education.

The recommendations for online learners, online instructors, the University library, distance technology developers, KSOL, and design considerations for PBL based on findings from Research Questions 1–4 are summarized below.

Recommendations for Online Learners, Instructors, and Designers

For online learners
- It is strongly recommended that, for students who did not have online learning experience before, attending the course orientation is necessary.
- Undergraduate/younger students should be reminded that an intensive online learning course requires a time and motivation commitment.
- Check in the course management system often–on a regular basis.
- Use chatroom or other distance communication technologies on a regular basis.
- Recognize that interpersonal skills are important for group work.
- Make time for group meeting and group work.
- Realize that the group grade depends on all members' contribution.
- Be aware of using humor online.

For online instructors

- Develop a virtual orientation module for students who are unable to make it to the on-site orientation.
- The driving question of PBL needs to be guided to help learners make connections to their background knowledge, expertise, or interests in order to increase learners' motivation that is crucial to the quality of their projects and learning experiences. For example, asking students to create projects that they can really use in their classrooms would help.
- Provide a list of sample driving questions for different subject areas.
- Encourage students to help one another whenever possible.
- Remind students to make time for group meeting and group work.
- Create a social space, for example requiring students to write a short introduction and upload a picture to the Portfolio section inside KSOL for the whole class to see if possible.
- Provide more time and encourage more interactions before group formation
- Encourage polite language and Netiquette to show courtesy.
- Remind students to be aware of culturally diverse backgrounds if there is an international or other culturally different student involved.
- Allow for face-to-face meeting. For distance learners, encourage students to use video conferencing technology.
- Allow for changing groups.
- Provide scaffolding according to the nature of projects.

For the University library
- The University library should provide a section (online tutorial or face-to-face workshop) particularly for online learners in using library resources and Internet resources at a distance.
- There is a need to better inform the users about the maximum number of users that are logged in for searching Education Full-Text articles instead of showing an error message.

For distance technology developers
- Distance technology has its flexibility, but it cannot replace the social connection that people need when working as a group. Providing greater social connection through means such as video conferencing in order to build a sense of learning community is important.
- Make sharing files among different computers or operating systems easier.

For KSOL
- Improve the process of changing the default email address in the group space
- Improve the clarity of distinguishing public chatroom from group chatroom
- Improve the ability to turn in assignments by displaying digital dropbox file/receipt
- Provide built-in visual emoticons for users to use.
- Make formatting text in chatroom and message board available in KSOL
- Make spellcheck available in message board and chatroom in KSOL
- Provide archive of information automatically so it is not lost when instructor deletes a group space

Design considerations for online PBL

- Individual tasks and group tasks need to be properly considered, a learner's grade will depend on both group work and individual assignments
  - It also needs to be made clear for group members who have different expectations for their grades. For example, how can one high achiever in the group deals with other team members who are satisfied with a B or C grade?

- Team membership needs to be guided
  - Guide the team membership to include content expert and technologically skilled person.
  - Encourage team members to depend on each other, to grow "trust" in each other, and to be trustworthy themselves.

- Both flexible deadlines and absolute deadlines need to be available
  - Have absolute deadlines for projects they need other group's feedback.
  - Allow flexible deadlines for individual assignments.

- Changing team membership needs to be made available
  - This option helps to reduce the tension for groups that don't work well together.
  - Allow group membership to change only between projects, not in the middle of a project.

- Learning and doing need to be balanced
  - The balance of learning and doing is needed, although it depends on the

subject. The goal is that students would be able to use the learned content and apply to their contexts.

In addition to these recommendations, it is important for us to continue investigate the following questions: how can we prepare students to meet the expectations of constructivist learning activities such as project-based learning online? What are the skills that they need in order to be effective in asynchronous online environments when they are not able to meet and work face-to-face? How can we support students to be more effective in using written comments within a virtual learning community? How can we prepare students for the complexity involved in online project-based learning? What would be good "bridge" activities and scaffolding strategies to move students to higher-level of learning in online PBL? To encourage active online learning in a virtual project-based learning community, these important questions remained to be investigated.

REFERENCES

21st Century Learning. (n.d.). Retrieved October 11, 2005 from http://www.21learn.org/.

Ackermann, E. (1996). Perspective-taking and object construction: Two keys to learning. In: Y. Kafai and M. Resnick (Eds.). *Constructionism in practice: Designing, thinking and learning in a digital world* (pp. 25-35). Mahweh, NJ: Lawrence Erlbaum Associates.

Barab, S. A., Thomas, M. K. & Merrill, H. (2001). Online learning: From information dissemination to fostering collaboration. *Interactive Learning Research, 12*(1), 105-143.

Barron, B. J. (2003). When smart groups fail. *Journal of Learning Science, 12*(3), 307-359.

Barron, B. J., Schwartz, D. L., Vye, N. J., Moore, A., Petrosino, A., Zech, L., Bransford, J. D., & CTGV. (1998). Doing with understanding: Lessons from research on problem- and project-based learning. *Journal of Learning Sciences, 7*(3&4), 271-311.

Beers, M. (n.d.) How do we learn? Published by the BLIT Learning and Teaching Centre. Retrieved March 11, 2006 from sidebars website http://online.bcit.ca/sidebars/02summer/inside-out-1.htm

Blumenfeld, P. C., Soloway, E., Marx, R., & Krajcik, J. S., Guzdial, M., Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist, 26*(3&4). 369-398.

Blumenfeld, P. C., Krajcik, J. S., Marx, R. W., & Soloway, E. (1994). Lessons learned: How collaboration helped middle grade science teachers learn project-based instruction. *The Elementary School Journal, 94*(5). 539-551.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). (Eds). *How people learn: Brain, mind, experience, and school: Expanded edition*. Washington, DC: The National Academy Press.

Brown, J., S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, *18*(1), 32-42.

Brown, J., S. & Duguid, P. (1993). Stolen knowledge. *Educational Technology*, *33*(3), 10-15.

Bruce, B. C., Levin, J. A. (1997). Educational technology: Media for inquiry, communication, construction, and expression. *Journal of Educational Computing Research, 17*(1), 79-102.

Bruner, J. (1996). *The culture of education*. Cambridge, MA: Harvard University Press.

Bunker, E. L. (2003). The history of distance education through the eyes of the international council for distance education. In Moore, M. G., & Anderson, W. G. (Eds). *Handbook of distance education* (pp. 49-66). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Burge, L. (1988). Beyond andragogy: Some explorations for distance learning design. *Journal of Distance Education, 3*(1), 5-23.

Bush, V. (1945). As we may think. *Atlantic Monthly, 176*(1), 101-108.

Carr, S. (2001). Is anyone making money on distance education? Colleges struggle to figure out how much they are spending on online programs. *The Chronicle of Higher Education.* [Online]. Available: http://chronicle.com/

Chen, P. & McGrath, D. (2004-2005). Visualize, visualize, visualize: Designing projects for higher-order thinking. *Learning & Leading with Technology*, *32*(4), 2-5.

Collins, A., Brown, J. S., & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator*, 6-46.

Cornell, R. & Martin, B.L. (1997). The role of motivation in Web-based Instruction. In B.H. Khan (Ed.), *Web-based instruction* (pp. 93-100). Englewood Cliffs: Educational Technology Publications.

CREDE. (n. d.). Center for Research, Education, Diversity, and Excellence. Retrieved: October 2, 2005 from www.crede.org/tools/glossary.html.

Creswell, J. W. (1998). *Qualitative Inquiry and Research Design: Choosing among five traditions.* Thousand Oaks, CA: Sage Publications.

Curtis, D. (2002, September). The power of projects. *Educational Leadership,* 50-53.

Day, J., Lou, H., & Slyke, C. V. (2004-05). Instructors' experiences with using groupware to support collaborative project-based learning. *Distance Education Technology, 2*(3), 11-25.

Dewey, J. (1974). My pedagogical creed. In R. D. Archambault (Ed.), *John Dewey on education: Selected writings* (pp. 427-439). Chicago: University of Chicago Press.

Dillenbourg, P. (1999). What do you mean by collaborative learning? In P. Dillenbourg (Ed). *Collaborative-learning: Cognitive and computational approaches* (pp. 1-19). Oxford: Elsevier.

Dillman, D.A., Christenson, J.A., Salant, P., and Warner, P.D. (1995). What the Public Wants from Higher Education: Workforce Implications from a 1995 National Survey (Pullman: Washington State University Social and Economic Sciences Research Center, Technical Report #95-52).

Driscoll, M. P. (2000). *Psychology of learning for instruction.* (2nd Ed.). Needham Heights, MA: Allyn & Bacon.

Evard, M. (1996). A community of designers: Learning through exchanging questions and answers. In: Y. Kafai and M. Resnick (Eds.). *Constructionism in practice: Designing, thinking and learning in a digital world* (pp. 223-240). Mahweh, NJ: Lawrence Erlbaum Associates.

Frank, M., & Barzilai, A. (2004). Integrating alternative assessment in a project-based learning course for pre-service science and technology teachers. *Assessment & Evaluation in Higher Education, 29*(1), 41-61.

Frankola, K. (2001). The e-learning high dropout rates in online courses. *Syllabus, 14*(11), 14-16.

Fuchs, C. (2002). Social information and self-organisation. In: R. Trappl (Ed). *Cybernetics and systems, 1*, 225-230.

Gagné, R. (1965). *The Conditions of Learning*. New York: Holt, Rinehart and Winston.

Gibson, C. C. (2003). Learners and learning: The need for theory. In Moore, M. G., & Anderson, W. G. (Eds). *Handbook of distance education* (pp. 147-159). Mahwah, NJ: Lawrence Erlbaum Associates.

Giese, M. (1998). Self without body: Textual self-representation in an electronic community. *First Monday: A Peer Reviewed Journal on the Internet* [Online], *3*(4). Available: http://www.firstmonday.dk/issues/issue3_4/giese/index.html.

Goldman, S., Duschl, R., Ellenbogen, K., Williams, S. & Tzou, C. (2003). Science inquiry in a digital age: Possibilities for making thinking visible. In H. van Oostendorp (Ed). *Cognition in a Digital Age* (p. 253-283). Mahwah, NJ: Lawrence Erlbaum Publishers.

Grabe, M., & Grabe, C. (2004). *Integrating technology for meaningful learning* (4th ed.) Boston, MA: Houghton Mifflin Company.

Guzdial, M. (1998). Technological support for project based learning. In C. Dede (Ed.). *Learning with Technology* (p. 47-72), Alexandria, VA: ASCD.

Haake, J. M., Haake, A., Schümmer, T., & Lukosch, S. (2005). Collaborative learning at a distance with the project method. *Educational Technology, 45*(5), 21-24.

Hanna, D. E. (2003). Organizational models in higher education, past and future. In Moore, M. G., & Anderson, W. G. (Eds). *Handbook of distance education* (p. 67-78). Mahwah, NJ: Lawrence Erlbaum Associates.

Harasim, L. (1990). Online education: An environment for collaboration and intellectual amplification. In L. Harasim (Ed.), *Online education: Perspectives on a new environment* (pp. 39–64). New York: Praeger.

Hargis, J. (2005). Collaboration, community and project-based learning- Does it still work online? *International Journal of Instructional Media, 32*(2), 157-161.

Henri, F. (1992). Computer conferencing and content analysis. In A. R. Kaye (Ed). *Collaborative learning through computer conferencing: The Najaden papers* (p. 115 – 136. New York: Springer-Verlag.

Hiltz, S. R. & Turoff, M. (1978). *The network nation: Human communication via computer*. Reading, MA: Addison-Wesley.

Hollan, J., Hutchins, E., & Kirsch, D. (2000). Distributed cognition: Toward a new foundation for human-computer interaction research. *ACM Transactions on Computer-Human Interaction, 7*(2), 174-196

Jonassen, D. (1992). What are cognitive tools? In P. Kommers, D. Jonassen & J. T. Mayes, (Eds), *Cognitive Tools for Learning* (p. 1-6). Heidelberg: Springer-Verlag.

Kafai, Y., & Resnick, M. (Eds). (1996). *Constructionism in practice*. Mahwah, NJ: Lawrence Erlbaum & Associates.

Kearsley, G. (2000). *Online education: Learning and teaching in cyberspace*. Belmont, CA: Wadsworth.

Kommers, P., Jonassen, D. & Mayes, J. T. (Eds). (1992). *Cognitive tools for learning*. Heidelberg, FRG: Srpinger-Verlag.

Kozma, R., & Schank, P. (1998). Connecting with the 21st century: Technology in support of educational reform. In C. Dede (Ed). *Learning with Technology* (p. 3-27), Alexandria, VA: ASCD.

Krajcik, J. S., Bluemenfeld, P. C., Marx, R. W., & Soloway, E. (1994). A collaborative model for helping middle grade science teachers learn project-based instruction. *The Elementary School Journal, 94*(5). 483-497.

Krajcik, J. S., Soloway, E., Bluemenfeld, P. C., & Marx, R. W. (1998). Scaffolded technology tools to promote teaching and learning in science. In C. Dede (Ed). *Learning with Technology* (pp. 31-45), Alexandria, VA: ASCD.

Lajoie, S. P. (2000). *Computers as cognitive tool: No more walls*. Mahwah, NJ: Lawrence Erlbaum Associates.

Land, S. M., & Greene, B. (2000). Project-based learning with the World Wide Web: A qualitative study or resource integration. *Educational Technology Research and Development, 48*(1), 45-67. Retrieved October 12, 2005 from ERIC (FirstSearch) database.

Land, S. M., & Hannafin, M. J. (2000). Student-centered learning environments. In D. H. Jonassen & S. M. Land (Eds). *Theoretical foundations of learning environments* (p. 57-88). Mahwah, NJ: Lawrence Earlbaum Associates.

Lave, J. & Wenger, E. (1989). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Lehrer, R., Erickson, J. & Connell, T. (1994). Learning by designing hypermedia documents. *Computers in the Schools, 10*(1/2), 227-254.

Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications.

Liu, M. (2003). Enhancing learners' cognitive skills through multimedia design. *Journal of Interactive Learning Research, 11*(1), 23-39.

Liu, M., & Hsiao, Y. (2002). Middle school students as multimedia designers: A project-based learning approach. *Journal of Interactive Learning Research, 13*(4), 311-337.

MacGregor, S. K. & Thomas, W. R. (2002). Learning geometry dynamically: Teacher structure of facilitation? *Proceeding of the National Educational Computing Conference.* San Antonio, Texas, June 17-19. Retrieved October 12, 2005 from *ERIC (FirstSearch)* database.

Mann, C., Stewart, F. (2000). *Internet communication and qualitative research: A handbook for researching online.* London: Sage Publications.

Marchaim, U. (2001). High-school student research at Migal science institute in Israel. *Journal of Biological Education, 35*(4), 178-182.

Marx, R. W., Blumenfeld, P. C., Krajcik, J. S., Blunk, M., Crawford, B., & Meyer, K. M. (1994). Enacting project-based science: Experiences of four middle grade teachers. *The Elementary School Journal, (94)5,* 517-538.

Maxwell, J.A. (2005). Qualitative research design: An interactive approach (2nd Ed.). *Applied Social Research Methods Series, 41*. Sage Publications.

Mayer, R. E. (1996). *Thinking, problem solving, cognition* (2nd Ed). New York: Freeman.

McCreary, E. K. (1990). Three behavioral models for computer-mediated communication. In L. M. Harasim (Ed). *Online education: Perspectives on a new environment* (p. 117-130). New York: Praeger.

McGrath, D. (2002, November). Getting started with project-based learning. *Learning & Leading with Technology, 30*(3), 42-45.

McGrath, D. (2003, March). Designing to learn: A focus on design in project-based learning. *Learning & Leading with Technology, 30*(6), 50-53.

McGrath, D., Cumaranatunge, C., Ji, M., Chen, H., Broce, W., & Wright, K. (1997). Multimedia science projects: Seven case studies. *Journal of Research on Computing in Education, 30*(1), 17-36.).

McGrath, D. & Sands, N. (2004, April). Taking the plunge: A school district commits to a five-year plan with technology-infused PBL. *Learning & Leading with Technology, 31*(7), 34-36.

Merriam, S. B. (1998). *Qualitative research and case study applications in education: Revised and expanded from case study research in education.* San Francisco, CA: Jossey-Bass Publications.

Merriam, S. B. & Associates. (2002). *Qualitative research in practice: Examples for discussion and analysis.* San Francisco, CA: Jossey-Bass Publications.

Miles, M. B. & Huberman, A. M. (1994). *Qualitative Data Analysis* (2nd Ed). Thousand Oaks, CA: Sage Publications.

Moore, M. G. (1989). Three types of transaction. In M. G. Moore, & G. C. Clark. (Eds). *Readings in principles of distance education*, (p. 100-105). University Park, PA: The Pennsylvania State University.

Murphy, K. L., Drabier, R., & Luepps, M. (1998). A constructivist look at interaction and collaboration via computer conferencing. *International Journal of Educational Telecommunications, 4*(2/3), 237-261.

Murphy, K. L. & Gazi, Y. (2001). Role plays, panel discussions and simulations: Project-based learning in a web-based course. *Education Media International, 38*(4), 261-270.

National Center for Education Statistics. (n. d.). Home Page. http://nces.ed.gov/. September, 2006.

Nelson, T. H. (1987). *Literary machines.* South Bend, IN: The Distributors.

Nemiro, J. E. (2004). *Creativity in virtual teams: Key components for success.* San Francisco: Pfeiffer.

Newell, R. J. (2003). *Passion for learning: How project-based learning meets the needs of 21st-century students.* Lanham, MD: Scarecrow Press.

Özdener, N. & Özcoban, T. (2004, May). A project based learning model's effectiveness on computer courses and multiple intelligence theory. *Educational Sciences: Theory & Practice, 4*(1), 164-170.

Papert, S. (1980). *Mindstorms.* New York: Basic Books.

Papert, S., & Harel, I. (1991). *Constructionism*. Norwood, NJ: Ablex Publishing Corporation.

Perkins, D. N. (1986). *Knowledge as design.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Perkins, D. N. (1991a). Technology meets constructivism: Do they make a marriage? *Educational Technology,* 18-23.

Perkins, D. N. (1991b). What constructivism demands of the learner. *Educational Technology,* 19-21.

Perkins, D. N. (1992). *Smart schools: Better thinking and learning for every child*. New York: The Free Press.

Perkins, D. N. (1993). Person plus: A distributed view of thinking and learning. In G. Salomon (Ed.). *Distributed cognitions—Psychological and educational considerations* (p. 88-110). New York: Cambridge University Press.

Perkins, D. N. (1999). The many faces of constructivism. *Educational Leadership,57*(3), 6-11.

Perkins, D. N. (2003). Making Thinking Visible. Retrieved: June 26, 2005 from: *New Horizons for Learning* Web site: http://www.newhorizons.org/strategies/thinking/perkins.htm

Phillips, D. C. (2000). Constructivism as an epistemology and philosophy of education. In D. C. Phillips (Ed). *Constructivism in Education: Opinions and second opinions on controversial issues* (p. 17-18). Chicago: University of Chicago Press.

Piaget, J. (1952). *The origins of intelligence in children*. (Margaret Cook, Trans.) New York: International Universities Press.

Piaget, J. (1980). *Adaptation and Intelligence: Organic selection and phenocopy.* (Stewart Tames, Trans.) Chicago: University of Chicago Press.

Project Based Learning: The online resources for PBL. (2005). Retrieved April 9, 2006 from http://www.pbl-online.org/

Ravitz, J., Mergendoller, J., Markham, T., Thorsen, C., Rice, K., Snelson, C., & Reberry, S. (2004). Online professional development for project-based learning: Pathway to systematic improvement. Paper presented at meetings of the Association for Educational Communications and Technology, October 21, 2004. Chicago, IL.

Reeves, T. C., Laffey, J. M., & Marlino, M. R. (1997). Using technology as cognitive tools: Research and praxis. *Proceedings ASCILITE '97,* Curtin University, December 7-10. Retrieved February 29, 2006 from: http://www.ascilite.org.au/conferences/perth97/papers/Reeves/Reeves.html

Rosechelle, J. & Teasley, S. D. (1995). The construction of shared knowledge in collaborative problem solving. In C. E. O'Malley (Ed), *Computer-Supported Collaborative Learning*. (p. 69-197). Berlin: Springer-Verlag.

Rosenfeld, S. & Ben-Hur, Y. (2001). Project-based learning (PBL) in science and technology: A case study of professional development. *Science and Technology Education: Preparing future citizens, I & II*, 31-37.

Salomon, G., & Perkins, D. (1998). Individual and social aspects of learning. *Review of Research in Education, 23*, 1-24.

Scardamalia, M. (2002). Collective cognitive responsibility for the advancement of knowledge. In B. Smith (Ed.), *Liberal education in a knowledge society*. (p. 76-98). Chicago: Open Court.

Scardamalia, M. (2004). Instruction, learning, and knowledge building: Harnessing theory, design, and innovation dynamics. *Educational Technolo*gy, *44*(3),30-33.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. *The Journal of the Learning Sciences, 3*(3), 265-283.

Scardamalia, M., & Bereiter, C. (2003). Knowledge building. In *Encyclopedia of Education.* (2nd Ed., p. 1370-1373). New York: Macmillan Reference, USA.

Secretary's Commission on Achieving Necessary Skills. Teaching the SCANS Competencies. Washington, DC: U. S. Department of Labor, 1993. (ED 354 400).

Shotsberger, P. G. (2000). The human touch: Synchronous communication in Web-based learning. *Educational Technology, 40*(1), 53-56.

Smart, K. A. & Meyer, K. A. (2005). Changing course management systems: Lessons learned. *Educause Quarterly, 28*(2). [Online]. Available: http://www.educause.edu/

Song, S. H., & Keller, J. M. (2001). Effectiveness of motivationally adaptive computer-assisted instruction on the dynamic aspects of motivation. *Educational Technology Research and Development, 49*(2), 5-22.

Sorensen, E. K., & Takle, E. S. (2002). Collaborative knowledge building in Web-based learning: Assessing the quality of dialogue. *The International Journal on E-Learning, 1*(1), 28-32.

Stahl, G. (1999). Reflections on webguide: Seven issues for the next generation of collaborative knowledge-building environments. In: *Proceedings of Computer Supported Collaborative Learning (CSCL '99),* Palo Alto, California, p. 600-610. Available at: http://www.cs.colorado.edu/~gerry/publications/conferences/1999/cscl99/.

Stahl, G. (2000). A model of collaborative knowledge-building. In B. Fishman & S. O'Connor-Divelbiss (Eds). *Fourth International Conference of the Learning Sciences.* (p. 70-77). Mahwah, NJ: Lawrence Erlbaum Associates.

Stake, R. E. (1994). Case study. In N.K. Denzin & Y.S. Lincoln. (Eds). *Handbook of qualitative research*. (p. 236-247). Thousand Oaks, CA: Sage Publications.

Stake, R. E. (1995). *The art of case study research.* Thousand Oaks, CA: Sage Publications.

Stake, R. E. (1998). Case study as qualitative research. In S. B. Merriam (Ed), *Qualitative research and case study applications in education: Revised and expanded from case study research in education.* (p. 26-43). San Francisco, CA: Jossey-Bass Publications.

Stake, R. E. (2003). Case studies. In N.K. Denzin & Y.S. Lincoln. (Eds), *Strategies of qualitative inquiry*. (2nd Ed.). (p. 134-164). Thousand Oaks, CA: Sage Publications.

Staver, J. R. (1998). Constructivism: Sound theory for explicating the practice of science and science teaching. *Journal of Research in Science Teaching, 35*(5), 501-520.

Swan, K., Shea, P., Fredericksen, E, Pickett, A., Pelz, W., & Maher, G. (2000). Building knowledge building communities: Consistency, contact, and communication in the virtual classroom. *Educational Computing Research, 23*(4), 359-383.

Thomas, J. W. (2000). *A review of research on project-based learning.* Retrieved September 11, 2005 from: http://web.archive.org/web/20030812124529/www.k12reform.org/foundation/pbl/research/

Toolin, R. E. (2004). Striking a balance between innovation and standards: A study of teachers implementing project-based approaches to teaching science. *Journal of Science Education and Technology, 13*(2), 179-187.

Trentin, G. (2000). The quality-interactivity relationship in distance education. *Educational Technology, 40*(1), 17-27.

Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological Bulletin, 63*(6), 384-399.

U.S. Department of Labor. (1993). *Teaching the SCANS competencies* [Online]. Available: http://wdr.doleta.gov/SCANS/teaching/teaching.pdf.

Viner, M. (2003). Observations and exploration of a sequence of design environments: Students designing a series of multimedia projects. *Dissertation Abstracts International, 64* (12), 4433A. (UMI No. AAI3113979) Retrieved March 11, 2006 from Digital Dissertations database.

Vygotsky, L.S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Wang, M., Laffey, J. Wangemann, P., Harris, D., & Tupper, T. (2000). How do youth and mentors experience project-based learning in the Internet-based shared environment for expeditions (iExpeditions). Paper presented at *American Education Research Association (AERA)*, New Orleans, LA, April 24-28, 2000. Retrieved October 12, 2005 from ERIC (FirstSearch) database.

Wang, M., Laffey, J. & Poole, M. J. (Jan 2001). The construction of shared knowledge in an Internet-based shared environment for expeditions (iExpeditions). *International Journal of Educational Technology, 2*(2). Retrieved October 12, 2005 from ERIC (FisrtSearch) database.

Wilson, B. G., & Myers, K. M. (2000). Situated cognition in theoretical and practical context. In D. H. Jonassen & S. M. Land (Eds). *Theoretical foundations of learning environments* (p. 57-88). Mahwah, NJ: Lawrence Erlbaum Associates.

Yang, S. C., (2003). Computer-mediated history learning: spanning three centuries project. *Computers in Human Behavior, 19*, 299-318.

Yin, R. K. (1989). Case study research, design and methods. (rev ed.). *Applied Social Research Methods Series 5*. Thousands Oaks, CA: Sage Publications.

Yin, R. K. (1994). *Case study research, design and methods.* (2nd ed.). Thousands Oaks, CA: Sage Publications.

Yin, R. K. (2003). Applications of Case Study Research. (2nd ed.) *Applied Social Research Methods Series 34*. Thousands Oaks, CA: Sage Publications.

APPENDIX A: Team A Project 1 Experience

Team A members: Lillie, Dora, and Tonya

Project 1	Lillie	Dora	Tonya
Project 2 & 3			

Project 1 experience
Project title: The Oregon Trail, 5th Edition
Points received: 6/6 pts

Team A did very well for project 1. But problems started to show. Dora complained that not all team members participated, as she described in this reflection:

Our group had trouble getting together for our first couple of chat times; Tonya and I were the only members present.

I felt Lillie wanted the rest of the group to work around her schedule that includes watching TV.

We became concerned about the other two members of our team after our second chat when only Tonya and I participated. We had to submit our posting without their responses..

Our next chat session went a lot better. All four of us were there to chat, but before we could finish our discussion, Lillie had to leave to watch her favorite TV show. This did not set to well with me. I felt that if we set a time by rearranging our schedules, then we needed to keep the time free. We all have busy schedules and would like to spend a little time relaxing. That is a luxury that I don't have this semester.

After I had signed off I felt I had been a little short with the girls about this issue. Guess who had to make some calls to apologize?

Tonya worried about trusting her team member to post the summary of the team's work as well as that people might not have the same working style as she did:

As far as being satisfied with group online learning, I am to a point. I mean, it is nice to work in a group and give input but not always be responsible for posting the assignment. The flip side is not being able to contribute your own original work and worrying whether or not the person in charge is going to post the assignment.
When topics are discussed and the group gives input, it is up to the person in charge of posting the assignment to mesh it together as one. Therefore, what I might have thought was important to include may not have seemed important to the author.

In addition, Tonya talked about her many years of collaborative experience in college and what she thought would be good for motivating group members:

> *During many of my courses at University I have had to participate in the collaborative group process. There are always those who show up and give their all. Then there are those who would rather watch a TV show or something else. I would prefer to do my own work and post it. However, I know that in the real world we have to work with other people who may not have the same personality that we do or the same style. That is alright and we can always learn from one another. I just think that we have to work really hard to keep each other motivated and make everyone feel that their thoughts and comments are important.*

The online format provided flexibility for learning, but many life commitments could get in the way too, such as children, parent-teacher conferences, or even TV shows, as Dora described:

> Dora: *I was unable to join the rest of my group for the scheduled chat session, I felt really bad but I was caught up in Parent Teacher conferences well past the time that had been allowed. I rushed home and posted my lesson plan on to our group site and then e-mailed the rest of the group. I called Cindy and Tonya to let them know the lesson plan was posted. I didn't know Lillie's phone number. Cindy understood, because the same thing happened to her since we both work in the same district.*

Lillie appreciated the convenience of distance education, but her main concern was not seeing her teammates face-to-face:

> *Tonight we chatted in the chat room. It is so weird to talk to the members of my group that way. It is also very nice, not having to drive somewhere to "meet" so time consuming. It is hard not seeing my group members in person though*
>
> *A not so good part of this for me is not being able to actually see my group members as we work on something. It is hard to get a feel for what someone is thinking without hearing the tone of their voice or their expression as they talk. This is also a good thing because you can get a lot more done in a smaller amount of time. This is due to the fact that you do not have to drive anywhere to meet and the time we spend together in the chat room is pretty much all on the assignment. It is not as easy to get off task talking about other things when you are in a chat room. At least that is my perception.*

Nonetheless, Lillie described the problem with dividing group work:

> *Tonight, we had a great discussion about the project. I am going to type up our thoughts and post a draft by Saturday for everyone to look over. I like having one person do something rather that dividing up everything piece by piece. That way the assignment will have one stream of consciousness flowing through it. At the same time it is still a group effort because I am including the ideas we discussed in the chat room in with what I write as well as receiving input about the draft after I post it.*

Finally, team A finished project 1 and received full points for their group project. As Dora described:

I believe that my group members are finally all working together to complete our projects in a timely manner.

It seems that our group is finally getting into the swing of working together. We were just diamonds in the rough, that are beginning to shine!

One time, Lillie indicated in her journal that she had the wrong time for group chat that caused her missed the chat.

February, 26, 2006 Ooops! I had the time wrong for my groups chat tonight and missed it. They went ahead and discussed the pros and cons of multimedia tools. I am going to post my thoughts on our message board and email them my apologies. I hope that is okay!

While working on the preparations for project 2, Dora and Tonya proposed to Dr. M that they would like to form a new team. Dora expressed her anxiety after making the decision, as evident in her reflection:

Dora: *I had long discussion with Tonya that was long over due. We decided it would be best to see if we could separate ourselves from the other two members of our group. Members of our group are only scratching the surface information during our group discussion. I do not feel they are taking the class as serious as we would like. I am not comfortable with the papers that were being turned in as part of my grade. Together Tonya and I composed and emailed a letter. We sent it to our instructor. I am anxious to hear her response.*

The situation got complicated, with lots of emails exchanged among the group members and the instructor:

Dora: *Wow! Who would have ever guessed how out of control this issue would get! Dr. M, I want to apologies to you. Tonya and I would never mean to cause you this much grief. After reading all the email responses, I feel very frustrated! I believe that many of the emails reveal the difficulties we have been experiencing this semester. I am so relieved we received word that we would be working as a group of two for the rest of the semester.*

Not surprisingly, this decision also made Lillie uncomfortable, as she described:
Lillie: *Wow! I cannot believe what just happened. Two members of my group have decided they do not want to work with me or Cindy. I really believed we were all working so well. I really don't understand what happened. Also, what really bugs me is how it was handled by them as well as my professor. There was no prior discussion about it. The whole situation was avoided it seemed like to me. As a teacher who often*

times has students working in groups, there are often group members who have problems with other group members but I force them to work it out...not just give in and let them switch groups. I mean what does that teach them...when you have a problem don't deal with it avoid it. I am very very frustrated with this whole situation.

Archived in another chat history, Tonya had a conversation with Dora concerning this issue:

Tonya: *Okay, this is how I fell. We sent an email to ask to work as a team. Not because we don't like the other two members, but because we want a different experience in the class. It seems our schedules were conflicting or people did not want to chat, etc. Then the postings didn't really include all of our input.*

Dora: *I also feel that we are both perfectionist, and its hard working in a group that does not put in the same effort that we do.*

Tonya: *I know, and we have both experienced, groups that just don't work. It is not anyone in particulars fault but what you just said is true. Some people have different priorities and expectations.*

Dora: *All I know is I would like this issue taken care of as soon as possible.*

Tonya: *I guess email [Dr. M] and tell her that we did not intend to make our other members upset, however, we would still like to proceed as a team. I don't think we have any other options now anyway.*

Dora: *A team of 2!!!!!*

After Spring Break, Lillie and Cindy joined team F, meanwhile, Tonya & Dora formed a new team, team G. Team A was no more in existence, and team A's group workspace was deleted accordingly. One unintended consequence was that all the group postings such as the group message board postings as well as the chat histories were gone:

Dora: *The only bad thing is that we lose all of the files.*
Tonya: *What files? We still have the postings, right?*
Dora: *Chats.*
Tonya: *Oh, yeah. That is very true. That is where my journal info is!!! Oh NO.*

Team A neither finished project 2 as a team, nor worked together toward the end of the semester.

APPENDIX B: Team B Project 1–3 Experiences

Team B members: Rebecca, Nina, and Doris

Project 1 Experience

Project title: *Kid Speaks Spanish*
Points received: 5.5/6 pts

Team B had a core leadership initiated by Doris and Nina. The tasks were divided up according to each person's strengths. To decide on which software to review, team B used Nina's kindergarteners as target audiences for using "*Kid Speaks Spanish*" software:

Rebecca: *We used Nina's expertise in her kindergarten classroom in order to help determine the best software.*

Nina: *Each person had her own job. We found it works best when we take turns with the different responsibilities, that way no one is stuck with a job they do not like for a long period of time…. We each had our own duty.*

Rebecca: *Our group is aware of each person's strengths and weaknesses. So, job assignments were assumed.*

Doris: *We divided the task of reviewing the software as follows…*

Rebecca: *The next meeting we wanted each person to have their opinion ready on the type of software, ideas about the ten criteria, and the stage of instruction we could use this software most efficiently and effectively.*

Even though the tasks were divided, team B felt they were "working together", and they also showed a sense of solidarity when working as a group:

Rebecca: *Working together in a group seems to come so naturally for us and was invaluable in accomplishing this assignment.*

Nina: *I enjoy working with these women and would not want to go through this experience with anyone else!*

Generally speaking, team B's learning experiences with project 1 were positive. They gradually developed a positive attitude toward online learning and enjoyed learning others' perspectives:

Rebecca: *I am learning a great deal. I appreciate doing this class on line. I like being in control of when I do an assignment. I like seeing the immediate feedback and being able to engage in a discussion with other class members on line. There is no way I would be this close to getting my Masters if it were not for classes like this. I am able to be with my family and fulfill my education dream as well.*

Doris: *It is the way of the future and not only are we able to complete our Master's Degree, but we are learning important communication skills in technology at the same time!*

Doris: *I really enjoy hearing each person's opinion on a given topic. I feel we each have strengths that benefit our group members, and at the same time our weaknesses become less obvious since we see other ways of accomplishing a given task.*

Project 2 Experience
Project title: *Recycle-Reuse-Reduce; A Project Based Program*
Points received: 11/12 pts

Team B used the same strategy working for project 2, they divided the tasks according to one another's interests or expertise. As Nina described:

Nina: *Doris focused on communication tools, Wendy searched for higher-order thinking tools, Rebecca researched cognitive tools, and I concentrated on productivity tools.*

Moreover, when deciding on which grade level to be covered for project 2, team B accommodated each person's teaching level into the project design.

Rebecca: *We had a long discussion about the direction in which we should go. One idea that was very important to us was to include Nina's kindergarten class, Doris's fifth grade science, my fifth grade language arts and math class, and Wendy's sixth grade science class. We decided a recycling project could fit within all of our classes.*

Maybe due to the unfamiliarity of using the chatroom, team B entered the public chatrrom instead of their own group chatroom in order to complete the chat assignment during the project 2 phase. In this chat, team B discussed the reading assignment and some of the technology tools. For example, when one participant talked about her new tool - a webcam - other participants discussed the possibilities of how and when to use this tool. Personal experiences were shared in using these tools:

Doris: *Hi all! I thought we could start this chat by talking about what we felt was important in Chapter 5!*

Rebecca: *Let's go.*

Nina: *I though Chapter 5 had lots of information to learn. I use the internet as a tool more for personal use than classroom use.*

Doris: *I was interested in the pros and cons of computer-mediated communication. (CMC) One of the pros that I thought was interesting to me was the average response for a student in a classroom setting consists of about 12 words, but when a student chats*

online the response rate is 106 words. That is quite a difference. It does allow more participation.

Nina: *I could see how you guys could use it at your teaching level, but I don't think kindergarten students are quite ready!*

Rebecca: *I think the kids who have a different time answering questions in class would really benefit.*

Nina: *I agree*

Rebecca: *How could kindergartens use this? Are they even typing?*

Nina: *Some are, but some are still learning the letters in their name.*

Doris: *I think it is good practice even for alphabet recognition*

Nina: *Do you guys use the internet for communication, inquiry, or construction?*

Rebecca: *I found netiquette interesting. I think students need to be aware that they should use their manners everywhere. I use the internet mostly for communication. I love email and I just purchased a web cam.*

Doris: *I use the internet mostly for inquiry and construction, but there is never enough time at school, plus we are blocked from many sites.*

Nina: *Have you used the web cam?*

Doris: *How do you like the web cam?*

Rebecca: *It is really hard to learning something new, but it has been great with [Jeff] traveling so much. He wanted to be able to see the kids while he was gone.*

Nina: *Can you use it in your classroom?*

Rebecca: *I am hoping to use this as my individual assignment. I am hoping to use it within my classroom.*

Doris: *Sounds like good ideas.*

Rebecca*: I need to have the school purchase one so that I can use it on my maternity leave.*

Nina: *I think the students would also like to do a presentation using the web cam. Is this something your students could handle?*

Rebecca: *Like anything, I'm use I would need to use a lot of preteaching. Once they are familiar with the do's ad don'ts, kids learn technology so much faster than we do.*

Team B showed resistance to the new way of communication; it was evident in their one-time chat experience. As they described:

Nina: *If we do this again, I need to fix my computer, and we might do it after I put my children to bed.*

Rebecca: *I agree.*

Nina: *I think we did okay for the first time.*

Rebecca: *Should we use this for the next project?*

Nina: *I do miss the face to face conversations we have*

Rebecca: *Me too.*

Nina: *I guess that is what I am used to.*

Rebecca: *Change is hard.*

Doris: *I think we do better face to face, but this would work if we were a further distance apart*

Nina: *I agree.*

Doris: *So true! Thanks for your thoughts I am ready to sign off!*

Some of the difficulties for using chatroom were identified. As Rebecca and Doris reported in their project journals:

Rebecca: *The chat room was most difficult because of the time lag*

Rebecca: *The chat room was difficult because I had a difficult time following the conservation (conversation?) between several different people. About the time I though of how to respond the topic have changed before my thought was posted.*

Doris: *The chat room with four people was very difficult. The topic changes so rapidly, while you are responding the next question had already been asked.*

Rebecca: *The chat room really did not benefit our group, but I'm sure if you had a group that was working together many miles away I'm sure this would be more beneficial.*

Team B developed a strategy for handling disagreements when they had different opinions. As Rebecca described:

Rebecca: *The more our group works together, the better we function, and the more interesting our projects get. It amazes me how many ideas can be generated when a group of teachers collaborate together!*

Rebecca: *It is difficult to share all of our thoughts and ideas on this project. Anytime disagreements arose, we would hear out what each member had to say. Then there always seemed to be a group member who tended to be unbiased who would make the final call. I would not term it a disagreement, rather a difference of opinion that resolves itself quickly and we move on.*

Project 3 Experience
Project title: *The American Civil War*
Points received: 12/12 pts

Team B had a difficult time working on project 3. The most frustration came from the lack of experience in using web-authoring tool to create a Web page. Although there was an open lab on how to create web pages on a Saturday morning, no one in team B attended the workshop. One of the participants indicated that it took more than two hours driving from where the team lived to the campus, also, for working moms, weekends meant more responsibilities for family.

Some of the difficulties as identified by the team included software availability, sharing, browser default format, and information overload. As the participants described it:
Doris: *The web authoring tool was the most difficult, once we learned that you could use a macromedia tool such as Dreamweaver it became much easier*

Doris: *I know there are several programs that make Web authoring possible, but it was difficult to share files because some were not viewable to all of our team.*

Rebecca: *Our group experienced a lot of frustration when putting it together. When posting the final product, there were several items not coming together as planned. This also made revising our webquest difficult since we were "fixing" something that we had already done.*

Doris: *I can honestly say this project was frustrating! I did learn some things not to do, like assume that because the web quest shows properly on your computer it may not display properly once it is sent. It is frustrating working that many hours and even utilizing the web quest at our school, and then have it displayed improperly once it was sent.*

Rebecca: *WOW! What information we have! This was really overwhelming. There are so many possibilities when creating a Web Quest.*

Doris: *Technology issues of this type make project, file sharing, and communication difficult.*

Nina described how the team solved the problems by adapting a template from the Internet and divided the tasks in order to complete the project.

We searched the Internet for a Web Quest template that described the steps in completing the project. We then divided up the tasks that needed to be completed.

First I felt overwhelmed. We has so much information that I did not know if we were going to be able to organize it in the Web Quest, but after we got started, it was not as bad as I thought it was going to be.

Also, Doris went for help from the school's tech teacher:

Doris: *Yikes, our web quest came up and it is a mess! Went down and conferred with the tech teacher-he was stumped, his only suggestion was to try and send the htm. File again, we did it id display better, but still not correctly.*

Finally, team B proceeded and finished the project on time.

Nina: *We probably could have continued to make revisions, but felt the project meet our goals for our students and our class assignment goals.*

Team B used the Main Message Board (MMB) to post their team's work. Moreover, they perceived the MMB as an avenue to exchange ideas as well as to learn from others:

Rebecca: *I like the message board the best because I was able to read other people's insights and opinions. I could learn just as much here as I did reading the material in the book.*

Rebecca: *The message board was nice to compare my project to what others were producing.*
Doris: *I thought the message board was most interesting. It is always good to get other perspectives and ideas about projects and assignments.*

Doris: *The threaded discussion message helped because you could ask other people in the class questions about their projects and also receive ideas and suggestions from them.*

To help students visualize due dates for each assignment, Dr. M marked the due dates on the KSOL calendar. Rebecca appreciated this feature and used it as an organizational tool:

Rebecca: *Because organization is key to my success, I would like to see what the rest of the calendar contains so that I am able to plan ahead as much as possible.*

Another KSOL tool mentioned was the File Drop Box. One participant wondered if she could use it in her school so her students could submit files to her:

Doris: *I would like to know how to set up a file drop box, I don't understand that process, but was wondering if it might be a possibility for students at our school to be able to use the process to hand in assignments to me.*

Overall, team B participants felt they had extended their knowledge about technologies and had gained a better idea of how to implement them in their classroom. As Rebecca and Doris described:

Rebecca: *I learned many different ways that technology could be implemented in the classroom. Technology does not have to be an add on, but can be used to motivate students to do class work in a fun and creative way.*

Rebecca: *I did not even know that most of these projects existed before this class. I really was not aware of all the different file names. I always looked at technology as one more thing to do. I am now ready to implement the various projects within my room. So I would say the content and the skills increased my knowledge base.*

Doris: *I have learned some new techniques for incorporating technology into my classroom. Some of the research that was necessary allowed me to see other projects that had been implemented by other teaching experts.*

In summary, Nina made a comment about her learning experience with these projects, as she said:

Nina: *The women I have to work with in my group are outstanding! I did get frustrated during this project but they helped me through it. I have learned a great deal from them as well as learning on my own! I enjoy working with these women and would not want to go through this experience with anyone else!*

APPENDIX C: Team C Project 1–3 Experiences

Team D members: Brian, Kate, Carol, and Martin

Project 1	Brian	Carol	Martin	
Project 2 & 3	Brian	Carol	Martin	Kate

Project 1 Experience

Project title: *The Stem Cell Guy*
Points received: *5.5/6*

Team C had a rotating leadership, as Carol described:

Our current mode of operation is to take turns posting information on the main message board after we reach a consensus on the group message board. The main way we reached a consensus was either by taking a "majority rules" approach or, because we take turns posting on the main board, the person who posts the information makes the final decision. This works well as long as every person in the group has contributed their ideas. If they have not, it burdens the person who posts the information with doing most of the work. This is unfair and, thankfully, this is not happening with my group.

The pattern for group work as identified was the group met in chatroom to brainstorming ideas, then had one individual post a draft summary on the group message board, others provide feedback, and finally the group reached a compromise. The collaboration worked well by dividing the tasks, but problems could still occur, for example:

Carol: *In the tutor project, I took the role of posting my view of a lesson plan for our groups chosen topic: Stem Cell Guy. Other members of my group gave their ideas and suggestions based on my lesson plan (because my lesson plan was posted first) and one member posted the final lesson plan on the main message board based off of the groups accord. The same format should have been followed with the justification, however, it was very close to the due date and not all group members had a chance to post their ideas and suggestions. Unfortunately, this may have caused one member of our group to post the justification with mostly his thoughts.*

Carol further asserted that just combining the individual tasks into one project did not make the project a complete one. The group needed to work ahead of time in order to allow more time for weaving together everyone's thoughts. As she suggested:

Carol*: My main apprehension is that the group will not work enough ahead so everyone's ideas and suggestions are considered when making a final posting. I believe that if this occurs a group member will post this concern on the board and the members will adjust any unwanted behavior with out resentment.*

Carol furthered expressed her positive attitude toward other projects, as she said *"I trust my group members enough that we will continue to be professional through out the semester."*

Team C used the group message space frequently; not surprisingly, some of the difficulties in using this asynchronous technology were also mentioned:

Martin: *If someone poses a question, it's usually the next day before it gets answered and then another day until the reply.*

Brian: *The difficulty of on-line learning is that I may log on at midnight and have a question that I may not be able to get answered until the next day prolonging the completion of assignments.*

Martin: *Sometimes the online parts of this that should speed things up, make things take forever if people aren't checking messages, which I definitely am guilty of as well.*

Martin: I have mixed feeling at this point. It's nice to have the message board as a central point to post information, but it's kind of a hassle to figure out exactly how to communicate in a way that keeps everyone comfortable with the timeline and the final product. I tend to be a perfectionist and though I was relieved when someone else volunteered to post the final discussion I also had to work hard at not being uptight about the final product that was going to be turned in in my name.

After the group posted their discussions, each participant was required to reply to one or two other teams' messages. These assignments were designed not only to encourage learners to learn from different perspectives but also to provide feedback and suggestions for improvement. However, Brian pointed out that some of the students were too polite and this resulted in "empty praise," while some students might become more critical due to the anonymity in message board:

Brian: *I feel like the interaction on the main message board is somewhat contrived, I think for some people don't feel comfortable giving criticism to people that they don't know. For some reason, the anonymity seems to have the opposite effect on me. I find myself being more curt and critical in my replies than I would normally be, but perhaps this is just my reaction to my perception that many of the other replies are empty praise*

However, there were some disappointing moments, for example:

Brian: *One thing that disappointed me was when my wife and I had our second child I asked the group if anyone would finish the project for me because I did not feel I had time to do a sufficient job and no one was willing to volunteer. I do realize that it was my turn post the assignment and to pull my weight in the group that it was my responsibility to finish the project. In return I think there are hard feelings that we did not get full credit for the software review.*

Some participants suggested ways to improve their group communication by responding to questions more frequently, or even call or meet people face-to-face.

Martin: *As we were working on this project, I sometimes felt like some of the exchange could have been so much easier over the phone.*

Martin: *The next best thing would probably be for everyone to be more prompt in responding to questions. It could be nice if we could change the e-mail entered in KSU online, because several of us don't use our K-State accounts that the e-mails are sent to (I would have my KSU account forwarded to another account, but I don't want all the extra junk mail in my other account).*

Brian: *Also, with all members having the opportunity to see one or more group members at least once a week is the major reason that we can produce projects without much difficulty.*

Martin: *Overall, I think this format has potential, but I think it would be better served to be more of a combination of online and face-to-face. I definitely miss the face-to-face real-time discussion. Maybe monthly meetings, or even video conferencing could address this issue?*

In addition, Martin identified that each teammate had different work styles yet the group worked out well because everyone was being flexible to adjust to others. As he described:

Martin: *This was the first assignment that I was responsible for posting and I think I preferred that role to a contributor to the discussion. As I mentioned in my first journal entry, I prefer to be in control, so I prefer to be in the role of the person who is making the final decision about what will be posted. I also tend to be comfortable with waiting until closer to the due date to complete my work, so again this role works out for me.*

Martin: *It's obvious that there are different work styles in our group with some wanting to work ahead and others (including me) being more comfortable with waiting until later to finish assignments, but so far I think everyone is flexible enough that no one is getting overly frustrated.*

So far, the team felt good about their first project. They liked the ideas, the collaboration, and the project being relevant and useful. As they reflected:

Martin: *It is a bit more work, but the group had some good ideas that made it work out well.*

Brian: *I feel that our team is pretty easy going and what the majority reason wants is what we go with.*

Carol: *So far, I feel as though I have identified some resources that I can use in my science class. In fact, I am trying to keep a record of all programs and internet cites that could be useful to my students and my two young children at home. So, in conclusion, I do feel as though this class is relevant and useful to my situation.*

Notably, Carol distinguished this online class from the ones she had before and stated her feelings about this new way of learning:

> Carol: *The primary benefit to this type of learning environment is that I am able to work at my own pace to complete assignments (within limits, of course). I am able to work on assignments during the work day, at home and anywhere there is a computer. I have had other types of online courses in which I felt as though I have not learned anything in the class. It is somewhat hard to discipline myself to read a plethora of information and report on it. I do not feel as though I am overwhelmed with the content and reading in this class. I really enjoy the collaboration piece! It is nice to be able to bounce ideas off of other teachers and get relevant feedback.*

Project 2 Experience
Project title: *Three Branches of Our Federal Government in Action*
Points received: *11.5/12 pts*

After project 1, Kate (from team F) joined Team C; although Kate did not state directly why she left team F, she compared her observations between these two teams occasionally. In her reflections, she implied that she had had a rather heavy workload for her former team (team F) and expressed a better feeling for the later team:

> Kate: *My second group really used the message board to our advantage so that tool was probably most useful to us.*

> Kate: *In my second group, I would say my role was just like everyone else's. We didn't really have an emerging leader because we all put forth the same work and effort.*

> Kate: *I did not stay with my first group but I would definitely stay with my second group.*

Team C used the same pattern while working on project 2. They determined the learning outcomes, divided up tasks, ant assigned people to work on either part A or part B of the project. But this time, Team C experienced a very difficult time. The problem started from the third chat when the team was trying to decide on the project topic.

Martin was absent; below are the conversations among the three participants who joined the chat:

> Kate: *Do we need to decide what our project is going to cover?*
> Carol: *perhaps something involving physics and mathematical graphs?*
> Brian: *sounds good to me*
> Brian: *What is the easiest physics concept?*
> Kate: *I struggled in all types of science just to warn you!*
> Carol: *motion probably, speed, velocity, acceleration…*
> Brian: *The district has the CBR that can be used with speed and velocity and is used on the TI – 83 and use excel to show data*
> Kate: *I'll be fine with whatever we choose*

Carol: *sounds cool. But I have no idea how it works. Could I learn it quickly?*
Kate: *I would have to learn it all too*
Brian: *the CBR?*
Kate: *Would we want to do something with social studies?*
Carol: *how so?*
Kate: *There's a lot of research to be had there*
Kate: *Off the top of my head, explore different cultures. Lewis and Clark expedition…*
Brian: *something with the different branches of government might not be that bad either*
Kate: *That could work too*
Carol: *the branches of government may be easy to use Inspiration with. It would also be easy to access higher level thinking skills of students*

Due to this decision, the team felt frustrated throughout the project for working on a topic that none of the team members were familiar with. Martin blamed himself for missing the chat. In their reflections, participants reported their feelings. For example:

Carol: *After a long debate in our group chat room, Team C decided to write and create our Tool Project based on the three branches of government - a tough task because none of us are social science teachers! Our goal was to get students to understand the checks-and-balance system, roles and responsibilities of legislative personnel and the basic concept for a good idea to become law.*

Brian: *I found it very frustrating that the majority of us are mathematics teachers and the other two are science teacher[s] and we could not come up with something in either content area.*

Carol: *In the end we wound up working on a content area that none of us had a sufficient background in and after looking back on the project this is why part B people had so much trouble figuring out what to do.*

Martin: *I have to admit that I'm a bit confused as to why we are doing a social studies project when we're all math and science teachers, but I think I voided my vote by missing the chat. Not being a social studies teacher it's a bit challenging to know how realistic the implementation of this will actually be.*
I blame myself for a great deal of this because I missed the first chat where a lot of the important decision-making happened and then I didn't step up and immediately express my ideas about how to modify the project – I think the biggest thing that would have improved this project would have been if it was in one of our content areas. The idea itself I think was a pretty good one, but I would rather be working on something that will actually be making into one our classrooms rather than just going through motions for the sake of the assignment. I will try to voice this more clearly as we get into this next project. It by no means needs to be in my content area, but one of us should benefit by getting at least the beginnings of a project to use in the classroom.

To clarify the questions Martin had, he decided to improve the communication this time by calling everyone in his team. Although online learning provides the flexibility for learning but it also requires tremendous change, such as using distance technology for communication instead of meeting face-to-face. For this project it did not work out smoothly, as you can see here when Martin expressed his resistance of using chatroom and wanted to meet people physically:

> *Though I liked the convenience of electronic communication, the thing that I disliked the most about this class was just not having the face-to-face contact with both other students and the professor. One of the enjoyable parts of learning to me is doing it in the context of building relationships and I don't really feel like I got much of that at all from this class. I don't feel like I really know the people in my group any better than I did at the beginning of the semester and that's something that I miss.*

> *During this project (for the first time, really) I found myself wanting that face-to-face. There's only so much that is conveyed through text and (due to my less than proficient typing skills) I find myself being more blunt in my communication which I worry may send the wrong message. For the next project I am going to work on being more assertive up from with my ideas, but also trying to do it in a way that encourages discussion and collaboration.*

The other problem that occurred was due to the Spring Break that was in the middle of project 2. For people who had plans for holidays and those who hadn't, the schedule conflict once again showed:

> Martin: *I'm a little apprehensive because I'm going to be gone for all of spring break, but there are some folks in our group that are very interested in getting their part done right away, so hopefully they will be around for break and can get started.*

Participants expressed their positive experiences with this project:
Carol: *Overall, I believe that we did pretty well collaborating together, but not as well as we have done in the past.*

> Kate: *I think we all did a great job of contributing to the project and our communication both in the chat room and within our group message board definitely increased for this last part of the Tool project. We all seem to check for updates on our message board quite frequently to make sure we are not missing anything within our group.*

> Brain: *The only reason that the project was completed by the due date was that our group communicates very well with each other.*

Nonetheless, the weaknesses of this project were identified:

> Brian: *Another frustration that I had was the fact that the individuals working part A waited until the end of last week to finalize their part. In the end this only left part B with about 4 days to complete the student projects.*

Martin: *However, the tool project part is all just on the basics of the 3 branches with little that really encourages higher order thinking. Regarding group interaction and project success, I think that this project was our group's weakest effort yet. We did not have a clear idea about what exactly it was we were doing until right up to the wire and then it ended up being a bit of a rush job, but I sill think the end result was reasonable.*

Carol: *I feel as though our collaboration was more difficult to accomplish with this project. None of us had completed an assignment like this in our classes. So we were beginning completely from scratch. Therefore, in the initial part of the assignment we did not anticipate the types of complications that arose when the Part B group was working on their assignment. This forced Kent and I to reevaluate the part A portion and revise where necessary (hence the "revised" posting). It was somewhat difficult for each of us to answer each other questions when we were not sure of the how those answers would play out for the rest of the group members. One person making a slight adjustment in their small portion had an effect on the work the rest of the group accomplished.*

In this project, students used PBL criteria to design a PBL unit for their classroom. Brian and Kate reflected on this learning experience in bringing content into context:

Brian: *On the positive side of things this project has opened up doors for PBL ideas that I can use in my mathematics classroom. It is very easy to see how PBL projects promotes student learning and I will definitely be integrating projects like this in my course content.*

Kate: *Looking back over this project, I have learned quite a bit about project-based learning and projects that can go along with it. When reading the textbook I found that some of the things they mentioned could be done in my own classroom and I hope to implement those next year during certain units. I was really proud of my newsletter and I hope to continue to do this each month for our team to keep parents even more informed of what is happening within the classroom.*

Project 3 Experiences
Project title: *Tired of Paying $3 a Gallon? A WebQuest for 10th Grade Science*
Points received: 12/12 pts

Although team C members worked at the same school district, due to heavy teaching loads and sport-coaching duties, this team did not meet face-to-face for previous projects. Martin commented on the communication issues and how the group improved their communication by using a wide array of tools:

Martin: *Last project we found that the chat room was not sufficient enough to fulfill our needs. We kind of had some communication issues last time and unfortunately ended up with a project that wasn't even in anyone's content area.*

Martin: *We were actually able to make more efficient use of the technology by communicating through talking and e-mail (between most of the group) and chat and cell phone at the same time. It has been good to get a little more comfortable with chat and distance communication, but I think it's really a challenge to do group work that way exclusively--I think we struck a good balance this time.*

Nonetheless, this time, team C decided to meet face to face.

Martin: *Carol and I were talking about our project in the hallway at school today and we both think that it would be a good idea to physically get together on this one.*

Brian: *Our group decided to meet one evening to start and finish the project instead of using the chat room. Last project we found that the chat room was not sufficient enough to fulfill our needs. The group met and hashed out all the aspects of the webquest and each of us researched and collaborated on all aspects of the project.*

Carol: *I enjoyed being able to meet to get the majority of this project finished in one sitting. I felt as though everyone contributed equally and as always, we got along with each other well.*

Martin: *The difficulty in scheduling a face-to-face definitely makes the online discussion more attractive, but I think we've got it worked out that four of us will get together tomorrow and at least get some decisions made and make sure we're all on the same page--maybe we'll even get a chunk of the project done. The meeting was a real success. We all got together in my classroom and I wheeled in the mobile lab so everyone had their own computer. The face-to-face meeting this time made this project the smoothest running of all the ones that we've done so far, but it also required some sacrifice in terms of scheduling. In a few hours on one night we were able to complete 90% of the project and had a clear plan of what still needed to be done.*

Carol: *I believe that this was the best project that my team and I worked on this semester. Perhaps it was because we met as a group to get a GOOD start on the web quest. Martin organized the information as Kate, Brian and I researched and typed the information for Martin to paste on the web quest.*

Martin: *This project was the only one that we worked totally as a group instead of individuals then making our work a group project
Finally, all group members worked very hard and attributed to our project.*

Kate: *Met with group at JC High School to begin/work on our **Webquest project**. Kevin* [a non-participant] *could not make it but he was able to join the chat room so we kept him informed as we worked.*

Tasks were divided as previous projects, as Carol described:

Carol: *Kevin* [a non-participant] *was responsible for creating the evaluation component, I believe that Brian wrote the teacher and student task sections, and Kate wrote the Process sections. Brian and Kate also researched the four alternate sources for gasoline powered cars while Martin worked on the background and organized the information and I researched the standards.*

Martin found a webquest template and was in charge of putting each teammate's information together. He also worked on the aesthetic part as well as uploading webquest to his school's server. After that, he waited for feedback and felt that the workload for this project was not balanced:

Martin: *I ended up being the web page guy and the facilitator, which worked out pretty well I think.*

Martin: *Though I got some interesting ideas from the message board, there was pretty much zero feedback from the rest of group C. This was not a big deal because the changes weren't that big of a deal and it just made sense for me to do the work because I had the most experience with web pages, but I definitely feel like I put in way more time and effort on this project than the rest of the group.*

Overall, participants had positive attitude reflected on what they learned from this project, for example:

Brian: *First off this project was the project that I enjoyed the most. I can easily see how these types of project based learning activities can be integrated into the classroom.*

Kate: *Overall, I really learned a lot in this class…The class has also shown me that although a lot of my students are ahead of me when it comes to technology knowledge, I can learn to do a lot of the things that they do and it has even encouraged me to try our school's class server. I have begun giving assignments on an online program (much like K-State Online) and they have really enjoyed this option.*

Brian: *This project (project 3) was the only one that we worked totally as a group instead of individuals then making our work a group project. Also, our group collaboration on this project was excellent. I enjoyed every minute of the collaboration process and the project seemed to flow and progress so much better than our previous tries.*

Kate: *Looking back over this project, I have learned more about webquests than I learned briefly in undergraduate. Now that I have seen all the different ways in which they can be used and incorporated into my existing lessons, I look forward to using them next year. I will be teaching a new curriculum next year and I think it will allow for even more uses of technology in general!*

Carol: *I honestly, believe that this was the most useful project this year. I hope to use web quests in the future.*

Kate: *The webquest project has probably taught me the most as I vaguely remember making one in undergrad. but couldn't really remember all that it involved. I would have liked to see other places to go to build a webpage that did not require installing something on a computer.*

It is evident that participants were more aware of tools available for them to be incorporated into the curriculum and they were motivated to learn more:

Carol: *I didn't even know that much of the software even existed until this class - Inspiration, webquests for example, were new to me.*

Carol: *Honestly, things seemed to fly by too quickly for me to make any tangible activity in my classroom. However, I am now more aware of items available for me to incorporate into my classroom. It seems as though my school district is 'behind the times' when it comes to AVAILABLE technology for teachers and students.*

Kate: *One thing I really liked about all of these projects was learning to use tools I had not used before and once I learned them, I was able to use them in the next project. I have learned about new tools I didn't even know were out there but now that I know, I will be able to use them in future lessons.*

Kate: *I would like to learn more about the options when building a web page. I built the simple web page for our assignment but would like to find out more of the add-ons that can be incorporated. I would like to have a class webpage next year for my math students to go to.*

Kate: *My overall learning experiences were positive as I was learning not only about new tools, but learning about the experience that technology can give you within a classroom. My students really enjoyed some of the technology things I did this year.*

Martin: *I liked the flexibility and openness that allowed for the possibility of choosing a project that could--at least potentially--be actually incorporated into the curriculum of someone in the group. This makes it feel like there's a bigger purpose for the project than just to complete it because that's what the syllabus says to do. I also liked that I was exposed to some aspects of technology that I hadn't used much before. I generally consider myself to be relatively tech saavy, but I had not used chat much before and I had never taken the time to make a webquest before. I think I'm more likely to use these in the future just because of my oncreased exposure suring this class.*

Martin: *I do feel like I have a better vision of how and where I can incorporate technology into my curriculum. Now it's just a matter of actually doing it.*

Team D members: Nola, Ann, and Toby

Project 1 Experience

Project title: *Oregon Trail*
Points received: *6/6 pts*

In general, Nola initiated most of the team's work. She set up a lot of meetings and kept things on track. During the online meetings, the team did not spend sufficient time on discusstion; instead, they divided up tasks, working on their own parts, and then putting the individual parts together as a unit. As some of the participants described:

> Nola: *So let's pick a topic that will be easy for all of us to input into and put a unit together*

> Toby: *For the article summaries, each member would submit their responses to one person, and that person would compile the information and post it on the message board*

Ann missed almost all of the discussions and failed to respond to emails on time for completing this project until the very end. As Toby reported:

> Toby: *For the majority of the tutor project, our group consisted of four members but only had three do the work. Ann was late to join in our group and did not contribute anything until the very last assignment. Ann had said early on that she was not certain if she would take the class and that was all we heard from her until the software review, but she did not submit anything for it. For the remaining three, we distributed the work amongst the group so everyone would be doing a part.*

Ann was an international graduate student. She was new to online learning, and to using KSOL as a tool. She knew that she missed a lot of information at the beginning, but it was also true that she did not spend enough time and attention to this class. To understand Ann's situation and her experience with KSOL, the researcher met with her twice and showed her where to look up assignments, due dates, uploading files, sending messages, and checking grades. These instructions were covered in the orientation session, and it was obvious that for students who had never had online courses before, attending the orientation was crucial for later success.

Although she felt that she was left out to the team, she appreciated Toby's help to keep her on track:

> Ann: *I was not very familiar with this online learning tool in the beginning. It taks time for me to get used to this system but sometimes I might have missed many important assignments.*

> Ann: *It is no secret that I have struggled with communicating with my group on many of*

our projects. I know that I often struggle with English from time to time, but a lot of it has been because some of the members of my group have chosen to leave me out. Toby has done a great job of trying really hard to keep me informed but there is still much I do not understand.

Fortunately, team D showed their camaraderie to Ann and accepted Ann's late contributions:

Ann: *I just got an Email from my group member so I think I still can contribute something to my group. I feel glad that I still can learn more from this course!!!*

The result of team D's first project turned out very well. They did not use chatroom for this project; instead, they used Group Message Board and email the whole time. However, some of the frustrations of using these asynchronous communication tools were identified:

Toby: *The time it takes of waiting for someone to reply to your email was furstrating.*

Toby: *Message Board, it just took too long.*

Not surprisingly, Toby expressed strongly that online collaborative learning calls for swift responses to one another. Waiting for responses was painful, as he described:

Toby: *The collaborative process of our group was about as good as can be expected. What is difficult is the speed at which responses to questions come at. Usually it takes a day or so for answers to come back. This is hard because in our group, the times that each member has to work on this assignment is different than what the others have. When members of our group did respond it was usually pretty helpful.*

Toby: *To be quite honest, I felt that the online collaboration makes this class a little difficult. As I mentioned above, waiting for all the members of a group to respond to questions can take some time. If members could 'chat' at least once a week to discuss ideas, this would make a lot of the work much easier. Feedback is most effective when it is given back relatively quickly to the time it was asked for. Finding time that works with all members of a group is also very hard to do. Many people have very hectic schedules and it is hard to find time for everyone to meet together.*

Project 2 Experience
Project title: *The Telephone*
Points received: *8.5/12 pts*

Perhaps, team D's early success caused entropy to occur and destroyed the gains achieved in project 1. Team D's second project was not as good as their first project. This time, instead of using the Group Message Board, team D used the chatroom to communicate with one another with their project (except for Ann, who did not realize there was a Group chatroom and

missed the chat several times). As Toby described, it was frustrating and led to lack of interaction:

> Toby: *For the majority of our group, the communication of our project went much better. Our group did struggle with Ann in communicating with her in our team chat sessions. I guess Ann was confused about which chat room to log into and missed our meetings. I think this in turn, frustrated our group, and led to the lack of communication. I think things patched up in the end and Ann was able to work on the revision of our project. Overall, there was some improvement in our group about communicating on what work needed to get done. I think by the final project we will finally have everything worked out.*

From the archived chat history No. 5, we see that Ann did not join the chat, and the rest of the team was trying to decide on the topic for the tool project. It is evident that the discussions did not go deeply enough. Note that none of the participant in this team had their own classrooms:

> Toby: *Well. Business for subject you think?*

> Nola: *Yeah, since three of us are*

> Toby: *I don't know how we divide this up*

> Nola: *Alright, so all we need to do before spring break is decide on a subject area, grade level, topic and the tool we are going to use*

> Nola: *After that we can divide it up*

> Toby: *How to divide it*

> Nola: *So let's pick a topic that will be easy for all of us o input into and put a unit together*

> Toby: *Just tell me what to do*

> Nola: *I have absolutely no idea*

The team finally decided on making a Powerpoint presentation about the telephone. They worked on each part separately and then put it together into a single PowerPoint file. They submitted the file to the *File Dropbox* in KSOL. The function of the file dropbox was created for instructors to collect student assignments. Some assignements had to be turned in this way rather than as Word attachments sent to the Message Board, and that was because the instructor needed to either preview them before public posting, or needed to be the one to post them (as for example putting web pages on the College website for viewing by the rest of the class. The files submitted are only visible to the senders and the instructor. The screenshot below shows a button that user could use to select the file to be submitted. If the uploading process goes well,

the file name will appear as received in the section that indicates "*Files you have uploaded*" for user to review. However, the file is not visible to other learners.

Ann was waiting to give her feedback for this project and work on the second part, the justification part. She checked the message board, and there were nothing about this project. Actually, there were only nine threads that consisted of ten messages found in the Group Message Board, no discussions ever happened in the Group Message Board. Ann reflected on her confusion about the process:

> Ann: *I understand that our current project is about the invention of the Telephone and that our audience is elementary students learning history. I thought that I had to wait until my group posted our project to the message board before I gave suggestions on revising, and they have not yet to post our project. I am confused because it was due Wednesday, yet, there is nothing posted. I guess my part in it is that I should have e-mailed them suggestions even though nothing was posted. I feel that perhaps I would function better in a different group and maybe they would try to communicate with me because it seems as though, some of the members are frustrated with me at this time. But I am trying and I am willing to help, if I am informed how.*

> Ann: *The project that is due today I would be very willing to talk to them about I e-mailed Toby and I have not received anything back yet. I have no idea how they would like to approach the next project. I have e-mailed them I am at a loss at what else I can do. A couple of the members of my group have not logged in since April 3, 2006.*

Even in the Main Message Board, team D failed to post their project for other groups to review. This caused a situation in which no feedback was given for revision. It seemed that no one in this group cared about revising the project.

After finished the Tool Integration project, Toby was amazed by the project and other groups' projects that would retain students learning. Nonetheless, Toby expressed his concerns about time constraints when integrating technology into classroom. As he indicated:

> Toby: *What I learned from completing this project is that mixing a wide variety of activities into a single unit can make for interesting and exciting lessons. I think every group did a good job of mixing up the activities by using everything from multimedia, to reenactments, to oral presentation. The unit's that each group created will do an excellent job of retaining student's interests by changing up the lessons daily.*

> *Another thing that I learned from the tool integration project is that creating such complex projects will require a lot of work on the part of the teacher. Quality lessons require a good portion of a teacher's time. We had four people to divide up the work and it still took a fair amount of time. In the end, I think that students will enjoy lessons that incorporate variety and the use of multimedia in the classroom.*

Project 3 Experience
Project title: *The Civil War*

Points received: *10.5/12 pts*

Team D improved their communication by meeting face-to-face at the library for the last project. They met twice in the university library, as Nola described:

Nola: *During this project, we were actually able to meet. That really helped out. We met twice at the library. The first time we met, we talked about what we were going to do and split up some of the work. Then the next night, we came back to the library and put it all together. Since some were a little better at Geocities.com than others, they were able to help us out. All in all, I think everyone did an equal share on the final project. It was fun to be able to create a webquest with everyone's help.*

Ann missed one of the meetings, as Toby described:

Toby: *The webquest project that our group put together was our best job of collaboration for the entire semester. Everyone did a great job of doing their part and handing their work in on time. The only problem we had was Ann missed one of the meetings at the library due to some confusion, but she made it for the next one. I have been completing this course out of state and just flew in so I thought it would be nice to meet as a group at the library to discuss a few items. Meeting face to face was much better than discussing things online. Even though the chat room is nice to use, it doesn't compare to an actual group discussion in person. At first we were a little dumbfounded when it came to picking a topic, but eventually the group settled on the Civil War.*

We discussed what we wanted all of the areas to be and then divided the work. At the library we each had a computer that we used and worked on our respective pages. This was nice because we could still ask questions to each other and discuss as a team what we wanted. After two solid nights of working in the library we sent various emails to discuss any problems or things that we needed to fix.

The poor communication caused the participants in team D to feel that they learned mostly by themselves. They felt that they could have gotten the assignments done much quicker individually. However, at the end of the class, team D finally developed a better feeling for their final project as described by some of the participants:

Toby: *I have to admit that in the beginning I was not very excited to do the webquest. I thought it would be a huge headache for our team to meet up, discuss, and complete the assignment. It turned out that I was wrong.*

I have never really completed a website and it was neat to finally do one. This has interested me to the point that I might buy some software (Dreamweaver) and begin playing around with it to further my knowledge with webpage design. The possibilities are endless for designing a webpage. I have to say that I enjoyed this project the most.

I enjoyed this project. It did not turn into the headache I thought it was and I think [our]

group did a decent job. Meeting together really helped things out and I think it showed on our project.

Ann: *This Webquest project is my favorite, because I have always wanted to learn how to make a website. Our group members really have worked as a team on this project. We have collaborated very well on this project. Besides learning how to create a website, I have learned a lot about American history from the information that we gathered. In addition, I have also gained the very good relationship with my team members and understand the essence of the collaborative learning. I am very excited about all the new technology that I learned in this class and I definitely will use this new technology combined with other useful tools we have learned in my future classroom.*

Toby: *Working with webpages was pretty fun, I had never created one before, it is such a bonus to use in the classroom.*

Suggestions to improve the online learning and collaboration experience were found in student journals as well as in survey answers. For example, Toby believed that smaller group size and fewer group assignments would help:

Toby: *I feel that more than three members in a group is just too much. I think with fewer members, the collaborative process would be more effective. Less time would be wasted on trying to get the thoughts of everyone in the group.*

Toby: *Another idea that I think would be helpful for the class would be to include fewer group assignments. I do not feel that some of the beneficial aspects of group work would be lost if a more assignments were done individually and just a few projects were done as a group. I know that it is hard to do a class like this because it is important to have groups to complete this class.*

Nola's major concerns were related to the time constraints and group collaboration, as she reflected:

Nola: *There are lots of information we need to know and read before we get the good job done. And there is no certain time to hand in it, we need to check the website everyday or anytime.*

Nola: *The nature of the projects really weren't that difficult and neither was the technology skills. The really problem we had was group collaboration and time constraints.*

Accordingly, rather than learning the course content, participants felt they learned more about the skills:

Nola: *I really didn't learn that much content, but I did learn the skill of creating a website*

Toby: *More so on the skills side. I am not sure that I pulled as much away from the content aspect.*

When asked about if the team members would like to stay with this group in the future, Ann replied "No, they just want to finish this course as soon as possible." From the team's working pattern that revision of projects was not valued, it is not hard to understand why Ann felt this way. The other reasons interpreted might be three of the students (two participants and one non-participant) in this team were undergraduates who might have different commitment for intensive online learning; lack of classroom teaching experinece and real audience (their students) in mind also affected the quality and the nature of the projects.

Team E members: Beatrice, Regina, and Anita

Project 1 Experience

Project title: *Hot Dog Stand*
Points received: *6/6 pts*

As mentioned earlier, team E had a core leadership initiated by Regina and Beatrice. Beatrice was worried about one group member who did not always connect to the team like the other three participants did, as well as worried about the possibility that waiting for her response might cause the final assignment to be posted too late for review:

Beatrice: *I think it has been a little frustrating getting everyone in our group together, although it is better now than earlier in the semester. It took a long while to establish contact with Ashley (and somewhat with Anita). So Regina and I sort of took the lead in the assignments. Even so, not all of us check the message boards daily, which is important if we are to keep in contact and know what the group is doing. Because of that, and because I was afraid things would get posted too late (at the eleventh hour), Regina and I would get things done ahead of the others. We seem to have the best schedules for posting of the four of us. It is terribly hard for 4 fulltime people to have the same niche of time to talk. In that respect, maybe the message board would have been better for us, but then again, not all of us check daily. The regular due dates cause a bit of anxiety when you don't feel you have regular contact with your other group members*

One probable problem our group will have is Regina and I both wanting to get going on things (so we tend to get ahead of the others). But we don't want to wait until the last minute to do something, and not have it be our group's best effort. We all want to have the group's input in critiquing what will be posted before it is actually put on the message board, so our deadlines are really moved up a day or so, so that we have time to critique and revise, if necessary.

For this project, three of the team members used the group chatroom three times to decide on the project to be finished. Ashley (a non-participant) missed chats due to her daughter being sick, and although she had a different opinion about the software to be reviewed, the rest of the team felt it might be too late for change.

Regina: The TUTOR project was a large project that required much collaboration and a larger amount of individual time. Beatrice, Anita & I used the Chat Room on Jan. 26th discussing another assignment, but what software to use crept into this discussion.

Beatrice: Ashley posted on our message board that she wondered if we might consider a different software program, but Regina said it was a bit late to be switching to another program. We chatted on the 6th about the software evaluation. Ashley was supposed to

have joined us, but didn't. She posted an apology later saying her daughter had been sick, and she was unable to take part.

We both posted our lesson plans. Some of Ashley's didn't come out in her post, so it was incomplete, but I responded to hers asking for a bit more info

I feel badly that Ashley seemed a little put-out about her lesson plan not being the one that we used...but she was gracious about it. We other three tried to let her know that she was helping us, so she wouldn't feel left out.

Two of the participants reflected that Ashley needed to be more functioning; they even expressed their willingness to change their schedules in order to fit in with Ashley's schedule.

Regina: *Beatrice, Anita, and I work well together, same type of work ethic. Ashley hasn't made a Chat room yet, a few messages, so it's not as easy to decide upon--but she does have good ideas, we just need to hear about them quicker. (And I know she is busy, but everyone is in this day and age!)*

Beatrice: *So I really think groups of three would be better than groups of 4 (although that increases the work of the instructor when it comes to grading); it is easier to get three of us together to chat. Other than that, I have really enjoyed learning with others long-distance, and I really like the chat room for immediate 'conversation'. The lag time in the comments being put on the chat board is sometimes a problem, but over all it has worked well. Ashley and I got into conversation late last week to find a time to talk this week. I think if Ashley can let us know when she can chat, it will be easier for the rest of us to find time to fit in.*

Beatrice: *How can we improve our team's collaborative process? Well, I feel we collaborate very well for four people who don't know each other, only what we've learned by the message board. We use the Chat room and message board easily, we just need all 4 team members on the team. (But, I'm not sure how we can accomplish that.)*

In the examples below, Anita explained the majority rules the team used when making decisions. And Regina described how they worked on each part of the project in order to complete this project:

Anita: *As with any group, there are the dominant personalities and those that are more laid back. Sometimes that can create for some interesting group antics, but so far so good. I don't know that there have really been any disagreements, even though we all voice our opinions pretty freely. We usually just use the majority rules when we are deciding between several different options and so far that has worked. To complete the assignments, we all read the material then meet to chat 4 or 5 days before the assignment is due. We take turns writing up the postings based on the information that has been discussed in the chats. The posts show up on our group message board at least 2 days before it is due for the group to review. This is great because one of our members is an English teacher so she pretty much whips our posts into shape.*

Regina: *Anita did the actual write-up (TUTOR discussion 1), posting it first so we could review it and make suggestions for improvement (which Regina did). This was our usual way of doing things (even after we went on the chat line and discussed). It kept all of us on the same page with what was to be posted to the message board, and allowed us to work out the kinks.*

Obviously, the project went well and the participants reflected that their success was because they were able to accommodate individuals' strengths and keep in touch with the team on a daily basis.

Anita: *I am very pleased with my group and our ability to work together on this project. So far it seems like the group's dynamics work in our favor. We are fairly diverse in age and background which so far has enabled everyone to take the lead at one time or another. For example, I am familiar with software evaluations because I do this daily for my job. However, I am not familiar with preparing lesson plans because the only time I have had to do them was as part of a class assignment. Luckily the other members of the group has experience in writing lesson plans and were able to teach me through our discussions. We communicate on a daily basis and our messages are starting to include personal conversations as we are starting to get to know each other.*

Anita brought out some of the issues regarding group work. Anita had received two degrees via distance education, as she indicated, but this was the only class that used group work to this extent. She was concerned that the group projects might not be divided evenly and it would cause some team members to be doing more work than others. In addition, she also worried that her failure to login while attending conferences might disappoint her teammates. As she described:

Anita: *I understand the necessity to use groups in this setting but it is very demanding. I typically work about 12 hours a day and am taking 2 other classes along with this one. I have done this for several years and have perfected my time management skills to meet my demanding schedule. However, I have only had to be responsible to myself and not to an entire group before. The short turn around between assignments would be ideal for individual assignments but it makes it extremely difficult to get together with the group and get everything done. I feel frantic at work and in my other coursework because I am afraid to let this group down. I also feel that I am not getting a firm grasp on the material when I don't complete the assignments on my own. Invariably one or more of the group will end up doing most of the work even though that isn't the intention. I have 2 conferences to present at this spring and am really fretting the weeks I will be away because right now if I miss logging onto our group message board for one day, I feel that the rest of the group will think I am slacking.*

Those worries aside, some participants felt that they had learned from this project and prepared themselves to be ready for the challenges ahead:

Regina: *I use the computer a lot everyday, but I've done many things already that I've never done before--using the KSU library on line, using message board, chat room, downloading educational software, where to find state standards and benchmarks just to name some.*

Beatrice: *I have really enjoyed learning with others long-distance, and I really like the chat room for immediate 'conversation'. The lag time in the comments being put on the chat board is sometimes a problem, but over all it has worked well.*

Beatrice: *I am liking the course and learning a lot from it. I know I'll learn a lot more, when I see what the next chapters in the book are going to be discussing. I'll be out of my technological comfort zone, for sure. However, I will be better informed as a teacher and technology lead teacher after this course.*

Project 2 Experience

Project title: *Mission: Museum*
Points received: *11.5/12 pts*

Anita took the lead this time for her group to sketch out the lesson plan for this project. She was not familiar with writing lesson plans because she worked in higher education, but since her teammates were busy with parent/teacher conferences at that time, she did it and did it well with help from her teammates:

Anita: *Wow, this project started out extremely confusing; too many ideas spilling without anyone stepping forward as a leader in the group to help sift through them all. Most of the group was extremely busy during the first portion of the assignment with parent/teacher conferences and one of us coming down with mono, so that left me to interpret our conversations into some sort of lesson plan.*

It actually turned out to be a really good learning situation for me as I am the only one in the group who does not actually have to coordinate lesson plans on a daily basis. The group was good at answering my questions and guiding me in the process and by the time I had laid out the bones of the assignment, the others' schedules had cleared and we were able to put some finishing touches on together.

Ashley's lack of involvement still bothered the team to some extent. But as Beatrice stated, the team kept a positive attitude toward the future:

Beatrice: *Looking ahead, I am optimistic (as I always feel when I finally hear from Ashley) that things will go well from here on out. She sounds like she is feeling better and that will make a big difference in her participation. I am so impressed with Anita's knowledge of technical things. And Regina's way of writing and critiquing are always so thoughtful and helpful. It was fun to finally see her face-to-face at Saturday's Web session.*

While working on project 2, Team E chatted eight times for 6 hours and 20 minutes. The team members were fluent in using the chatroom for exchanging ideas and making decisions. Rather than assigning roles to individuals, the participants were more actively participating and volunteering to perform tasks in the areas of their expertise:

Regina: *What a project and what a learning opportunity to put to use in a classroom! Anita, Beatrice and I began using the chat room on March 13th. I brought up my concept map idea on the westward movement and pioneers and our ideas just seemed to flow from there. Actually, it was kind of exciting to be part of a planning session that covered so many ideas and how they might work.*

Regina: *Our chat lasted over an hour, but it covered: pioneers, to challenges, political, to different eras, journaling, conquering unexplored areas, and moved to ideas like space, contrasting eras, 4 focuses, 4 people, to explorers, land pioneers/explorers, space, conflicts and dangers, concept map with explorers in the middle and 4 areas to find information on, to Lewis & Clark to North Pole explorers, to undersea explorers, to a scenario that poses questions, to a Mission Possible, and on to 4 types of pioneers/explorers, to explorers and what makes them successful, how one completes a mission, onto real history, to land, sea, sky, air. We discussed grade levels and how this fits into curriculum. Anita volunteered to pull the ideas together and Beatrice volunteered to gather state standards for 5th grade. We will all look over and briefly chat the next night. Even though it was minus Ashley, that was perhaps the most idea filled discussion we have had in this group (and we've had good discussions)—ideas just kept coming.*

Beatrice distinguished the differences between the chatroom and the message board, as she stated, she liked the instant responses in the chat to speed things up:

Beatrice: *Considering this project seemed so monumental at the outset, I am really very pleased that it came off so well. I really think for our group the Chat Room is the way to go for more precise communication because (when we are all on together, which doesn't always happen) we can quickly get on the same page. Using the message board can be frustrating because while you can see when the others do/do not check in, they don't always leave a post (and sometimes I don't either). So you don't know what they are thinking or if they have read all the posts on the board. So I really, really like the Chat.*

In order to produce a quality project, the team conducted research via the Internet to find resources to be used in the project. Regina reflected on the information she found and even though the process was time consuming, she learned from it:

Regina: *Research was very time consuming, but interesting, and I will say I did learn things on all of my explorers, especially on Lewis and Clark's expedition that's not in the textbooks. Interesting to think Lewis' death might have been a murder, not suicide— another project, another time.*

After all the hard work, Team E members were satisfied with their project. As all the participants reported:

Beatrice: *I will say that this is the most balanced project to date our group has done. As usual, Regina and I tended to get the jump on the other two and have things ready in as soon as possible. So it was hard to wait to see what the others would produce. But when the other parts were submitted, they were really good, and I feel good that in our part B that was turned in you will see elements that each one of us produced and contributed to the overall project. So I feel Group E excelled as a group in this endeavor.*

Anita pulled the ideas together beautifully; leaving blank areas that needed more input and discussion. We all had the opportunity to look over MISSION: MUSEUM before the next night, March 14th chat along with the state standards that could apply too. For chat all 4 were on-line to have further discussions and firm up ideas for the tool project. It was a good flow of ideas—a give and take discussion. Ashley volunteered to create the rubric(and frankly, we let her because, I feel, she doesn't always pull her weight within this group—doesn't use message board & chat like we other three do to keep updated.) All was going to be posted by Friday, March 17th so if we wished, we could work over Spring Break, which Beatrice and I did, and we would all know where/how the project was headed.

Regina expressed her beliefs in learning, she perceived that PBL would raise and maintain student interest for learning:

I believe this PBL was appropriate for the 5th grade age level and if I had a classroom, once again, it is something I would try. I was the "non-traditional" teacher when I taught. My philosophy is you need to get and maintain student interest before they will want to learn.

Spring Break issue also disturbed this team especially because the team members worked for different school districts that had different Spring Breaks:

Regina: *I think that the Tool Integration Project could have a better overall flow to it if it would not have fallen in as a project to prepare for in/during/after Spring Break AND it does get very frustrating to do your best, be enthusiastic, and post to the message board and parts just don't come through or the format is changed! Saturday and Sunday posts that need student feedback are also a stumbling block, when they do not post without instructor help.*

Insightfully, Anita described her feeling about the group work. Even she indicated that although she did not experience a difficult time with her teammates, the stress still existed:

Anita: While there was a tremendous amount of cooperation among the group, it was not without its stress. I personally do not believe that I will be taking another course that incorporates this much group work. I had 2 out of town conferences to attend during this particular project and for one I missed receiving the best paper award that I wrote with a colleague because I had to stay at the hotel for a chat due to it being the only time that the entire group could meet. I had committee responsibilities at my other conference which didn't let me sign into the class site for approximately 3 days. The snide comments

and guilt that met me after I returned did not feel too swell. I am giving 110% to just this one course and everything else is suffering, which is difficult for me to swallow because time management has always been my forte.

I have had no specific problems or bad experiences with my group and I know that some people thrive in this kind of course layout, but it just doesn't work with my life at the moment. The shining light out of it though has been that it gives me an avenue of research to consider that I've never thought of before. Group dynamics is one thing, but looking at the individual life circumstances that go into making a course built upon group work a positive or negative experience would be interesting.

I hope it doesn't sound like I am complaining. I am just being honest. It is a double edged sword though because I have learned a lot in this class, mostly due to the interactions within my group.

Project 3 Experience

Project title: *Latin America*
Points received: *12/12 pts*

At the beginning of project 3, team E endured the hardship of narrowing down the topic. Although the team members had decided to focus on middle school level, they could not determine the topic. Moreover, Anita felt so helpless because the conversations among three elementary and middle school teachers were so foreign to her. As documented in student journals:

Regina: *This has been an interesting lesson in ideas adaptations! We all seemed to be having trouble getting started on this assignment.*

Beatrice: *I wish I had a better idea of this project; it's just not coming clear to me what to do. Glad we are chatting tonight.*

Anita: *This project was definitely the most difficult for me personally, but it the most fun our group had coming up with ideas. The difficult part for me was in the rest of my group selecting to focus on the middle school geography curriculum to complete this project. I felt pretty helpless at times during the development stage. There were times during our group chats that I honestly felt as if everyone were speaking a foreign language except for me. Not coming from an education background (I didn't choose a direct route, instead decided to take a detour through psychology and library science before arriving here), I was unfamiliar with many of the concepts and issues discussed during our collaboration. At one time I even had to post a comment during one of our chats saying I was going to sit back and watch because I had no idea what was going on. Everyone was kind and said they would help bring me along, and in the end I think they did.*

The team relied on chat more than ever. They chatted 10 times and spent 370 minutes for project 3. But chat was not always productive, especially with four people typing all at once:

Beatrice: *Sometimes I feel as if I am not quite understanding how this is coming together...or if I am on the same track as the others. Glad we are chatting tonight.*

Chat was frustrating at times. It is hard for us to visualize what the other is talking about. I believe we are ok... Next chat is Thursday at 7; Regina can't be there, but she'll read the post afterward. Hope by then this is all coming together.

Finally, team E narrowed down the topic and decided to go with Ashley's idea. Things started to go smoothly, as documented in the student journals:

Beatrice: *Chatted tonight, and have finally got the topic narrowed down and doable. We each have some searching and stuff to do, and we will post, then chat tomorrow night at 7:00. I am feeling better about this now.*

Regina: *On April 19th for 45 minutes we, all four of us, used chat line to throw out and discuss ideas; we came up with continents and the water cycle, which ultimately we did not use. We left chat line with another chat scheduled for April 24th and went on the assumption that we would look into the water cycle or continents at the middle school level. We used the message board, back and forth multiple times during this entire quest project. Discussion still kept going back to the five themes of geography Ashley's idea this time to use the themes, but with no real direction of where to go.*

At chat on April 24th we decided to forget the water cycle and continents and go with using the five themes of geography and adapting the ideas I posted on continents of having students be film directors on a fact finding type of mission to get financial backers for a full-length documentary.

On the next day, the April 25th, every one was busy back and forth checking and posting messages in the Group Message Board:

Beatrice: *4/25/06 Busy day...lots of posts to message board. Went thru the 5 themes and tried to jot down what info a student would search for in each theme in a word document. Put it in the group's file, but no one has looked at it yet. I also read the others' posts and checked websites. I found a few good ones, but many are related to my word document, so I don't know if the others will like them.*

Regina: *April 25th by the number of posts on the message board, it appeared we've all busy bees working on this project. I worked mostly all day on introduction, tasks, and viewing web pages. It was a good back and forth discussion day's I did wonder how Beatrice and Ashley got much teaching done that day's. I didn't sub that day and was busy all day!*

At the same time, Anita started to work on the webquest, she enjoyed the dual-role from her experiences. On the one hand, she was a *learner* learning the educational language from K-

12 educators; and on the other hand, she acted like a *Web designer* who interacted with her clients. As she described:

> Anita: *Once all the "details" were sorted out, I did get to participate by designing the web page. I knew it was going to be a challenge to create a site relevant to the age group we had selected to work with, so I stuck with a simple template from the WebQuest page and did what I could with it. This was actually quite fun as the group acted like one of my design clients, telling me what they wanted as far as the design layout, color scheme, simplicity etc. So for me, this project ended up being a really big learning experience, I came to understand the language of education through practical means as well as receiving practice in taking directions from "clients" on the design side.*

A cycle of development and revision process continued. More content and resources were added for Anita to use. Also, feedback and comments from other teams also were valued. The project was finished:

> Beatrice: *Anita is confident we are just about done. I copied and pasted what I had come up with, so she can use that. We decided to chat at 7 on Monday just to make sure everything is A-ok.*

> Beatrice: *4/29/06 I spent some time on the Internet and located some additional websites to use on the Web Quest, so that each of the 7 countries we picked would each have two specific sites to go to for the research. I posted a message to Group E and uploaded the document to the group files. I also think we need to address who in the group (of students actually doing the Web Quest) would be responsible for the cover of the brochure.*

> Beatrice: *5/1/06 Anita put up the latest WebQuest. I checked links...all worked but one. It looks so good, we don't need to chat tonight. Regina posted later in the day, agreeing it was "good to go". Yea.*

> Regina: *May 1st, our WebQuest is completed. It looks fantastic and is ready to post. Beatrice checked in with Dr. M for a site to post URL. I went through entire WebQuest again and all links are live. Anita has done a great job putting all this together. I feel our group has covered all the teacher criteria on the quest and it is ready to post. We will chat again if any great ideas are given to us in a constructive critique mode that would increase the value of our quest.*

> Beatrice: *5/3/06 Read over the comments about our webquest and made some responses.*

> Beatrice: *Read over Anita's and Regina's posts...we need to chat (tonight?) to see what revisions we want to make, if any. I do think maybe a couple of things are needed. Tried to find a better geog. site for the 5 themes.*
> Beatrice: *We all chatted, a great collaborative discussion and Anita will make a few adjustments and re-post. I put the new geog. site (5 themes) in the group files so Anita could retrieve it to use.*

Beatrice: *5/4/06Anita has made changes and re-posted. The Latin America WebQuest looks great!!!*

While Regina said, "*I am please with the result of our web page*", she also felt the really difficult part for this project was getting everyone to agree on the topic as well as incorporating state standards and higher order thinking skills. As she described:

Regina: *Thinking back, this has been the most difficult assignment of this class. I've decided that it's not so much doing the actual work of gathering information and putting the quest together, but rather all four of us agreeing on the subject of the quest and what to use. Beatrice, who is usually right on top of academics, was in the same wondering around mode as we all were on this quest's but came through with the standards and higher order thinking skills.*

In addition to work on the revisions, each student needed to comment on two other group projects. This was a great opportunity for teams to see from different perspectives. As Regina identified, the same topic might had different interpretations by different people:

Beatrice: …*Also responded to another group's webquest. It was really fantastic.*

Regina: *While reading though all the posted quests, there are so many different variations of how to put together. Looking back, this personal choice-like or dislike- is probably what does make this assignment more difficult than the others. For example, our theme, the five themes of geography, is a constant, but it can be approached so differently by whoever is putting together a quest.*

Beatrice wrote a very good summary for this project and how the team collaborated, it seemed participation alone was not enough, the team members needed to share, critique, and give encouragement and praise from time to time. As she described:

Beatrice: *I think we all did a great job on this project. Each person had her own area of expertise and used it to the group's advantage. Everyone participated, shared, critiqued, encouraged, and praised what we all had done… We all checked and double-checked links and wording to make sure things were the way we wanted. We all chatted after others had offered feedback on our Web Quest and came to an agreement on what was needed to improve the Web Quest. This was our best collaborative effort of the semester.*

The learning experiences were positive. Regina gained the importance of authentic learning and how to use PBL and webquest, same as Beatrice. For Anita who indicated that the project might not be directly applicable, the learning experience was invaluable and could be transferred to any educational settings:

Regina: *I did learn there are a variety of educational technologies that if I had a classroom I would be comfortable using--authentic learning is needed--I hate workbooks! Educational software I did use, now I could come up with a PBL or even quest on trails,*

pioneers, or about anything. Skill wise I'm amazed at what is on the computer programs, I was not aware was there and I thought I was pretty comfortable using my computer.

Beatrice: *Maybe in my tech. institute this summer I select webquest as a project to do!*

Anita: *It was a struggle for me at times to take myself out the teaching zone where I am comfortable and step into the unfamiliar territory of elementary and middle school. However, I learned a great deal and while the actual products of this course may not be ones that are directly applicable, the principles and techniques can transfer anywhere, which is invaluable.*

Not surprisingly, at the end of the semester, team E developed a sense of friendship and could not wait to meet in person. As Anita described:

Anita: *I enjoyed this class and my group in particular. We really seemed to work well together, with each of settling early into our specific roles. The dynamics remained positive throughout and I can't wait to actually put a face to names when we get together for a drink at the end the semester.*

APPENDIX F: Team F Project 1–3 Experiences

Team F members: Kate, Omar, Tina, Allison, and Lillie

Project 1	Kate	Omar	Tina	Allison	
Project 2 & 3		Omar	Tina	Allison	Lillie

Project 1 Experience

Project title: *Genetics' Discovery School*
Points received: *6/6 pts*

      Allison, Kate, and Omar met face-to-face in the library one night to get started on the discussion assignment and planning for the project. During the discussion they became aware of the fact that Tina was far away and would not be attending any meetings. The team came to the agreement for future meetings they would set up ahead of time and would use the chat room method to include Tina in the group meetings.

      Actually, Omar and Tina planned to meet in the chatroom but missed for chat for several times. In fact, some of the problems came from the one-hour time difference between the states in different time zones. In addition, Tina entered the public chatroom 4 times instead of the group chatroom before she realized there was a group chatroom. The first time when the group decided to meet in the chatroom, Tina entered the public chatroom again; she even posted her thoughts about how to improve online collaboration and answered to her own questions. As she posted:

> Tina: *Chat sessions that require direct contact can be tricky. Timing is everything. We all have busy schedules thus it is very difficult to correlate our time so we can chat with one another at the same time.*

> Tina: *I am presently illustrating a method by chating to my group before they enter the room that would bring a solution to this problem. We limit ourselves in this type setting. Chatrooms can be run in a more message board like situation if one so chooses.*

> Tina: *I understand this isn't the traditional way of doing things, but it is a method that works. Look I am utilizing it at this present moment as I am talking to my group right before they log into the chatroom at 9pm.*

> Tina: *This proves that you don't have to be present at the same time to have a successful learning environment.*

> Tina: *Chat features can work in more than one way. For example, I have just illustrated a new approach.*

Tina: *Yes. I could collaborate this chatroom approach into my next assignment. I need the support of my group and a little more creativity to do so.*

While Tina was elaborating on the new features of the chatroom, Omar was waiting in another chatroom - the group chatroom. The chatting time was set at 9 pm that night; enthusiastically, Omar had logged in 9 times since 4:15 pm. At 9:01 pm, Omar started to type:

Omar: *Hello Tina, I hope I find you well. This was one of my best chapters as I almost agreed one every front. Yes I believe that on-line discussions are very crucial for kids, for these following reasons:*

Omar: *1. kids are made to think out their points of posting before they do so. This I think encourages good points to be brought forth in the discussion. 2. Teachers get to know some things about their students, like their attitudes as they are free from the 'eyes' of others. Teachers are able to help the kids where they have misconceptions about a certian topic or idea. I remember Dr M had such experiences last time about the TOOL thing. What do you think?*

Omar: *Hello Tina, are you there?*

Omar left the chatroom unsuccessfully. Two days later, Tina logged into the group chatroom, read the chat history, and discovered that she was in the wrong chatroom before. As she posted:

Tina: *I am just realizing that we have two different types of chatrooms in our class.*

Tina: *You will find my original chatroom achieves found in the other chatroom made for the entire class. If I had realized that we had a group chatroom then I would have gone here sooner.*

Tina: *I waited in the other chatroom on different occasions for someone to log in so we could complete chapter 5 discussion and its assignment*

Tina: *I believe the problem that has occurred illustrates the problems that can occur when working with Internet tools. This is a real life example.*

However, team F finished project 1 on time because of Kate's hard work. As Tina and Omar described:

Tina: *Overall, Kate has done a good in collaborating all our work together into one final product.*

Omar: *It was hard to have others, save for Kate, to post their comments on time before the deadline. The most unfortunate part would again be that they do not post anything to show that they saw your post, till we just decide to post hoping the other two agree with our views. It was really frustrating at times…*

Omar: *Kate posted all our comments since we were a group. I respect her...she is so diligent.*

As for Kate, she reported that Omar was the most helpful member throughout this project. Tina contributed some but did not keep in constant communication. Moreover, Allison was not responsive for most of the time. As a result, she did not feel that she could trust Allison, as she described:

Kate: *One group member has been very helpful in getting their information to me in a timely manner but there is also a group member I do not feel that I can rely on at all. I myself did all of the gathering of the other group member's contributions and put them into a final product to be posted. This was not too much for me to handle but the timeliness in which other member's information was sent to me made me not want to volunteer to do this anymore.*

Kate switched to team C apparently for that reason. Kate handled the changeover very well therefore did not cause any hard feelings among her team members. Tina expressed her feeling when she recognized that Kate had left the team:

Tina: *I just learned that Kate has changed groups due to the other group working in the same District & her having a better opportunity to meet physically with them on a week to week basis. She has been a very consistent and committed leader to our group. We will miss her dearly.*

Project 2 Experience

Project title: *School Newsletter*
Points received: *11/12pts*

After Kate left, the communication problems among the team members did not improve one bit. For example, one time when the *Daylight Saving Time* changed on April 2nd, 2006, Omar was confused for the *Spring forward and Fall back* rule, and thought that it was the opposite. He missed the opportunity to meet at the chatroom and felt he was left out of his team:

Omar: *There was a time when we had to meet, my time (zones) were mixed up, someone had told me to change my time backwards, so I came late for the chat, and noticed they had done it already...I was 'mad' as I thought they just did it willy-nilly (of course did not show it to them, acted professionally), I later learnt the correct correction of time zones.*

Allison was sick at that time and did not participate in many assignments. For the total 12 chats (not including the 2 chats that Omar and Tina made separately), Allison only participated the first 4 chats and the last chat. Tina only participated 3 times, she never showed up in chatroom after the sixth chat. This made the team frustrated at times. Omar commented on their group collaboration:

Omar: *Collaboration on pertinent issues, which is the core of this type of learning has always been a challenge in this group, since it's inception/formation…*
It is frustrating, esp when one plans ahead and you want to meet the deadlines, you are 'dragged' to the floor by the group members who seem uncaring. I do not know the reasons for it, but my other group members seem unconcerned when it comes to the group project so much so that it's a pain, one wonders they still are part of the group.

Omar felt the same way about Allison. As he cautiously asked so many questions and implied that he did not want to work with people like this:

Omar: *What do they say when they get that A, do they say 'they' worked hard?? and what does 'they' mean here? When such a person looks for a job, what is their mindset when they are told they got the job related to the class? What are they saying basically? I still am struggling with the answer to this. I do not have a competent answer. people are different, some respond instantly, others take their time, while there those who who 'don't care' a bit, if they do. I (in future) don't want to work with the last one(s). They are a pain!! Period!*

Kate's leaving created a leadership vacuum. As a result, when Lillie and Cindy were assigned to team F in the middle of project 2, they quickly took over the leadership for team F:

Lillie: *Trying to connect with my new group. It doesn't seem like they have a whole lot done considering the project is due this Saturday. Hopefully I am wrong. I am trying to get us all together for a chat about the project.*

Lillie: *I think our group collaboration has improved on this project. Coming into a new group was difficult at first. Once we were able to get together to chat things seemed to be able to work well.*

In fact, this structure worked well at the beginning, as Omar described his appreciations for his new teammates:

Omar: *In this project we split roles and thanks to the managerial skills of Lillie who instantly came and took the leading role, although initially I was skeptical, as I was in this role of 'leading' sort of.*

...we ended up a functional group. With the joining, or is it me joining them, of the other two members, there seems to be a sense of urgency that has been injected in our group. I am thankful to whatever happened to the group they came from, for they became my 'real' good partners.

Lillie and Cindy participated in all the chats (9 times) after they joined this team. But for at least 3 times, only Lillie and Cindy chatted and they tended to make the decisions for their entire team project. Lillie complained about Omar in one of her reflections:

Lillie: *Our group worked very hard in completing the task. It seemed as some worked harder than others. We all had a part to play in the completion of our project. One being*

the production manager, the other being the writer, the other being the editor, and the other being the director. I saw my role as one of the editors. I did have some problems with the writers comments after the project had been committed. He seem to be on a different schedule than the rest of the group. I sent my evaluations of the rough draft to him several hours before the deadline. He apparently didn't check his email find my contribution before the deadline. This created some problems in our lines of communication.

The team continued to meet in the chatroom and completed their second project on time. As Tina reflected:

Tina: *We met two more times to finalize our project in our small group chatroom. Everyone did a good job in taking on a responsibility to complete the project. We adjusted well for adding two new group members in midstream. They both enhanced our group productivity.*

Allison was not involved much in this project, "*hopefully she is okay and will be able to join us in the next project.*" Lillie commented. Anyway, Lillie felt she had learned a lot from this new way of learning and incorporating technology:

Lillie: *As I reflect back on this project I realize that I learned a lot about project based learning. I had somewhat of an idea of what I thought it was coming into to the project. As I worked on this project I learned the five requirements of project based learning. I learned more in depth the importance of working in groups when doing project based learning as well as the need for a good driving question to get the project going. As a result of this learning I feel that I will look for ways that I can incorporate the use of technology through project based learning in my classroom. I have learned that it is a great way to get students working and learning together while using technology.*

Project 3 Experience

Project title: *Diversity Cultures*
Points received: *11/12pts*

Lillie and Cindy met in chatroom to discuss possible topic for project 3. The other three members did not show up. Consequently, Lillie and Cindy decided the topic and divided the tasks for each member. As Lillie described:

Lillie: *I was able to meet with Cindy to discuss our webquest project tonight. We thought the rest of the group would be there but they did not show up. Cindy and I went ahead and decided on a topic for the project. We also decided to type up the first part of it, she doing the introduction and task, me doing the process. We are in hopes of Omar and Tina to do the rest after they look over what we have done and get input from us.*

In another chat, Lillie reported again:

Lillie: *Cindy and I were able to meet again. We decided to go ahead and do the rest of the project since we have not been able to get in contact with the rest of our group. I enjoy working with her. We seem to work well together.*

It would have been nice if the rest of our group contributed more. We felt like we did not have time to wait for them to show up due to the fast approaching deadline to have the project completed so we went ahead and did what needed to be done.

But, from Omar's point of view, Lillie did not take other team members' suggestions and opinions into account, she did not keep herself open to modifications as well. Eventually, this caused Omar's voice to fade out from both the Main Message Board and the Group Message Board. Omar did not enter the chatroom after the eighth chat. In some personal emails to Dr. M, it was surprising to learn that Omar was working on another webquest by himself.

Omar: *I have just finished working on the group webquest. I am posting it onto the group msg bd.*

In addition, Omar asked Tina to evaluate the WebQuest he posted. This caused Tina to be confused. She replied in an email to Omar and carbon copy to Dr. M as well:

Tina: *Omar, These comments below are confusing to me. You specifically asked me to help you in evaluating editing our webquest group project. I along with the others have done & are doing just that. All our evaluations and constructive critics came before the project deadline. There isn't a connection going on here in your statements below.*

Although why Omar did a different webquest remains unknown, his action made his teammates very upset, and himself too, as he implied:

Omar: *I had trouble with some members who played games when it came to being collaborative, in terms of communication; they would fake that they would do stuff, yet in the end they don't. At times it took so long, too long for comfort, to hear from them making it so difficult to keep up pace. Anyways that's how, I suppose, we do come to learn, learn about ourselves and others.*
I really enjoyed the 'group'.

Lillie felt although the other members finally showed up and gave their inputs, it was too late for her to weave their thoughts as well as to make the changes:

Lillie: *The other three members of our group seem to all of a sudden want to have an input in the project, however now is not the best time seeing as it is due. It is difficult for me to take their comments this late in the project.*

As Tina admitted, she would have contributed more to the project, she concluded that it was because she and her teammates were not being able to meet face-to-face. Tina reported she had already completed 3 online courses before but she could not make it to the chat time for

several times because her time conflicts.

> Tina: *Overall, our group worked to complete this webquest assignment on time. Some contributed more than others. I will admit that I didn't contribute as much as I would have liked too. Distant Education does have its downfalls. This is one of those downfalls not being able to meet face to face with your group members, so they can see that your a real person on the other side of the computer screen.*

Not surprisingly, the miserable situation made Omar felt he did not learn from others:

> Omar: *Well the group memebers were mostly the mirror through which I saw myself perhaps failing (to agree) or making it. Many a time that not whatever happens I take it upon myself to say probably I could have done better, or handled it differently…There are times when I learnt lots from others, the way they do not/ do agree to others points or the way they encourage you, and all that. So I leant through the interactions with my group although most of the effort was mine, I say.*

As shown in the webquest screenshot in chapter 4, the images in team F's webquest were not showing, overall, the webquest was not appealing at all.

> The collaboration and communication appeared to be not proceeding smoothly throughout team F's three projects. When asked to reflect on learning experience, Omar suggested group choice should be studied further:

> Omar: *I would like to say kudos for this course…I learned lots, but the collaboration part and group choice should be studied further. It's so very crucial; if you know what I mean…you get people really depressed with individuals…but perhaps we got to accept it as part of life…I don't know!!*

APPENDIX G: Team G Project 2–3 Experiences

Team G members: Tonya and Dora

Project 1		
Project 2 & 3	Tonya	Dora

Project 2 Experience

Project title: *Hansel and Gretel Reader's Theatre Script*
Points received: *11.5/12 pts*

Dora and Tonya entered chatroom to discuss their project ideas. Since Tonya was a substitute teacher and did not have a classroom, Dora suggested some ideas to Tonya how they might approach the project. Together, they came up an idea for Dora's 8th grade reading class students. Dora also explained to Tonya that she would like to use this project for a possible grant that embraced technology within classrooms. At the end of the discussion, the team decided on a fairy tale story. As Dora described:

Dora: *We discussed the possibility of fairy tales to use for the project. It's going to be Cinderella.*

Obviously, team G's first chat was successful. Dora felt she was fully supported by Tonya, as she said:

Dora: *Tonight was our first chat as the new 'Group G'. It was great to have a discussion with someone who is really listening and sharing ideas.*

However, the Cinderella fairy tale appeared wouldn't work for Dora's project scheme that focused on capturing personalities of characters. Dora explained why she thought the Cinderella wouldn't work:

I began working on the character traits and realized there are lots of characters in the Cinderella fairy tale. I called Tonya and ask her if we could change our fairy tale to 'Hansel and Gretel' it only has 5 characters and it would make the project easier. It would have more realistic expectation for 8th grade students.

Ever since, the team used cell phones to communicate constantly. As Dora described, chatroom was a useful tool for communication, until they switched to cell phone:
Dora: *My group used the chat room the most and found it to be the most useful tool used this semester, until we decided to start using our weekend cell phone minutes.*

As a matter of fact, they called each other not just to discuss project, like Dora described, but also to encourage each other:

Dora: *I called Tonya today to talk about our project. I think sometimes it's just good to actually hear you partners voice, so you can get a better understanding of their ideas, feels and issues. Its great to say everything is going wonderful and on time.*

For Tonya, this project idea started abstractly. She indicated that she was not sure how this project could be carried out in a real classroom. As she described:

Tonya: *When I first began looking at the Tool Project assignment, I thought it was something that sounded interesting but I wasn't sure how I would fully put into practice what we had been discussing online and reading.*

After they changed the topic to "*Hansel and Gretel*", the project proceeded much better. As Tonya described:

Tonya: *However, once we had our lesson plan idea the whole project took on a life of its own! This has been one of the most enjoyable lessons that I have been involved in planning. Not only is technology incorporated and proven to be useful in the classroom setting, but it is used to streamline the creative writing process!!!*

Tonya continued working on the lesson plan and bringing into the *ISTE Technology Standards*. She additionally created a spreadsheet for collecting data with some help from Dora.

Dora and I talked on the phone and she offered some help with the spreadsheet. I have not used them on a regular basis so there is so much more that I need to learn!

Tonya understood that this project would be used with Dora's 8th grade reading students; she worked on the revisions and added her survey data to make this project practical. From her point of view, this project demonstrated how technologies could be used in teaching and learning, which could be shared with other teachers as well as administrators who were also interested in integrating technology into classrooms. As she described:

Tonya: *What better way than to have concrete evidence of how technology can be used, student input on the use of technology and a product to share with other teachers and administrators!*

The project was finished, and the team of two was satisfied with the final result and their team work. As Dora and Tonya expressed:

Dora: *I had a great time working with Tonya! I think that the two of us work well as a team and I believe that our project is a good representation of our hard work and commitment to the class. I also believe that we both contributed evenly to the project. We shared ideas, helped each other and even finished the project in record time.*

Tonya: *I feel we have done a super job of completing the Tool Integration Project. Dora and I work very well as a team and have high expectations for our individual and group performance in our graduate level classes.*

Project title: *Give It To Me Straight!*
Points received: *11.5/12 pts*

Tonya and Dora continued working on their fairy tale "*Hansel and Gretel*" and decided to make it a WebQuest. They felt it would be nice to see a project from sketch to a webquest. As both of them described:

> Dora: *Tonya and I had already planned to use our 'Technology Lesson Plan' to create our WebQuest.*

> Tonya: *From the moment Dora and I began and completed our Tool Integration Project for this course, we have discussed using it to complete our WebQuest project, as well. We felt our Tool project was one that would flow quite nicely into a webquest that could be incorporated into a classroom. Also, it would be a nice way to see our lesson plan go from paper to the computer screen!*

Team G decided to meet in person this time for their project. Both Dora and Tonya attended the class orientation and the workshop for simple webpage, this would be the third time they meet face to face. On a Sunday morning, the team met at the campus student union. Although the team had had the lesson plan from previous project, getting started was not easy. As they described:

> Dora: *Computers booted up fine, but it seemed as if we sat there a moment wondering where to start. This project was pretty overwhelming!*

> Tonya: *We sat at a table with our laptops, paperwork from the Tool project and thought about where to begin.*

Luckily, it did not take too long, and team G started working on the project. Then again, team G experienced some difficult moments; most of them were associated with webpage construction. First of all, only Dora had web authoring software installed on her laptop. This slowed down the work. They took turn using Dora's laptop; and while one person was typing, the other person searched the Internet to find resources to be used:

> Tonya: *Since we were using the web publishing software on one computer only (Dora's), I began to look for free clip art that we could use.*

> Dora: *We took turns typing and editing each of the pages as we worked.*

Dora and Tonya were both novices at creating a webpage. Although the two-hour workshop covered techniques for creating, saving, uploading webpages as well as inserting images, formatting fonts, and creating links, it still takes quite a bit of practice to become accustomed to authoring. Some of the problems mentioned included:

Dora: *I can say we had our share of frustrations as we worked. Links would not work, type would change alignment, pictures would not show up on the website. A couple of times, we had to change places in front of the computer because I was afraid I might pick it up and throw it!*

Team G worked together for nine hours that day and they almost completed the project. They continued working on it when they got home, with cell phone on in order to keep the communication smooth. As they described:

Dora: *We had been at the union for 9 hours working together on this project and still could not get everything to work properly. We decided to call it a day, but that's easier said than done. I just changed working locations, I moved from sitting at the union to working at home. It was rather funny.*

Tonya: *9 hours was a long time but when we left the union, we had our project pretty much complete. There were only minor changes and issues to take care of!*

Dora: *Tonya and I were both on the laptops and talking on our cell phones trying to work out our projects kinks. After at least an hour, it was time to quite for the night.*

Dora decided to ask for help. She went to see a computer instructor at her school. Unfortunately, they couldn't solve the problem:

Dora: *Monday I brought my laptop to school, to talk with our computer instructor to see if she could help me get the fonts to work when it was viewed from the web location. We tried, but with no success.*

Dora also learned that the hyperlink address needed to be precisely typed; and it was until someone checked it for Dora:

Dora: *I typed the link address over and over but had no success, until someone else looked at it. One silly little (.) in the wrong place. Who would have thought that such a little thing could be our big problem?*

Interestingly, Dora's student, an 8th grader, helped Dora upload the photo and solved the problem that neither she nor Tonya could conquer:

But what was funny is that one of my students was able to help me upload the photo in which we were having problems.

Finally, the project draft was ready for review. Team G sent it to Dr. M and received an email about the changes they needed to make. They fixed one typo, lightening the background photo, but experienced hardship in trying to align the text. As Dora indicated, "*All of the type was aligned on my laptop, but every time we viewed the page from a different computer the format was different.*"

As Tonya reported, the project was done. She felt this was an excellent project and would benefit teachers and students. Especially, Dora would be using this project for her students. Tonya was excited to go to see the students' presentations:

When the project was submitted, we both felt we had an excellent project that students and teachers would like. In fact, Dora is doing this very lesson with her middle school students as this is being typed. I cannot wait to go and see their presentations on May 8th!

Although Tonya thought these projects were challenging, in the end, Tonya felt she was more knowledgeable about the availability of technology in classroom. Obviously, for Tonya the course goals were reached. Below are excerpts from Tonya's journals and reflections:

Tonya: *WOW! I can truly say that I am much more knowledgable and excited to use technology in the classroom. This class has shown me how to put what I have learned into practice and how effective it can be as a learning tool.*

Tonya: *I learned that technology can always be integrated into the classroom and students and teachers need to always be up-to-date on new skills.*

Tonya: *Chat room, Web Authoring Tool and Concept Mapping. All of these were tools that I did not have much experience with. They really showed me what is available and how easy it is to communicate and post your ideas to integrate into the classroom*

Tonya: *I would have to say that this project was a challenge! But, challenges are great and we had a wonderful time working together to complete the webquest. At the same time, we have also strengthened a friendship along the way! Thank you for assigning the project and challenging us to incorporate technology in a way that is meaningful and useful in the classroom setting!*

APPENDIX H: Course Syllabus

Course Description: EDCI 718 Learning Technologies

Learning Technologies is a course about *the possibilities* for using technologies to improve learning and understanding. Teachers and other educators who take this course will encounter modern points of view about teaching and learning using technologies.

It is not a course in which you are taught how to use a computer. Although you should expect to learn new skills in the process, the focus is on how to think about using these technologies in a classroom or online setting. You will learn the skills primarily by interacting with your group and by online tutorials or examples, and by being resourceful and trying things out. If you have trouble you may ask for individual assistance on campus.

The course represents a broad introduction to the field of educational computing. In this course you will look at the various roles that computers may take in a learning setting, and explore ways of integrating technology into a curriculum from various points of view. You will learn which types of software are best for different parts of the learning process. You will view educational software and learn about how to find and evaluate that software. You will have an opportunity to *learn by the same methods that you are encouraged to use for your own students' learning.*

Online class discussions, student initiative / leadership, general participation, timeliness, and preparedness will be very important to your learning. *Most projects will involve cooperative learning.* However, some work will be done individually.

The primary audience for this course is teachers, even though you may (or may not!) be beginners at computing. The course will also be useful to those who have used a computer but are not sure how to use it for teaching and learning.

Instructor Contact Information

Instructor: ▮▮▮▮▮▮▮▮▮▮
Office Location: ▮▮▮▮▮▮▮▮▮
Office Hours: I am available most days by email, and I will set up virtual office hours as needed.
E-mail: ▮▮▮▮▮▮▮▮
Phone: ▮▮▮▮▮▮▮▮▮

Required Textbook and Other ResourceREQUIRED TEXTBOOK

Integrating Technology for Meaningful Learning by Mark Grabe and Cindy Grabe 4th Edition (CD-ROM not required). Boston, MA: Houghton Mifflin Company**.** Available from the university bookstore/ Amazon.com / Barnes & Noble (**ISBN: 0618392823**). ▮▮▮▮▮ can mail the book directly to you. Please contact ▮▮▮▮ directly at ▮▮▮▮▮▮▮ or email them at ▮▮▮▮▮▮▮▮▮▮.

ONLINE READINGS: Educational computing journals: Learning & Leading with Technology (assigned articles are available through the ▮▮▮ Library's ▮▮▮▮▮) and Technology & Learning (recommended supplementary material). These materials will be available to all students, but generally

groups will read different articles and report on them to the entire class.

ACCESS TO SOFTWARE: Part of this course involves viewing and studying different types of software. Because many of you are not near campus, you will need to find the recommended software near where you live or work, on the Internet, or available for trial download. We can probably help you with that.

CLASS HANDOUTS: Most class materials will be available on the Internet either as Web pages or as downloadable documents. In most cases these documents will be PDF files.

Course Goals

The College of Education at ▮▮▮▮▮▮▮▮▮▮▮ is dedicated to its vision of preparing educators to be knowledgeable, ethical, caring decision makers in a diverse world. The Conceptual Framework (CF) serves as a guide for fulfilling the College of Education's *vision,* and supports the university and college missions focusing on the development of a skilled workforce through teaching, research, and service. Our objectives for students in EDCI 718 fall into six areas:

Foundations:

- Understand software copyright issues.
- Understand how to use technology to enhance equity.
- Know how to find and use educational technology resources.
- Be familiar with new trends, new technologies.
- Recognize these different types of software, such as: drill & practice, simulations, tutorials, educational games, problem solving, databases, cognitive tools, telecommunications.
- Be able to use basic features of the World Wide Web and to develop Web pages.
- Understand some of the important social issues underlying the use of educational technologies.

Students & Learning:
- Know how to use technology to help students to take responsibility for their own learning.
- Know when (for what type of learning) to use different kinds of software.
- Understand the old and new paradigms of technology in education.
- Understand differences between traditional/behaviorist and constructivist approaches to learning and teaching.
- Understand the constructivist approach to learning and teaching by actually learning this course material in a constructivist, collaborative, project-based environment.
- Understand some of the different constructivist strategies for improving student learning with the help of technology.

Planning:
- Be able to locate and evaluate old and new software.
- Be able to plan sample technology-supported learning events for your own students.
- Become familiar with new ways of assessing student understanding.
- Be familiar with how to use an integrated curriculum with technology.

Instruction:
- Understand ways to enhance learning through the use of technology and constructivist strategies
- Be able to plan lessons that integrate technology
- Be able to develop a Webquest for use in the classroom
- Be able to use different types of software and different strategies fo technology use to address the needs of diverse students

Learning Environment:
- Understand ways to make cooperative and collaborative learning successful
- Understand ways to encourage a community of learners
- Understand ways to motivate learners to take responsibility for their own learning and to increase student engagement in learning

Professionalism:
- Be able to assess one's technology skills, knowledge, and dispositions
- Be aware of conferences, coursework, publications, and other means of keeping current in the field
- Be familiar with some "computer-using-teacher" journals.
- Be aware of opportunities for continuing professional development and ways of keeping your knowledge-base current.
- Be able to develop a technology-in-learning professional development plan for oneself

How to be successful online learner (tips for this course)

Graduate Level Coursework: Time Considerations. In general, in a 3-credit graduate level course, you should expect to put in about 12 hours per week in order to be successful and to get the most out of the learning experience..

Lab Time: You must plan on spending a good deal of "lab" time on a computer in order to complete your work. You must also plan time to collaborate in person (face-to-face or on the phone) and/or virtually (that is, by e-mail, online discussion board, chat or other electronic means) with your assigned or chosen group.

Collaboration from a distance: It is our intention to have collaboration that is meaningful and helpful to participants. You will have three group projects. It is a good idea to collaborate with people who are near to you in distance, in case you should want to meet face-to-face. This is particularly important for the third project. You may also switch groups after each project if you like. Finally, let me say that you do not need to meet face-to-face, but neither is it prohibited. Use whatevers collaboration strategies work for your group.

Software availability: It may be difficult for some of you to locate sotware depending on the resources you have available for your use. You should spend some time at the beginning of the course finding out what educational software might be available at a local school, library, or at a regional educational service center for you to use for browsing and studying. Alternative ways of finding software will be described; either (1) as full software or downloadable demo software, or (2) requesting software for preview from publishers with the intention that if you like it you might ask your school to purchase it. If you choose preview software as an option, you will need to move quickly because it will take a while to receive it. Usually companies give you 30 days to preview software.

Course Requirements

Project / Activity	Points
Participation/Discussion/Preliminary activities	15 pts.
TUTOR Software Project	15 pts.
PBL Project/Presentation	25 pts.

Quest Project/Presentation	20 pts.
Individual Paper	10 pts.
Final Exam	15 pts.
	Total points: 100

Late work and Incompletes: Because your three main projects are collaborative and you are responsible to your group and will be required to complete your portion of the project on time. Every person in the group will be graded both individually and and as a group, according to the requirements of the project. The project will need to be completed on time unless the instructor has given your group permission for an extension. If 3 people in the group finish the project on time without the help of the 4th person, the 4th person will not receive the group grade but will lose points according to the seriousness of the lack of participatioin. If you hand in your individual issues paper after the final exam, or if you are forced to miss the final exam, you will be given an Incomplete for the course. You will have to contact the instructor to discuss how and when these pieces of work may be made up. You will be expected to (a) be responsible to your group and (b) hand in graduate quality work on time. If you need to take an incomplete because you cannot complete your work this semester, you will need to join another group at a comparable time in the next semester. If you do not complete it then, you will be given the grade you have earned when that second semester is over.

E-mail and Web access: You should have your own e-mail account. You can obtain your free ▮▮▮ account through ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ You **MUST** have access to the Web in order to take this course. In order to use Hale Library's online materials and for many other purposes **students must have a** ▮▮▮▮▮▮▮, that is, an electronic ID (signon and password). These may be obtained online.

Online Library access: Once you have your eID, you may have access to Library materials that you can get in full text from your home. Always sign in when you go to the ▮▮▮ Library Website, and go through ▮▮▮▮▮.

Grading and process of doing the 3 collaborative projects

All projects will be graded based on the following criteria:

- Before the beginning of each project, a schedule will be posted giving due dates, individual and group activities to be accomplished, and Discussion or Project points for each activity. In this way you can plan your individual and group time at the beginning of each project.
- Note that many minor activities must be completed along the way– tasks which lead up to the main project. This is where each person and each group needs to do what you expect of your own students: take responsibility for your own learning. Read the textbook, find the resources you need, learn to use the software, do some planning, discussing, and thinking.
- The main part of each project will come after this preliminary set of activities and will be worth most of the points.
- Self evaluation and peer evaluation of your contribution to, and reflection on, the project will be required for each project.
- Presentation (on the Web or by email, whichever way is appropriate for the particular project) to others in the class is required of each project, and in every case class members will be required to view and comment on others' presentations (presentations to an authentic audience, and reviewing others' work is an important aspect of learning).

Important: meeting the due date. The course moves along swiftly, and your group will be depending on

you to do your part of each project. If you/your group can't meet the deadline for any special reason, such as family emergency, please inform the instructor and your project partners as early as possible.
Overall grade for the course is based on the usual percentages: 90-100 =A. 80-89=B. etc.

Academic Honesty

Plagiarism is prohibited and may result in failure on the examination, paper, or project in question, or failure in the course. Please note that submitting one's own work which was already graded or given credit for another class is a violation according to the "Academic Dishonesty" policy at Kansas State University. For further information, refer to ⬚⬚⬚⬚⬚ in the University Handbook. In addition, in this course you may not submit the same work to this class and to another class (even if it has not been graded for the other class) without the prior permission of both instructors.

NOTE: The Undergraduate Honor System Policy was passed by Faculty Senate on April 14, 1998. This policy is on the Provost's home page at ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚ Please note that as of 2004 the honor policy specifically governs graduate students as well as undergraduates.

Accommodation

If you have any condition, such as a physical or learning disability, which will make it difficult for you to carry out the work as outlined or which will require academic accommodations, please notify the instructor within the first week of the course.

ool Integration Project (**12 pts., Final Version Due Nov 10**)

For this project I would like you to concentrate on several learning goals for yourself, associated with the question of how one might set up a constructivist learning environment that:

- uses **project-based learning** as its format
- ntegrates *student* use of a **cognitive tool** (one of the concept-mapping tools your group members used)
- integrates *student* use of a **communication tool**
- integrates *student* use of a **productivity tool** AND
- focuses on student **higher-order thinking**.

It will involve designing a curriculum unit (ranging from 1-5 weeks, I'd say), for a particular age group, with either a single-subject focus or an integrated curriculum topic.

Have serious discussions with your group, decide on the nature of the project, and try to divide up the tasks. You have only 2 weeks to accomplish this project. So use the weeks wisely.

The Task: Instead of asking you to write a traditional lesson plan for every day of a long unit, though, I would like to ask you to think of and describe your project this way:

Part A. Description and explanation of the student project

- Describe the age level, subject areas, and technologies (hardware and software) that will be used
- Use the 5 requirements of a PBL project (acc. to the McGrath article that you read) to organize your description of student activities. Be sure to explain how the activities actually do meet those requirements.
- Describe how each tool will be used and for what purpose.
- Describe the sort of higher-order thinking you expect to engage students in.
- Describe what you expect your students to learn from this project
- Describe how you will know what they have learned, and justify this means of assessment.

Part B. Put on a different hat, and pretend that you are the students in the project you just designed

- Do the project as a group of students, your ideal students, might do it.
- You will probably have to email the files of your student project to me as attachments, or put them in the file drop box, so that I can make them visible to the rest of the class. You can post Part A (above) in the Tool Project Description thread of the Message Board.

Resources for this project

Don't forget that on the main page of this course, under COURSE-->Information, there is a library of online resources entitled **Online Resources**. In this resources list you might find useful ideas and further information on these subjects:

- Project-Based Learning
- Activity Structures (these are different forms of Internet-based activities)
- Teaching for Understanding

Additional short articles by McGrath that might be helpful include:

- McGrath, D. (2003, February). Artifacts and understanding. *Learning & Leading with Technology, 30*(5), 22-24ff
- McGrath, D. (2003, March). Designing to learn: A focus on design in project-based learning. *Learning & Leading with Technology, 30*(6), 50-53.
- McGrath, D. (2003, April). Developing a community of learners:What will it look like and how will it work?. *Learning & Leading with Technology, 30*(7), 42-45.
- McGrath, D. (2003, May). Rubrics, portfolios and tests, oh my! Assessing understanding in project-based learning. *Learning & Leading with Technology, 30*(8), 42-45.
- McGrath, D. (2003, September). We now join collaborative projects. *Learning & Leading with Technology, 31*(1), 36-41.
- McGrath, D. (2004, February). Strengthening collaborative work. *Learning & Leading with Technology, 31*(5), 32-35.

Journal and Reflection (Due approximately Nov 9)

Keep a journal of group activities and activities you do on your own, *and* do a reflection back on what you learned from the project, who contributed what to the project, and whether and how your group collaboration improved on this project.

Feedback on Other Projects (Due as close to Nov 9 as possible)

Look at all the group projects, both the teacher plans (Part A) and the sample student projects (Part B), and respond to at least two of them with helpful suggestions. Do it promptly so that if they want to take your suggestions for improvement, then will have time to make some quick revisions before grading.

APPENDIX J: WebQuest Project Description

Develop a Small WebQuest (12 pts)

Due: May 2

By now you have looked at several webquest examples and participated in a small webquest. As a participant in the quest, you gained first hand experience on what a student might go through while engaging in quest activities. Now it's your turn to *develop* a small webquest. While developing a webquest you will gain experience from a teacher's perspective. This project is an opportunity to put everything you have learned up to now to good use. The purpose of the QUEST project is to explore the constructivist learning approach with an Internet-based classroom activity. The main focus of this approach is to integrate the principles of constructivism to get learners involved in activities which are meaningful to them, to come to understand (not just find) content-related material, to take greater responsibility for their own learning, and to learn technology skills while they are doing it. Remember there are two types of webquests:

- large actual expeditions which classrooms follow and interact with, and
- smaller webquests that teachers and/or students design (such as those listed in bestwebquests.com) about a single issue / topic or interdisciplinary subject.

Your team will develop a second type, a small classroom focused webquest for this project.

Choose One (A or B, you'll have much more flexibility with A):

A. Build your own website: There are no required readings, but we will use several excellent "Reading and Training Resources" developed by Bernie Dodge at San Diego State University as a framework for developing and evaluating the webquest:

1. Go to http://webquest.sdsu.edu/.

2. Browse and read the training materials, focusing particularly on ***Building Blocks for WebQuests*** and on ***A Taxonomy of Tasks.***

B. Build your own website using trackstar:

1. Go to http://www.hprtec.org.

2. Click on trackstar focusing particularly on ***Build a Webpage for your Track*** and on ***Make a Quiz for your Track.***

Guidelines:

Each group will develop a small webquest similar to the examples in bestwebquests.com and hprtec.org. Make sure you agree on a project that can be developed within the time available:

- Keep a journal of your group and individual activities and hand it in after the project along with a reflection about the project.
- Target a particular grade and subject area (the best webquests are interdisciplinary and have cross-curricular connections).
- Come up with an issue/topic/task to build the quest (this will be the hardest thing to agree on). You may want to try the Chat room to brainstorm topics and tasks.
- Your webquest will be evaluated using the following criteria (12pts project + 3 pts. critique, revision, journal/reflection):

Points Possible	Criteria
3	**Overall aesthetics**
	• Overall visual appeal
	• Navigation & Flow
	• Mechanical aspects
2	**Introduction**
	• Motivational effectiveness of introduction
	• Cognitive effectiveness of introduction
2	**Task**
	• Connection of task to standards
	• Cognitive level of task
2	**Process**
	• Clarity of process
	• Scaffolding & richness of process
2	**Resources**
	• Relevance and quantity of resources
	• Quality of resources
1	**Evaluation**
	• Clarity of evaluation criteria
1	**Critique 2 other groups' webquests**
1	**Revision based on feedback your group received**
1	**Journal and Reflection**

• Please place your URL for your websites in the message board under WEBQUESTS or put the information about how to get to your track in this message board

•Review 2 other webquests from this class (Individual task)and give constructive critique. (Date: May 3)

•Read the critiques of your own project, and revise your project for final evaluation (Date: May 5).

•Hand in your journal and reflection (Date: May 5).

• Your team may submit your completed webquests to Tom March's bestwebquests.com website and/or to Bernie Dodge's Webquest Portal. Therefore, you may have an authentic audience for your work. If your project gets selected, you will have made a significant contribution to the field by developing a resource that could potentially be used by thousands of educators and students around the world.

APPENDIX K: EDCI 718 Survey

Please recall the following three **projects** you have completed:
- TUTOR Project
- TOOL Project
- WebQuest Project

1.1 What do you like about these projects? Why?

1.2 What don't you like about these projects? Why?

1.3 What were your overall learning experiences in completing these projects?

1.4 What are the most difficult part(s) to complete these projects? (1. the nature of the projects, 2. the group collaboration, 3. the technology skills, 4. time constraints, 5. other)

1.5 What did you learn from these projects, the content (how to integrate a variety of educational technologies into teaching and learning), the skills (how to use technologies), both, or none? Please be specific.

Please recall the following **technology tools** and how you used them in completing group projects:
- Message Board
- Chat Room
- Web Authoring Tool
- Concept Mapping Tool
- Others _____

2.1 Which tool(s) did you like the most? Why?

2.2 Which tool(s) did you like the least? Why?

2.3 Describe how the project method helped/limited you develop your skills in using these tools.

2.4 Describe your experience with any new tool(s) you learned in this class.

2.5 Will you use it/them in the future? Why or why not?

Please recall the social interaction skills you used in the **collaboration** with your group members:
- Turn-taking
- Repair misunderstanding
- Persuasion
- Arguing
- Others _____

3.1 Which skill(s) did you use the most?

3.2 Please describe your role in your group most of the time.

3.3 If given another chance, would you stay in the same group? Why or why not?

3.4 Describe your most difficult experience communicating online.

3.5 Did you learn by yourself or did you learn with your group member(s)?

Please recall the following **K-State Online tools** you used in this online class:
- Email
- Threaded Discussion Message
- Chat Room
- Digital Drop Box
- Group workspace (file upload, email, group chat, etc.)
- Others _____

4.1 Which tool(s) helped you the most for your online learning experiences?

4.2 If given more time, which tool(s) do you think you would learn better and use more often?

4.3 What was your most difficult experience with a tool?

4.4 Do you have any suggestions or recommendations for these tools?

4.5 Additional Comments:

APPENDIX L: Lessons Learned from Pilot Study

Lessons Learned	Revision of the Research Design
Communication natures- Not all group discussions happened online, some groups met face-to-face or used personal emails to communicate.	Encourage students to keep personal journals for each project.
Project sequence- TOOL project was the third one in the pilot study, some of the students reported overwhelming for learning new tools and at the same time, final exam, issue paper, plus holidays all came at once.	Move TOOL project to the second one. Provide more time for exploring new tools.
Weekly observation criteria- I used Stahl's (1999) six distinct dialogues: *brainstorming, articulation, reaction, organization, analysis*, and *generalization* to categorize the discussion messages. I had difficult time to categorize the messages.	Change the criteria to Stahl's (2000) phases for collective knowledge building: *articulate in words, discuss alternatives, clarify meanings, negotiate perspectives*, and *formalize and objectify*.
Survey findings- Some of the survey questionnaires used Likert scales and the results did not help me understand the meanings.	Use open-ended questionnaires.
Looked for participants' satisfactions for course objectives.	Looking for participants' experiences with projects.
Looked for participants' preferences for tools used, did not help for data analysis.	Looking for participants' experiences with the tools used.
Asked for participants' role in a group, but failed to look into collaborative discourse, which was a concern in many of the student journals.	Add a category of questionnaires that are intended to look for participants' social interaction skills used.

APPENDIX M: Ice Breaker Activity

Welcome to class! Lets get some practice posting messages to the **"Message Board"** (you will be doing a lot of this over the course of the semester). We will have separate forums or Message Board topics for each discussion-assignment. For this assignment click on the one called "Breaking the Ice."

Please post an introductory message introducing yourself to your classmates. To do this click on the "New Thread" over to the right. *Make sure that the SUBJECT includes your name*. Try and answer as many of the following questions as you are comfortable with:

 - Tell us about yourself, such as your family, pets, hobbies, workplace etc.; something exciting you did; Interesting places you have visited.

- Your experiences taking online / distance education courses previously and if you haven't, describe your expectations and concerns regarding online learning.

- Tell us about your computer experience or previous courses you've ever taken related to computer use.

Feel free to respond to **messages posted** by your fellow students. You can do this by clicking on the "Reply" button when viewing a message.

PS: The introductions are very important to form groups. Your interests, computer experience, teaching experience etc. will allow you to identify students with similar interests and discuss the possibilities of forming groups with them. It will also be very helpful to the instructor to gauge the general interests of the class and modify the content / activities to match your interests and experience.

APPENDIX N: Team E 9th Chat History

*** New Session Created 03/13/06 06:57 PM ***

Regina has joined the chat

Beatrice has joined the chat

BEATRICE: *Hello, Regina!*

REGINA: *Hio Beatrice*

BEATRICE: *I wish I had a better focus on this big assignment.*

REGINA: *I'm not sure what Dr. M is asking us to do either--I had to go look up every word used in the top part*

BEATRICE: *Well, I found the 5 requirements of a PBL:*

REGINA: *And, it was not easy finding lesson plans to go with PBL learning, more in "teaching" school learning situations*

BEATRICE: *1. A driving QS/Prob. that sets the stage for the project*

REGINA: *yes, I found the 5 too*

BEATRICE: *Oh, then I won't repeat them.*

REGINA: *What was your concept map on?*

BEATRICE: *Verbs.*

BEATRICE: *I wanted to do parts of speech, but it got so crowded and complicated, I just took one part and expanded it.*

REGINA: *I wonder what the others were on*

BEATRICE: *Do you think this project is meant to build on one of our concept maps?*

REGINA: *I'm not convinced this online is the way to go, I'd like to see other examples*

BEATRICE: *Has Dr. M posted examples on this from the past semesters? I didn't think to look.*

REGINA: *I though that's what I read--under integrates student use of a cognitive tool*

REGINA: *What I found were hypermedia examples, I think*

Anita has joined the chat

BEATRICE: *But it says using one of the concept mapping tools...not the concept map.*

BEATRICE: *Hi, Anita.*

REGINA: *Hi*

ANITA: *Hello*

REGINA: *How do you read this assignment?*

BEATRICE: *R and I are not sure about what we are doing on this.*

ANITA: *I don't know, it seems kind of vague. Do either of you use PBL in your classrooms?*

BEATRICE: *No, not really. I didn't know much about it before.*

REGINA: *I know we are using the terms we've read about--and trying to put together.....I don't have a classroom*

ANITA: *Me either Regina. I think that is why it is difficult to conceptualize*

ANITA: *I did some research on some possible projects, but thought it would be easier if someone had an existing one to work with*

BEATRICE: *I am open to suggestions.*

REGINA: *And, it may be the productivity tool etc. this is so no non linear it may be why I am having problems*

BEATRICE: *What are some of the projects you found, Anita?*

REGINA: *What was your concept map on Anita*

ANITA: *The easiest one I found was asking students to plan a trip of some sort. Like you are going to travel down the Nile River, plan you trip. Money, clothing, stops, medical necessities, etc...*

REGINA: *I can come us why questions on Going West--which was my concept map*

REGINA: *Sort of the same--Creat a profile who are you etc, compare and contrast life of a pioneer traveler and a travelor today*

BEATRICE: *And that was sort of one of our PBL/Ch. 2 examples.*

ANITA: *Maybe Ashley uses something in her classes.*

REGINA: *Ours was the Rain Forest and Rev. War*

BEATRICE: *OH. Yeh...didn't someone do something with Oregon Trail?*

BEATRICE: *See what a scatterbrain I am? Last week...end of grading period...this week parent conferences and assessment tests....argh.*

REGINA: *Well, I did the ind. software, because I had it*

REGINA: *But, I do think there are typical questions of all travel from past to now--*

REGINA: *Challenges --as a pioneer traveler.....what challenges for travel now*

REGINA: *Political era of a bygone time and political agenda today--I don't know*

BEATRICE: *So would they be comparing the two eras?*

ANITA: *I help with one about pretend you are an engineer for NASA working on the Challenger, what would you say to stop the launch this time*

REGINA: *I think that would help students look at pioneers from several perspectives and compare today*

REGINA: *Whatever we do we need to be able to find information easily*

BEATRICE: *What would the driving QS/problem be?*

REGINA: *This lesson has too last 1 to 5 weeks--that's not easy*

ANITA: *You could split the trip/era up into different aspects*

BEATRICE: *Having the kids keep a journal of their travels would be neat for the length of the project.*

BEATRICE: *How about this: How do pioneers succeed in their efforts to 'conquer' unexplored/uninhabited areas?*

REGINA: *I also think there are enough novels on westward movement kids could be reading within a group as another project*

BEATRICE: *You know, if we used that question, I would divide the class into groups...each with a pioneering focus.*

BEATRICE: *Like space. Westward movement. Immigration? ?????*

REGINA: *Ok, but they could then contrast how does that compeare with someone who 'travels' explores? today*

REGINA: *that's compare*

ANITA: *That sounds interesting. A lot has changed.*

BEATRICE: *If we did it that way...each of us could take a 'pioneer' focus and work on it.*

ANITA: *What would the four focuses be?*

BEATRICE: *Then each of us, as the student, could take someone else's to complete in Part B of the assignment.*

BEATRICE: *OK. Let's pick 4 that span some time.*

BEATRICE: *Explorers?*

BEATRICE: *Westward movement/settlement?*

REGINA: *Space*

BEATRICE: *Space travel/labs/possible colonies?*

BEATRICE: *We could use immigration, I suppose as a 4th area.*

ANITA: *Conflicts/dangers/illness/*

REGINA: *That would fall under all areas*

REGINA: *wouldn't it*

BEATRICE: *Yes. Visualize a concept map with PIONEERS in the middle.*

BEATRICE: *4 spokes come out with each of the 4 areas.*

REGINA: *I'm with you so far*

BEATRICE: *Around each 'spoke' some of the things Anita mentioned.*

BEATRICE: *As well as other things we need to pursue.*

BEATRICE: *I mean...other ideas we want to explore in each of the 4 pioneering areas.*

ANITA: *We can take this concept and explore and find 4 areas that are fairly easy to find information on*

BEATRICE: *I think so.*

REGINA: *I'll do the pioneers westward movement*

BEATRICE: *I'll take explorers.*

REGINA: *what about the political era of each*

ANITA: *Help me out. Are we going to still contrast with today? How would you contrast explorers?*

BEATRICE: *That may be hard for me with explorers---they came from so many different countries.*

BEATRICE: *Are we comparing or contrasting?*

REGINA: *how about mountain men or Lewis and Clark--early mappers*

BEATRICE: *Ok. So stick with pioneers from the U.S. geog. area? That may be simpler.*

REGINA: *we have explorers today--what about at the n.pole*

BEATRICE: *Undersea exploration.*

ANITA: *OK, that's the direction I was missing.*

BEATRICE: *Is Ashley going to join us?*

BEATRICE: *I hate to plan her part without her being in on this...*

[the chat history has 25 pages, this appendix shows only 5 pages]

Anita has left the chat

BEATRICE: *Bye*

REGINA has left the chat

BEATRICE has left the chat

*** Session Closed 03/13/06 08:26 PM ***