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# A Qualitative Case Study Analysis for a Potential Model for K-12 Professional Development using Virtual Learning Environments

Andrea Santacrocce-Tejedor  
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A Qualitative Case Study Analysis for a  
Potential Model for K-12 Professional Development Using Virtual Learning Environments

Andrea Santacroce-Tejedor

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Submitted in partial fulfillment of the requirements for the Degree of Doctor of Education  
Seton Hall University  
School of Education and Human Services  
2011

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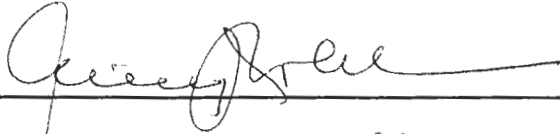
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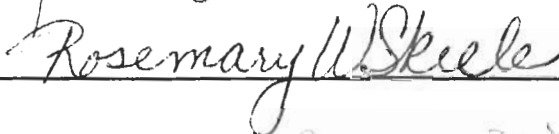
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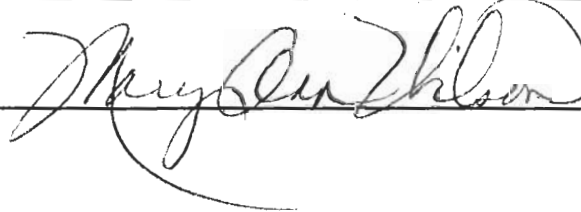
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## DEDICATION

This work is dedicated with love and gratitude to my dear, sweet, beloved family. To my husband and best friend, Jose', thank you for your love and unwavering support as I traveled this path. It was your encouragement and continuous belief in my dream that led me to complete the journey I started five years ago. To my Mother and Father, who have always cheered me on and believed I could accomplish anything. To my sister, Krista, who was the first to dream with me as we built sandcastles, climbed apple trees, and hiked through the woods. To my wonderful children, Leandra and Andrew, who showed me the power of their ideas and the joy of questions and curiosity. And finally, to my beloved grandmothers, Mema and Nana, whose commitment to learning led the way for all of us. I thank God every day for the blessings that I have been granted. I love you all with all my heart and cannot express the love and gratitude I feel as I cross the finish line. I am the luckiest person in the world!

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Andrea Santacroce-Tejedor

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### ABSTRACT

The purpose of this study was to examine three e-learning technologies based on a pedagogical framework for virtual learning environments, and to explore how these technologies could be used to facilitate extended professional learning opportunities whereby K-12 educators could communicate, collaborate, and reflect on their practice.

This qualitative research was conducted in two parts using content analysis for multiple case studies. In the first part, I conducted a content analysis of three e-learning technologies against Britain and Liber's (1999, 2004) Pedagogical Framework for Virtual Learning Environments based on Laurillard's (1993, 2002, 2009) Conversational Framework and Beer's (1981) Viable System Model. The three types of e-learning technologies evaluated were a multiuser virtual environment, web-conferencing software, and learning management system.

In the second part, I used content analysis to examine how the organizational structures and processes unique to each technology could be used to actuate the framework and facilitate professional learning for K-12 educators in three different virtual learning environments (n = 30). The cases chosen for analysis highlight the integrative nature of the technologies and how professional learning strategies can be employed by the instructor to create pedagogically sound professional learning opportunities that include communication, collaboration, and reflection. Data were collected in the form of transcripts, screencasts, digital artifacts, observations, and participant feedback. Narrative descriptions of each case provide a detailed account of the learning environment and the methodology used to create a professional learning opportunity. The data analysis followed the procedures outlined by

Leedy and Ormrod (2005) and Gayton and McEwen (2010), and was conducted on two levels, within cases and across cases.

The research findings revealed that the tools within each case enabled the instructor to create a customized professional learning opportunity, in which teacher-participants (TPs) communicated, collaborated, and reflected. The outcome is a three-dimensional planning model for the identification of tools and the coordination of activities in a virtual learning environment. Further studies should be conducted to determine how the planning model could be (a) applied to other virtual learning environments, and (b) used to facilitate long-term professional learning opportunities.

## CHAPTER 1

### INTRODUCTION

#### **Background and Problem Statement**

The study of professional development for K-12 educators came of age in the early 1970s and 1980s, as stakeholders in education began to question the efficacy of inservice education. These professional learning opportunities were designed for practicing K-12 educators to explore educational content and technological processes in varying depth, and to extend personal competencies (Ainsworth, 1976; Brim & Tollent, 1974; Zigarmi, Betz & Jensen, 1977). Early research equated professional development with the notion of a day-long inservice (Joyce & Calhoun, 2010; Zigarmi, Betz & Jensen, 1977), and defined these efforts as “individually-planned and/or school-planned activities for the improvement of instruction and/or the professional development of staff members” (Zigarmi et al., 1977, p. 545). Since that time, many reform movements have led to a new vision for professional development, whereby educators are provided the opportunity “to reflect critically on their practice and to fashion new knowledge and beliefs about content, pedagogy, and learners” (Darling-Hammond & McLaughlin, 1995, p. 587). At the foundation of the reform measures are questions related to establishing high academic standards for all students, enhancing the organizational climate of schools, improving the quality of the curriculum and instructional practices with the goal of increasing student learning outcomes (Borman, Hewes, Overman & Brown, 2003; Darling-Hammond, 1993; Darling-Hammond & McLaughlin, 1995; Fullan, 2005; Joyce & Calhoun, 2010).

The effect of the reform efforts has revealed the need for professional learning opportunities for teachers that lead to expanded and improved knowledge of K-12 content

and associated pedagogy. Traditional models of formal professional development for educators have included workshops and special training that were district-mandated or selected by teachers (Stein, Smith & Silver, 1999). These models for professional development have been highly criticized, because they have not demonstrated lasting effects in teacher practice (Hughes, Cash, Klingner & Ahwee, 2001; Joyce & Showers, 1995; Little, 1993; Stein et al, 1999). Perhaps it is the lack of specific research outcomes in coordination with new models for professional learning that explains why more than 90% of public school teachers across the nation report that they continue to participate in traditional forms of professional development (Wei, Darling-Hammond, Andree, Richardson & Orphanos, 2009), despite lack of empirical evidence of their effectiveness.

Research indicates that professional learning in the K-12 setting needs to provide extended opportunities for teachers to reflect critically on their practice and build new knowledge about today's students and how they learn (Ball & Cohen, 1999; Cohen & Hill, 2000; Corcoran, Shields & Zucker, 1998; Darling-Hammond & Richardson, 2009; Elmore, 1997; Little, 1993; Yoon, Duncan, Lee, Scarloss & Shapley, 2007). Such training might include exploration of theory, demonstration or modeling of a skill, practice of the skill under simulated conditions, or feedback and coaching. Joyce and Showers (1988) indicated that this organization is necessary if the outcome is skill development. Training that is organized around a series of sessions, spaced one or more weeks apart, is shown to be more effective than one-time offerings (Loucks-Horsley, Harding, Arbuckle, Murray, Dubea & Williams, 1987; Sparks, 1983). When the training is provided through a series of sessions, information can be scaffolded and teachers can have time to practice the new skills with both guided and independent practice. "The purpose of providing training in any practice is not simply to

generate the external visible teaching 'moves' that bring that practice to bear in the instructional setting, but to generate the conditions that enable the practice to be selected and **used appropriately and integratively**" (Showers, Joyce, & Bennett, 1987, pp. 85-86).

According to the National Staff Development Council (NSDC), the new definition of professional development is based on a commitment to continuous improvement; whereby courses, workshops, institutes, networks and conferences are used to support teachers' professional development efforts (2010). These efforts may be made available through internal human resources, external resources such as researchers and program developers at universities, education service agencies, and networks of content-area specialists (Byrk, Camburn & Louis, 1999; Hirsh, 2009; King & Newmann, 2000; Rusch, 2005). However, while the new definition of professional development acknowledges the role of courses and workshops, questions remain as to the effective implementation, including access to experts, time, funding, and school culture (Kleiman, 2004). As a potential new model for professional development, electronic learning (e-learning) technologies offer one possible solution to these challenges. The technologies can be used to connect educators synchronously and asynchronously to experts, create self-paced learning opportunities, and provide access to learning for anyone, anytime. The use of emerging technologies and ubiquitous access to organized learning may help to develop what Yoon et al. (2007) described as extended opportunities to reflect critically on practice and develop a new paradigm as to the changing culture of youth and their learning preferences.

Some of the technologies typically used to facilitate online learning opportunities include professional learning communities through Web-based technologies like course management systems, live broadcasts through video-conferencing, or self-paced learning



modules through online discussion boards. However, other technologies are emerging that can be used to connect educators in asynchronous, synchronous and immersive virtual learning environments.

### **Purpose of the Study**

E-learning has become a commonplace term used by technologists to describe learning that occurs using the Internet (Clark & Mayer, 2003; Reiser & Dempsey, 2007). However, this definition does not account for the pedagogy of learning. A recent definition that has emerged is “pedagogy empowered by digital technology” (Nichols, 2008, p.2). Given this definition, the essential question then becomes, how can the power of e-learning technologies be used to enhance and expand learning opportunities for K-12 educators? Today we are uniquely poised to examine how e-learning technologies can be used to connect educators to high quality professional development in asynchronous, synchronous, and immersive learning environments. Therefore, the purpose of this research study is to examine the specific tools that are available in three e-learning technologies to determine ways in which they can be used to support professional learning opportunities for practicing K-12 educators.

### **Conceptual Framework**

In order to prepare educators for the learning needs of K-12 students in the 21<sup>st</sup> Century, teachers need engagement in extended professional learning opportunities while immersed in learning spaces that utilize 21<sup>st</sup> Century technologies. Research into the use of virtual learning environments (VLEs) for professional learning opportunities for K-12 educators is modest, although the recent special issue on technology in the *Journal of Staff Development* indicates a growing interest (Volume 31, Issue 1, 2010). Theoretical insights

into e-learning environments must be analyzed based on emerging critical issues for teachers, learners, educational managers, and educational designers. “Few tools, however, have been explicitly designed to enable the communication necessary to provide teachers guidance, support their collaboration, and facilitate partnerships in teacher education” (Schneider, 2009, p. 86). In this research study, these matters were examined by using a pedagogical framework to analyze three e-learning technologies. Using the framework for the pedagogical evaluation of virtual learning environments outlined by Britain and Liber (2004), the technologies were evaluated based on how the e-learning technology encourages the pedagogical process. As Britain and Liber (2004) indicated, the framework is intended to provide “a means by which discussion about specific process aspects of tools and systems can take place in a structured way, and hopefully result in better choices and design decisions” (p. 11).

Britain and Liber’s framework is based on two different theoretical models: the Conversational Framework (CF) (Laurillard, 1993) and the Viable System Model (VSM) (Beers, 1981). The CF is a model of effective teaching practice for academic learning, while the VSM is a model of the design and diagnosis of effective organizational structure drawn. The framework incorporates elements from both theoretical models, (see Table 1: Elements of CF and VSM in the Framework for the Pedagogical Evaluation of Virtual Learning Environments). Britain and Liber (2004) suggested that, “how a VLE is designed can have a profound impact on how likely it is to constrain or facilitate the use of a variety of pedagogical approaches” (p. 4).

Table 1  
*Elements of CF and VSM in the Framework for the Pedagogical Evaluation of Virtual Learning Environments*

<b>Conversational Framework (CF)</b>	<b>Viable System Model (VSM)</b>
--------------------------------------	----------------------------------

---

Discussion/Discursive Tools	Resource negotiation
Adaptation	Coordination
Interaction	Monitoring
Reflection	Autonomous Learning
	Self-organization
	Adaptation

---

The research in this study was conducted in two parts. In the first part, I conducted a content analysis of three different e-learning technologies using Britain and Liber's framework for the pedagogical evaluation of virtual learning environments. I examined the tools that are available in each technology, and then charted the tools against the questions posed by Britain and Liber in their framework.

In the second part, I used content analysis to examine how the organizational structures and processes unique to each technology were used to actuate the framework and facilitate communication, collaboration, and reflection for three cases of professional learning for K-12 educators. The documents and artifacts from the three cases were analyzed and charted against the eight guiding questions that Britain and Liber posed in the pedagogical framework for the evaluation of virtual learning environments.

The three cases analyzed in this study were a part of a regional Title II, Part D, Enhancing Education Through Technology (EETT) grant to develop teacher-participants' (TPs) ability to utilize technology in order to engage students in the learning process with the goal of enhancing literacy instruction across the curriculum. The project staff designed professional learning opportunities to serve the needs of teachers working with students in grades 3-12. Specifically, professional learning opportunities were designed to: (a) provide authentic technology opportunities to high-needs districts, (b) prepare teachers to integrate technology into their curriculum, (c) address ways in which technology can be used to

support students' literacy-based thinking skills, and (d) demonstrate ways that administrative leaders can support and assess meaningful uses of technology in the classroom. As part of this grant, teachers were offered the opportunity to attend technology-based webinars, a synchronous meeting, or live Web conferences, with participants using their own computers to connect via the Internet.

The cases chosen for analysis highlight the integrative nature of the technologies and how professional learning strategies can be employed by the instructor to create pedagogically sound professional learning opportunities that include communication, collaboration, and reflection. Collis (1997, p. 12) argued the need for "pedagogical re-engineering," a term used to describe a design process in which the learning environment is completely redesigned to take intentional advantage of the learning opportunities provided by the new technologies.

### **Research Questions**

Although some researchers (Dede, 2006; Killion, 2000; Schrum, 1992) have described strategies for engaging teachers in online professional development, previous research has not specifically evaluated how the tools available in e-learning technologies can be used to provide opportunities for high-quality professional learning within a pedagogically sound framework. This study addressed that issue. The study attempted to answer the following questions (see Figure 1 for Research Questions' Relationships to Variables):

1) What tools are available in the three selected e-learning technologies to support a pedagogical framework as defined by Britain and Liber (2004)?

2) How can professional learning specialists leverage the tools in these technologies to provide formal professional learning opportunities for K-12 educators that support communication, collaboration, and reflection?

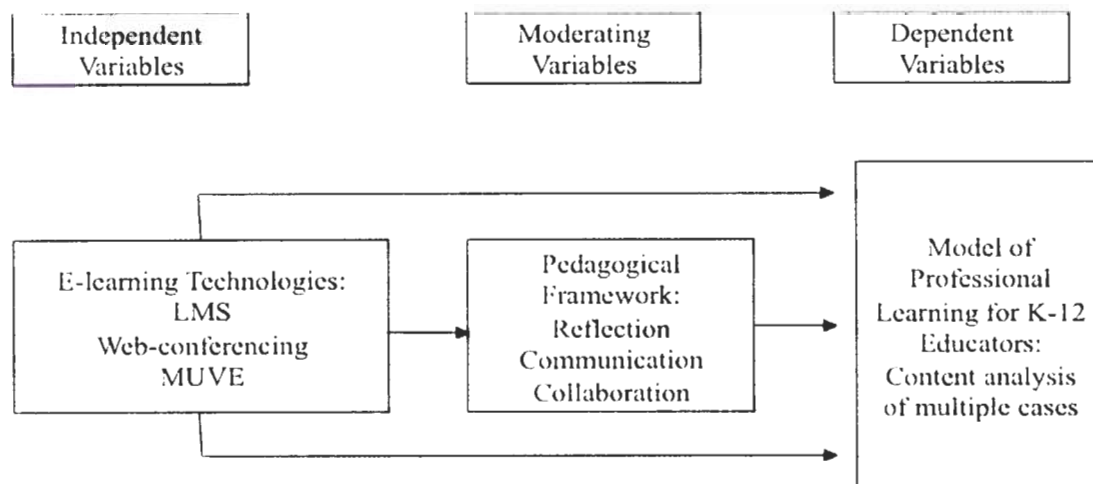


Figure 1. Research questions' relationships to variables.

Table 2 below summarizes the research questions and the methodology used to address each question.

Table 2  
*Summary of Research Questions and Proposed Methodology*

Question	Methodology: Sources of Information		
	Framework for the Pedagogical Evaluation of VLE	Content Analysis	Cases
Question 1	X	X	
Question 2	X	X	X

### Limitations of the Study

I am a professional development specialist and consultant for e-learning and instructional technology, as well as the instructor for the three cases evaluated in this study. In qualitative research like this multiple case study, my knowledge formed an important part of the understanding of the design, methods and interpretations. Merriam (2002) pointed out

that “the researcher is the primary instrument for data collection and analysis” (p. 5). Thus, one of the limitations of the study is that there inevitably remains an interpretive aspect to the evaluation of the e-learning tools and systems, which leads to the potential for bias. The potential for biased interpretation without data, and for predisposition to conclusions that are personally satisfactory, are addressed again in the Methods section. To address this limitation, I used multiple strategies to examine the cases, including the analysis of documents (i.e., transcripts, software guides, webcasts, forums, and blogs), direct observations, and the collection of digital artifacts. Due to the qualitative nature of this study, the results may not be generalizable. However, its findings might transfer to similar settings and contexts, such as other e-learning technologies and professional learning opportunities in virtual learning environments (Lincoln & Guba, 1985).

### **Significance of the Study**

The significant contribution to research that this study makes is the evaluation of emerging e-learning technologies against a pedagogical framework, and then actuating the technologies to evaluate virtual learning environments developed for extended professional learning opportunities for K-12 educators. Through this examination, insight can be gained as to how these technologies can be used to engage K-12 educators in communication, collaboration and reflection about their practice. Based on the findings, K-12 administrators and staff developers will be able to leverage the capacity of the e-learning technologies to design virtual learning environments in order to prepare educators to meet the learning needs of K-12 students in the 21<sup>st</sup> Century, while immersed in learning spaces that utilize these same 21<sup>st</sup> Century technologies.

### Definition of Terms

The following are definitions of relevant terms and acronyms used in this study.

*Blog* – an abbreviated form of Web Log, used by people to self-publish ideas and information.

*Computer Mediated Communications (CMC)* – “any communicative transaction that occurs through the use of two or more networked computers” (McQuail, 2005, p. 551).

*Conversational Framework (CF)* – Laurillard (1993, 2002) provided a framework for developing learning environments that are discursive, adaptive, interactive and reflective based on the dialogic nature of learning.

*E-learning* – “pedagogy empowered by digital technology” (Nichols, 2008, p. 4).

*Forum* – a Web-based discussion board where people can ask questions and post answers/comments.

*Learning Forward* (formerly the National Staff Development Council, NSDC) – Learning Forward is the leading national professional development membership organization for K-12 educators, which has adopted the mission that, “Every educator engages in effective professional learning every day so every student achieves.” See Appendix A for a complete definition of professional development.

*Learning Management System (LMS)* – “a collection of e-learning tools available through a shared administrative interface” (Nichols, 2008, p. 4).

*Micro-world* – “learning activities within a VLE that are enriched by multimedia resources and simulation programs” (Britain & Liber, 2004, p. 26).

*Multi-user Virtual Environment (MUVE)* – a 3-dimensional graphical interface, which is accessed over the Internet. Multiple participants interact simultaneously in an immersive environment that simulates a real world environment.

*No Child Left Behind (NCLB) Act of 2001* –Section 9101 of the No Child Left Behind (NCLB) Act of 2001 establishes exhaustive criteria to define professional development, including activities that involve both administrators and teachers, move teachers to "highly-qualified status", and improve student achievement on standardized tests. See Appendix A for the complete definition of professional development.

*Screen shot* – a picture of the computer screen.

*Viable Systems Model (VSM)* – Beers (1981) proposed the application of cybernetics to the field of organizational design, management and control, by viewing any situation as being composed of three parts: 1) the environment, 2) the operations performed by an organization in this environment, and 3) the metasystem activities of coordination, planning, and goal setting done by the organization.

*Virtual Learning Environment (VLE)* – any Web-based environment that can be configured for multiple participants to interact either asynchronously or synchronously.

*Webcast* – a broadcast over the Internet.

*Web-conferencing* – Internet-based communication software that allows multiple participants to connect simultaneously.

*Webinar* – a synchronous meeting or live Web conference where participants use their own computer to connect via the Internet

*Wiki* – an editable Web page that allows multiple users to edit the information.



## CHAPTER 2

### REVIEW OF THE RELATED LITERATURE

This chapter describes literature relevant to the research objectives of the thesis. It is organized into three sections: 1) professional learning for K-12 educators, 2) the basic characteristics of e-learning, and 3) pedagogical frameworks (Laurillard's Conversation Theory (1993, 2002, 2009), and Britain and Liber's Pedagogical Framework (2004) for the Evaluation of Virtual Learning Environments) for the use and evaluation of virtual learning environments (VLEs).

#### Professional Learning for K-12 Educators

In 2001, the *No Child Left Behind Act* (NCLB) established standards for high quality professional development. Under the federal act, Section 910(34)A includes 18 activities intended to improve the quality and quantity of professional development. The activities in four categories target the improvement of teachers' understanding of content area knowledge, achievement standards, effective instructional strategies, and technology to support student learning. It is recommended that these activities be a part of a sustained, districtwide improvement plan, which should be regularly evaluated for its impact on teacher effectiveness and student learning outcomes. Most recently, President Obama and his administration cited improving teacher quality as one of the four education reform areas it plans to target. The American Recovery and Reinvestment Act provided \$77 billion for reforms to strengthen elementary and secondary education. One of the pillars of the education reform is recruiting, preparing and rewarding outstanding teachers (The White House, 2009), by providing funds to make improvements in teacher effectiveness, and to ensure that all schools have highly-qualified teachers (U.S. Department of Education, 2009).

In 2009, the United States Department of Education released \$1.6 billion for Improving Teaching Quality State Grants. The purpose of the program was to increase academic **achievement by improving teacher and principal quality** (U.S. Department of Education, 2009). These funds were used to address the issue of teacher quality “whether they concern teacher preparation and qualifications of new teachers, recruitment and hiring, induction, professional development, teacher retention, or the need for more capable principals and assistant principals to serve as effective school leaders” (U.S. Department of Education, 2009).

Similarly, Learning Forward (previously known as the National Staff Development Council, or NSDC) (2001) developed standards for professional development that are ultimately aimed at improving the learning of all students. The resulting 12 standards are based on research that connects professional development to student achievement. These standards are guided by three questions: 1) What are all students expected to know and be able to do? (i.e., student learning standards), 2) What must teachers know and do in order to ensure student success? (i.e., professional practice standards), and 3) Where must staff development focus to meet both goals? (i.e., staff development standards).

The Learning Forward (NSDC) standards address the third question and provide direction for designing professional development experiences that ensure that teacher-participants (TPs) acquire the knowledge and skills they need to maximize student learning. In 1989, Sparks and Loucks-Horsley defined *professional development* as “those processes that improve the job-related knowledge, skills, or attitudes of school employees...that is intended to improve student learning through enhanced teacher performance” (p. 1). The authors identified five models of effective staff development: individually guided,

observation/assessment, involvement in a development/improvement process, training, and inquiry.

Similarly, Gall and Vojtek (1994) defined *staff development* as “any effort to improve teachers’ knowledge, skills, and attitudes as that they perform their roles more effectively” (p. 1). The authors analyzed staff development programs based on how they help teachers learn and the objectives of the staff development effort. The authors identified six different models of staff development based on the role of the staff developer: expert presenter, clinical supervisor, trainer, action-research facilitator, organization-development specialist, and change agent.

In 2010, Joyce and Calhoun defined “staff/professional development as formal provisions by organizations of ways of helping teachers and administrators develop a better workplace and enhance their knowledge and competence in their assigned roles” (p. 10). The authors identified the following models of professional development: individual inquiry, personal/professional services by peers, personal/professional services by supervisors, action research, open-ended local learning community activity, curriculum and instructional initiatives, workshops on generic instructional techniques, and sets of workshops scheduled during paid staff development days.

In 2009, Learning Forward (NSDC) proposed a new definition of professional development to be included in the reauthorization of the Elementary and Secondary Education Act; i.e., No Child Left Behind Act of 2001 (see Appendix A). The amended definition included specific language on the importance of professional development for educators, and identified how professional development should be aligned, conducted, and supported as a part of a comprehensive, schoolwide improvement plan whereby courses,

workshops, institutes, networks and conferences are used to support professional learning (Hirsch, 2009).

In trying to develop an effective framework for professional development, 13 lists of characteristics of effective professional development from national organizations and research agencies were analyzed (Guskey, 2003a). These lists were then compared to the NSDC (2001) Standards for Professional Development, which represents a model for “staff development that improves the learning of all students” (p. 5). One drawback is that most of the lists are not based on systematic research; rather, they are based on survey results and the opinions of educators and researchers (Corcoran, 1995a, 1995b; Educational Research Service, 1998; Garet, Porter, Desimone, Birman, & Yoon, 1999; Hawley & Valli, 1999; Kennedy, 1998; Kent & Lingman, 2000; Loucks-Horsley, Stiles & Hewson, 1996; National Partnership for Excellence and Accountability in Teaching, 2000; NSDC, 2001; Terzian, 2000; U.S. Department of Education, 1997; Wenglinsky, 2002). The common characteristics of effective professional development that Guskey identified on the 13 lists include: the enhancement of teachers’ content and pedagogical knowledge directly related to student learning, sufficient time to study and analyze students’ work, collaboration with colleagues to reflect on their practice and exchange ideas, evaluation in an effort to gather formative data, alignment with other reform initiatives, organization of school or site-based initiatives that are developed within the context of an organized districtwide plan, and implementation of ongoing, embedded efforts (Guskey, 2003a). Surprisingly, only a few of the lists emphasized the use of student learning data to guide professional development programming. Even fewer lists mentioned the need for research-based professional development practices.

The most frequently mentioned characteristic that was identified to have a substantial positive effect on teachers' practice was the enhancement of teachers' content and pedagogical knowledge. In accordance with this research, this includes: 1) knowledge, skills and teaching practices, specifically subject matter content; 2) pedagogy; 3) teaching practices in specific domains; and 4) the ways students learn (Cohen & Hill, 1998; Fennema, Carpenter, Franke, Levi, Jacobs & Empson, 1996; Garet et al, 1999).

Successful professional development programs emphasize high learning standards for all students (DuFour, 1997; NSCD, 2001). Another common factor to successful professional development programs that is consistent with these high standards is embedded professional development that is sustained, intensive, and classroom focused (Darling-Hammond, 1996a; DuFour, DuFour, Eaker & Many, 2006; Guskey, 2000; Lieberman, 1995). Researchers agree that there is a substantial positive influence on opportunities for active learning if professional development is sustained over time and includes substantial hours (Garet et al, 1999; Shields, Marsh & Adelman, 1998; Weiss, Montgomery, Ridgeway & Bond, 1998). Extended professional development opportunities are more likely to include in-depth discussion, exploration, and reflection of the content; students' conceptions and misconceptions; and pedagogy. In addition, professional development that is sustained over time is also more likely to allow teachers to implement the practices they are studying, obtain feedback, and reflect on the impact of their practice on student learning.

To be effective, collaboration must occur when teachers willingly participate, in order to identify problems and establish mutually acceptable goals, respect the contributions of all participants, and share in decision-making. Thus, collaborative activities must be a part of ongoing site-based professional development that is an integral component of a district-wide

plan, whereby teachers form professional learning communities centered on shared purposes and improvement goals (Darling-Hammond, 1996b; DuFour, 1997; Guskey, 2000).

Professional development needs to be a part of an overall program of teacher learning and development that emphasizes content and pedagogy that is aligned with standards (Lieberman & MacLaughlin, 1992).

The effect of the educational reform efforts has resulted in a need for professional learning opportunities for teachers that lead to expanded and improved knowledge of content and pedagogy. However, while NCLB requires states to provide high-quality professional development, it does not specify the parameters for professional development (Borko, 2004). Hiebert's (1999) definition of high quality professional development is based on rigorous standards, focused on content, and structured for in-depth learning opportunities. This definition highlights teacher collaboration, student learning outcomes, student thinking, and the curriculum and pedagogy, as well as alternative instructional methodologies and opportunities to observe these in practice. However, historically there has been a lack of evidence that supports the effectiveness of teacher professional development on sustained changes in teachers' instructional practices, nor is there a direct link to teacher engagement in professional development and improvement in student learning outcomes (Corcoran, 1995a; Frechtling, Sharp, Carey, & Baden-Kierman, 1995; Newmann, King, & Youngs, 2000; Wang, Frechtling & Sanders, 1999).

Learning Forward (NSDC) published "Professional Learning in the Learning Profession: A Status Report on Teacher Development in the U.S. and Abroad" (Wei et al., 2009). Researchers analyzed data from the federal Schools and Staffing Surveys from 1999–2000 and 2003–2004. The researchers reported that, in spite of the call for long-term, job-

embedded, collaborative professional development, the prevailing model of professional development that teachers engage in is generally short term in nature. In 2003, 92% of survey respondents reported having participated in formal professional development activities; such as, workshops, conferences or other training over the previous 12 months. Over the course of the previous year, 39.8% reported participation in individual or collaborative research on a topic of professional interest, 70.4% reported regularly scheduled collaboration with other teachers on issues of instruction, 63% reported using peer observation, and 45.7% reported using mentoring/coaching. Thus, in spite of the research that suggests the need for a change in the models of professional development, teachers report their primary experience of professional learning continues to be short-term workshops, conferences, and training sessions. However, the data also indicate that teachers have reported increased participation in professional development that utilizes collaborative models (Wei et al., 2009).

While researchers generally agree about the characteristics of high-quality professional development, there are many challenges to effective implementation—including time, funding, school culture, and access to experts (Ball & Cohen, 1999; Darling-Hammond & McLaughlin, 1995; Guskey, 2003b; Kleiman, 2004; NSDC, 2001; Shulman, 1987; Sparks & Hirsh, 1997; Stigler & Stevenson, 1991; Yoon et al., 2007). Advances in e-learning technologies offer one option to support teachers' learning and professional development (Dede, 2006; Killion, 2000; Schrum, 1992).

Dede, Breit, Jass Ketelhut, McCloskey & Whitehouse, (2005) reviewed 40 research studies dealing with online teacher professional development, in an “attempt to organize the field of online teacher professional development into major categories and to place the

accumulated empirical evidence (the known) into each category” (p. 6). Their investigation revealed that the 40 studies focused on five areas of concern, which included: (a) design, (b) effectiveness, (c) technology, (d) communication, and (e) research methods. As related to pedagogy, the researchers found that the predominant theoretical frameworks that were used to design online courses were social constructivism and communities of practice. Social constructivist theories (Rogoff, 1990; Salomon & Perkins, 1998; Vygotsky, 1978; Wertsch, Del Rio & Alvarez, 1995) focus on complex and authentic activities, social interaction, intentional learning communities, and guided assistance to learners. Communities of practice are defined as “participation in an activity system about which participants share understandings concerning what they are doing and what that means in their lives and for their communities” (Lave & Wenger, 1991, p. 98). Wenger (1998) added that a community of practice involves a collection of individuals sharing mutually defined practices, beliefs, and understanding over an extended time frame in the pursuit of a shared enterprise. Characteristics of a community include (a) common cultural and historical heritage, (b) interdependent system (i.e., the community is a part of something bigger), and (c) reproduction cycle (i.e., new members are cultivated and assume leadership roles) (Barab & Duffy, 2000). Dede et al. (2005) also found that many of the research studies yielded results indicating that “online discussions and individual contributions can be reflective, interactive, collaborative, or community building” (p. 36).

The use of e-learning technologies offers one possible solution to these challenges, as the technologies can be used to connect educators to experts, create self-paced learning opportunities, and provide access to learning for anyone at anytime. Some of the forms typically used to facilitate e-learning include online professional learning communities



through Web-based technologies such as a course management system, live broadcasts through video-conferencing, or self-paced learning modules often using online discussion boards. However, other technologies are emerging that can be used to connect educators in asynchronous, synchronous and immersive environments. The purpose of this study is to examine these technologies based on a pedagogical framework for virtual learning environments and to explore how these technologies can be used to facilitate extended professional learning opportunities whereby K-12 educators can communicate, collaborate, and reflect on their practice.

### **The Basic Characteristics of e-Learning**

Electronic learning (e-Learning) has become a commonplace term used by technologists to describe learning that occurs “using a combination of content and instructional methods delivered by media elements, such as words and graphics on a computer intended to build job-transferable knowledge and skills linked to individual learning goals or organizational performance” (Clark & Mayer, 2003, p. 311). Sloman (2001) defined *e-learning* based on connectivity, or “learning delivered or received mainly through the Internet, intranets, extranets or the Web” (p. 55). Similarly, Nichols (2008) defined *e-learning* as “the use of technological tools (primarily those that can be made available over networks such as the internet) for education” (p. 4). Key attributes of e-learning include convenient and flexible access, networked media-rich learning objects, Web-based technologies, interpersonal interaction among a community of learners, and pedagogically driven learning environments (Bull, 2008; Garrison & Anderson, 2003; Nichols, 2008; Rosenberg, 2001; Sun, Tsai, Finger, Chen & Yeh, 2008).

Course management systems have emerged as the primary technology to facilitate e-learning opportunities. However, new technologies are emerging that can be used to support learning through the use of virtual learning environments (VLEs). In the past, a VLE was defined as “a collection of e-learning tools available through a shared administrative interface...on which online courses are assembled and made available” (Nichols, 2008, p. 4). Today, flexible Web-based technologies can be configured to create environments where multiple participants can interact both asynchronously or synchronously. In an effort to make learning opportunities more accessible and available to a larger audience, educational institutions are utilizing diverse technologies and VLEs for learning in asynchronous, synchronous and immersive environments. VLEs include (a) multi-user virtual environments (i.e., Active Worlds), (b) Web-conferencing software (i.e., Adobe Connect, Elluminate, or WebEx), and (c) course management systems (i.e., Moodle and Blackboard).

MUVEs have a 3-dimensional graphical interface, which can be accessed over the Internet. Multiple participants interact simultaneously in an immersive environment that simulates a real world experience. Each participant enters the environment from his or her own computer after downloading the client to the computer. Participants can communicate through telegrams, instant messaging and voice chat. In addition, participants can build their own objects and environments and add hyperlinks to objects that link to other Web-based resources. Examples of MUVEs are Active Worlds, Second Life, Open, Sim, There, and Teleplace.

Web-conferencing software is Internet-based communication that allows multiple participants to connect simultaneously. Each participant joins the meeting from his or her own computer by entering a Website address. Participants then communicate through instant

messaging or voice chat. In addition, there are options such as file sharing, desktop sharing, digital whiteboard, polls and surveys. There are many different providers of Web-conferencing software, including Adobe Connect, Go to Meeting, IBM Lotus Sametime, Glance, Dimdim, and WebEx.

A learning management system is “a collection of e-learning tools available through a shared administrative interface” (Nichols, 2008, p. 4). Some of the tools available in a learning management system are file sharing, forums, blogs, wikis, journals, chat, glossary, podcast, questionnaire, and quiz. In addition, there are modules available that can be used to create self-paced lessons and assignments. The participants can access the activities and files asynchronously, which means that real-time interaction is not required, although it can be an option by enabling a chat. Some of the major learning management systems available today are Moodle, Blackboard, Sakai, and DesireToLearn.

The use of e-learning technologies is one of many options to provide professional learning opportunities. However, it is important to consider the pedagogical framework within which such technologies will be used. Thus, it is critical to identify the pedagogical frameworks for the design and evaluation of virtual learning environments.

### **Pedagogical Frameworks for the Use and Evaluation of Virtual Learning Environments**

A recent definition of e-learning that has emerged is “pedagogy empowered by digital technology” (Nichols, 2008, p. 2). Nichols’ definition places the pedagogy before the technology (Kirkwood & Price, 2006). Further, many theoretical frameworks have been used to support the design, development, evaluation and research of virtual learning environments. In recent years, much of the research on the design of VLEs has been based on social and constructive learning processes; i.e., learning that focuses on complex and

authentic activities, social interaction, intentional learning communities, and guided assistance to learners (Bull, 2008; Dawson, 2006; Garrison & Arbaugh, 2007; Rovai, Wighting & Lucking, 2004; Shea, Li & Pickett, 2006).

One pedagogical framework that has been used to develop virtual learning environments is Laurillard's Conversational Framework (CF) (1993, 2002). Although the framework was designed for a higher education setting, Laurillard (2002) wrote that it is "applicable to any academic learning situation" (p. 87). Therefore, it is appropriate to consider for the design of virtual learning environments for professional development for K-12 educators, which is the setting of this study. The CF provides an outline for developing learning environments that are discursive, adaptive, interactive and reflective. Many of the traditional frameworks that are used to develop and evaluate VLEs focus on a student-centered approach to learning which reflects the social-constructivist perspective. Laurillard's model, however, relies on the dialogic nature of learning, whereby reliable knowledge exists, is produced, and evolves in action-grounded conversations (Boyd, 2004; Pask 1976). By using conversation as a basis for teaching, learning relationships become transparent to the student and the teacher. Thus, personally significant and valued learning is achieved by exercising the freedom to learn in conversational encounters, which are valued by using criteria that arise from within the experience itself (Harri-Augustein & Thomas, 1991).

Laurillard emphasized the idea of dialogue in the development of the Conversational Framework (1993, 2002), using the model to depict the communication process that occurs between teachers and students in the development of the students' knowledge. The four elements of the learning process that Laurillard identified in the framework are discussion,

interaction, adaption, and reflection. Due to the iterative nature of the model, there are three engagements with one topic where the students learn from theory, action, and feedback. Teacher evaluation of students and the provision of feedback occur at an early stage to correct learner misconceptions. See Table 3 for a summary of the steps in the CF and how they relate to the four elements of the learning process and the corresponding activities of teachers and students (Laurillard, 2002).

Table 3  
*Summary of the Conversational Framework and the Learning Process with Teacher and Student Activities*

Four Elements of the Learning Process	Corresponding Activities
Steps 1 – 4 Discussion	Teacher and student describing - discussions and forums
Steps 6 – 9 Interaction	Task, goals, feedback, student learning process – chat, discussions, quizzes/tests/assignments
Steps 5 – 10 Adaptation	Internal to both teacher and students – project based learning
Steps 11 – 12 Reflection	Interaction to both teacher and students - reflective journals, self-assessment

On the contrary, Britain and Liber (2004) argued that Laurillard’s Conversational Framework serves as a starting point for evaluating VLEs. They defined a VLE as “learning management software systems that synthesize the functionality of computer-mediated communications software (e-mail, bulletin boards, newsgroups, etc.) and online methods of delivering course materials (e.g. WWW)” (1999, pg. 1). The framework that Britain and Liber designed focuses on the evaluation of the entire Managed Learning Environment (MLE) at three different levels: the module, the student, and the program. A MLE is implemented institution-wide and encompasses student management capabilities from the course level to the institutional level. For the purposes of this study, the focus was at the module level, whereby teachers/instructors can use the tools in the VLE to construct a

learning environment that allows for communication, collaboration, and reflection.

Laurillard's Conversational Framework can best be used at the module level as a construct to analyze how well the tools available in the VLE can support the four elements of the CF; i.e., the extent to which the VLE is discursive, adaptable, interactive, and reflective. Britain and Liber (2004) indicated that "while the CF is a useful tool for evaluating some of the important aspects of online pedagogy, the main limitation is that it is based around communications between one teacher and student and is not suited for evaluating the management side of e-learning tools' function" (p. 26). To accommodate this deficiency, Britain and Liber incorporated two different theoretical models into the framework, the Conversational Framework (CF) (Laurillard, 1993, 2002) and the Viable System Model (VSM) (Beers, 1981). The CF is a model of effective teaching practice for academic learning, and the VSM is a model for the design and diagnosis of effective organizational structure. The CF provides the basis for evaluating the important aspects of online pedagogy and the VSM provides the "organizational framework that enables the operation and adaption of the courses" (Britain & Liber, 1999, p. 23). Specifically, it provides the elements of the framework that are used to consider how the tools available in the VLE can be configured to facilitate learner collaboration, enable teachers to monitor student learning, provide differentiated resources for individualized student instruction, and modify the module based on student feedback.

Figure 2 below visualizes the Britain and Liber framework and how the elements of the VSM integrate with the elements of the learning process in the CF.

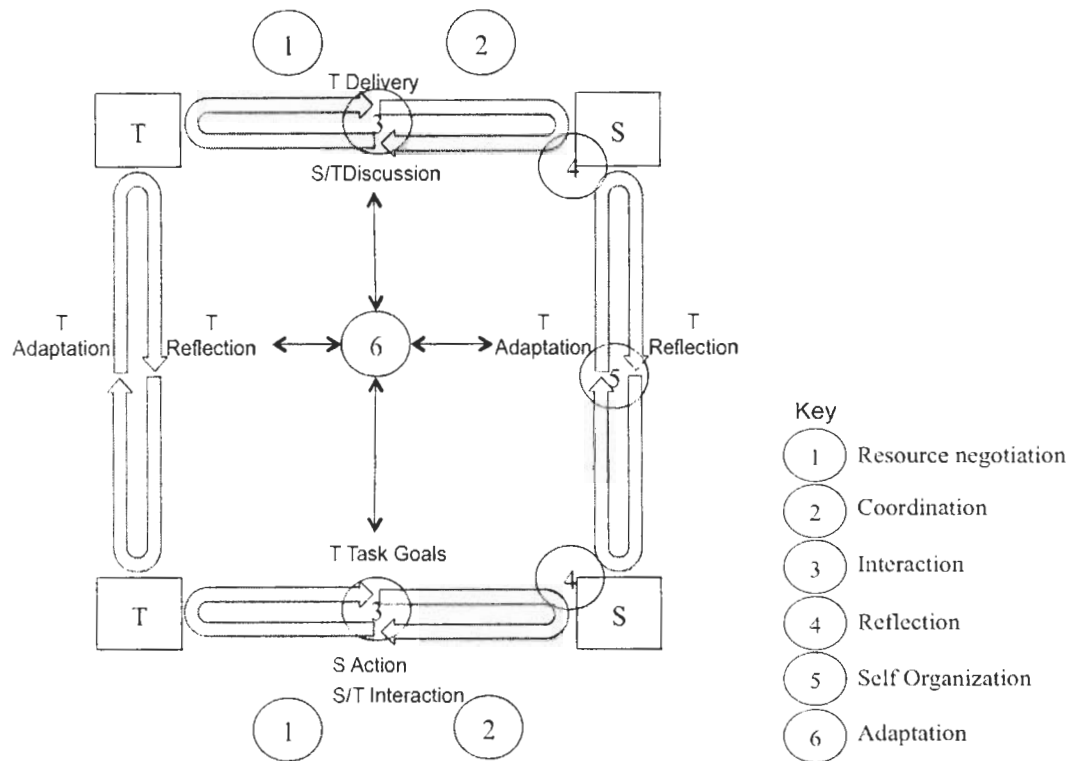


Figure 2. Diagram of the Britain & Liber framework: Integrating elements of VSM's Organizational framework and CF's learning process.

Table 4 summarizes how the six elements correspond to the VSM and the CF in Britain and Liber's framework.

Table 4  
Explanation of Elements 1 – 6 in Diagram of Britain and Liber Framework

Component	CF	VSM
1	Discursive Tools	Resource Negotiation
2	Not present	Coordination
3	Interactivity	Monitoring
4	Reflection	Autonomous learning
5	Not present	Self-organization

6

Adaptability

Adaptation

The first component in the diagram refers to resource negotiation in the VSM, whereby the instructor provides the resources that the students will need for the class, and defines the learning outcomes and opportunities. The CF is the discursive stage, where students utilize the resources for concept negotiation and discussion with the teacher to clarify the concepts. Component 2 in the diagram refers to coordination in the VSM; where the instructor establishes the protocols for learning during the course by identifying the timetable, access to resources, availability of instructor, and the overall workflow students can expect within the instructional environment. This element is not represented in the CF. Component 3 in the diagram refers to monitoring in the VSM. This element of the VSM correlates with interaction in the CF. The teacher monitors the student's action as it relates to the goals of the task. The students interact with the micro-worlds within the VLE and the instructor monitors the students' interactions and provides feedback. Component 4 in the diagram refers to autonomous learning in the VSM, which correlates with reflection in the CF. The student modifies his/her understanding based on the instructor's descriptions and feedback. However, in this model the student's concepts are also influenced by the coordination and group interaction in Component 5. Component 5 of the VSM refers to self-organization, where students engage in learning through independent study groups. This component is not represented in the CF. Component 6 refers to adaptation, which is reflected throughout the CF as the teacher continually re-describes concepts and adapts learning resources based on interaction with the student. Similarly, adaptation in the VSM refers to the teacher's ability to adapt the course, module, or activity to include new learning resources



and methodologies as the course progresses. Thus, by incorporating theoretical constructs from both the CF and the VSM, Britain and Liber (2004) have created a framework that can be used by designers and educators to analyze the tools in a virtual learning environment to support design decisions.

Other researchers (Eigenstadt, Komzak & Cerri, 2005) modified Laurillard's and Britain and Liber's frameworks to demonstrate the highly iterative nature of each step of the CF and to illustrate group interactions. Using this modified framework, the authors developed an online communication tool and used the CF to evaluate learning in a virtual environment. The authors extended the CF to integrate peer-group interactions, which could take place among students, teachers or artificial agents. The online tool provided students and teachers with an automatically generated roster group. Participants created a user profile and, when participants were online, the system generated a dark dot depicting their presence. The enhanced presence allowed users to find someone to assist and/or work with them. Thus, the technology mediated the process of students working together and using one another as an agent of learning. The authors found that the participants did not need to see each other physically in order to experience one another's presence; rather, this sense of presence was accommodated by knowing that the other person was online and available for assistance. Further, the peripheral awareness of others (Bachler, Buckingham-Shum, Chen-Berger, Dalton, De Roure, Eisenstadt, Komaz, Michaelides, Page, Potter, Shadbolt & Tate, 2004; Eisenstadt et al., 2003) was evident when users logged in to a graphical user interface that displayed the participants who were currently online. The real-time interactive interface, or dashboard capability, led to collaborative interactions. The authors concluded that conversations occurred at many levels of abstraction, and that modern communication media

were a natural and important focus of e-learning. Design considerations based on a supportive pedagogical framework are key in creating online learning opportunities where teachers and students can experience success.

Heinze, Procter, and Scott (2006) assessed the use of the Conversational Framework to design a blended learning environment for a part-time course in a higher education setting. Teachers met students face-to-face, and then supplemented this interaction with online coursework made available through a course management system. Staff and student interviews and focus groups were used to collect data. Faculty indicated that they were not sure how to teach in a blended learning environment, and thus they were not able to capitalize on tools available in the VLE. They also found the framework too complicated and difficult to relate to practice. The teachers also found that the framework was difficult to use with a large class. Lastly, the teachers indicated that many of the students did not fully participate in the learning conversation as depicted in the framework, as posited by Laurillard (1993, 2002).

Results indicated no learning differences between the module that used the CF and the module that did not use the CF. While the students reported that they liked to use discussion boards and face-to-face topic discussions for feedback, many of them indicated that they did not engage fully in the assigned readings. Most of the students did not use Multiple Choice Questions (MCQ) for formative assessment, only for summative assessments. Overall, the authors found that a viable theoretical framework must be grounded in established pedagogical theories, easy for faculty to understand and implement, applicable for large and small classes, adaptable for diverse student learning needs, and include a prominent interrelationship between the formative and summative assessment.

Carmichael (2001) used the CF as a basis to evaluate the use of Web CT, an online course management system, for an undergraduate business course. The use of an online course management system was initiated to accommodate the need for a flexible learning resource. The case study evaluated the learning resource on two levels. In the first level of analysis, the tools in the Web CT were evaluated to determine which step in the CF they best supported. For instance, the authors found that two of the tools, the goals and the module content, could be used to support the fifth step in the CF where teachers can set task goals. In the second level of analysis, the tools comprising the VLE were evaluated by means of a student opinion survey (n=15) (Carmichael, 2001). The author constructed a table that compared how each component of the VLE supported each stage of interaction in the CF. The author found that the components of the VLE did support the features of the CF. However, the student survey revealed that all of the students did not use every component of the VLE that was designed to support each step of the CF. Therefore, some of the requirements of the CF were not successfully met because the students did not access all of the activities that included teacher-student interaction.

The author concluded that a VLE could support the stages of the CF. However, he cautioned that it might not be entirely successful in delivering the aims of the CF, depending on how the students choose to interact with the components offered by the VLE (Draper, 1997, Brown, Doughty, Draper, Henderson & McAteer, 1996). The author recommended that student usage and assessment of the VLE be used to evaluate successful implementation.

Hegarty, Bostock and Collins (2000) researched the development of an online course for undergraduate students studying the use of information technology for students with special needs. Media and instructional activities were chosen based on how they supported

the 12 interactions between the teacher and student in the learning environment that Laurillard described in the CF. The final design used a combination of hard-copy materials, face-to-face meetings for lectures and discussions, written assignments, and computer-mediated communication (CMC). Nine undergraduates (n=9) participated in the course after it was redesigned for an online environment. The participants provided feedback on the redesigned course through a written evaluation and informal discussions with the researchers. Overall, the participants were positive about their learning experience. They emphasized the importance of teacher response to e-mail, and how they truly valued receiving feedback quickly on draft assignments. Initially, the students used Internet-based computer conferencing software to communicate. However, the students found it difficult to use, so they abandoned it in favor of e-mail.

Another critic of Laurillard's framework, Draper (1997) found that it lacks attention to the management of learning and the need for learning negotiation between teacher and students. Draper suggested that the model infers that the students will engage in the activities the teacher assigns, and that the engagement will result in student learning. However, nowhere in the model does Laurillard indicate that the teacher discusses these activities with the students. Thus, there is a question about the students' commitment to learning if the teacher has not negotiated the activities with the students. Further, Draper noted that there is a failure to address peer interaction in the CF. Often, students form peer groups to study outside of the formal class setting. This student-to-student interaction is not reflected in Laurillard's framework.

The results of the four previous research studies indicate that the CF can be used to support learning in a VLE. However, findings indicate that one shortcoming may be the lack of attention to student-to-student interaction.

In a more recent study, researchers analyzed how VoiceThread, a Web 2.0 collaboration tool, could be used to support online learning communities for K-12 educators (Gao & Sun, 2009). The researchers identified how the presentation, collaboration, and moderation features of VoiceThread could be configured to support the three elements—social, cognitive and teaching presence—of the community of inquiry framework (Garrison, Anderson & Archer, 2000). The findings indicated that the features, like document sharing, narrated presentations, multimodality commenting and highlighting, do support all three elements of the community inquiry framework. However, the findings also identified the need to carefully configure the tools to design a learning environment based on a pedagogical framework and learning theory (Laurillard, 2002, 2009).

### **Summary**

This review of literature examined pedagogical frameworks for e-learning technologies within the arena of professional development for K-12 educators. Most importantly, the pedagogical framework was examined as a tool to evaluate e-learning technologies and how they can be used to create micro-worlds within the virtual learning environments to support student learning. While much of the research to date has focused on the use of VLEs for formal courses of study in higher education, the framework provides the pedagogic basis for the evaluation of e-learning technologies and the design of formal learning opportunities for other populations, like K-12 educators. The technologies play a growing role in providing K-12 educators with access to professional learning opportunities.

Researching the ways the technologies can be used is vital to providing extended learning opportunities.

### CHAPTER 3

#### RESEARCH METHODS

I used a qualitative, content analysis of multiple cases to examine the use of virtual learning environments for professional development for K-12 teachers. Qualitative research is a complex inquiry process that explores or describes a phenomenon in context using a variety of data sources (Baxter & Jack, 2008; Creswell, 2003). Creswell (2007) defined this type of research as follows:

Qualitative research begins with assumptions, a worldview, the possible use of a theoretical lens, and the study of research problems inquiring into the meaning that individuals or groups ascribed to a social or human problem. To study these problems, qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is inductive and establishes patterns or themes. The final written report or presentation includes the voices of participants, the reflexivity of the researcher, and a complex description and interpretation of the problem, and it extends the literature or signals a call for action (p. 37).

Qualitative research studies are typically used to provide detailed descriptions of situations and settings, interpret phenomenon, verify information in a real-world context, or evaluate policies and practices; whereas descriptive quantitative research emphasizes the observation and quantification of the specific behavior that is under study (Leedy & Ormrod, 2005). As a result, qualitative research can sometimes be viewed as unscientific, exploratory, or subjective in nature (Denzin & Lincoln, 1994). However, Stake (2006) suggested that the use of qualitative research using multiple case studies allows the

researcher to “study the experience of real cases operating in real situations” (p. 3), by asking open-ended questions, collecting data in the form of words and images, and analyzing the information for emerging themes.

### **Modes of Inquiry**

Many researchers support the use of case study as a strategy of inquiry when the boundaries between the phenomenon and the context are not clearly defined (Denzin & Lincoln, 2005; Merriam, 1998; Yin 2003). This study sought to determine how the tools in a virtual learning environment could be configured to facilitate professional learning opportunities for K-12 educators. A case study was chosen because the case (professional learning) cannot be considered without the context (the learning environment), and, more specifically, without the tools within the virtual learning environment that can be used for communication, collaboration, and reflection. In this study, I used content analysis of multiple cases as a method. Stake (2006) defined *case study* as a “qualitative approach in which the investigator explores a bounded system (a case)... over time, through detailed, in-depth data collection involving multiple sources of information” (p. 73). In this study, the cases are bounded by time and place/activity (Creswell, 2003; Stake, 2006). Each case of formal professional learning (activity) was a 15-hour course (time) that occurred in a different virtual learning environment (place). A multiple case study enables the researcher to explore differences within and between the cases (Yin, 2003). Each case in this investigation offered a unique perspective on the use of a virtual learning environment to facilitate a professional learning opportunity. However, all three cases were analyzed against a pedagogical framework to produce a global perspective on the nature of learning in virtual learning environments. To accomplish this, I conducted a content analysis of each case. The



“collection, review, interrogation, and analysis of various forms of text as a primary source of research data” (O’Leary, 2004, p. 177) were used to examine: (a) the ways in which the workshops were designed to capitalize on the unique tools available in each of the technologies, and (b) how the technologies are actuated to create pedagogically sound learning environments in which teacher-participants communicated, collaborated, and reflected on practice and on today’s students and their learning (Darling-Hammond & McLaughlin, 1999). My intent was to gain a deeper understanding of how different virtual learning environments could be used to create extended learning opportunities for K-12 educators to critically reflect on their practice. As such, the multiple case study tradition was used to study the tools available in three different virtual learning environments and how they were used. Extensive data was gathered through multiple sources, including the analysis of documents (i.e., transcripts, software guides, webcasts, forums, and blogs), direct observations, and the collection of digital artifacts (Creswell, 2007; Yin, 2003).

I used multiple embedded cases for the study, whereby the technology and situation of each case was evaluated. The overall study was concerned with the pedagogical framework of each e-learning technology and how it was used to facilitate a specific professional learning opportunity. Each of the three technologies and its use was the topic of a case study, in an effort to place it within the theoretical framework as described by Britain and Liber (2004), which includes theoretical constructs from Laurillard’s Conversational Framework (CF) and Beer’s Viable Systems Model (VSM). For all three cases, an embedded design was used because the documentation and data for each technology was needed to address the research questions about the pedagogical framework for each of the virtual learning environments. The results of the data collection process were not pooled;

rather, the data were part of the findings for each individual technology or case analysis. Once the individual studies were organized, each was examined individually based on the theoretical framework for the pedagogical evaluation of virtual learning environments. The goal of this study was twofold: (1) to report a case description of each virtual environment; and (2) to analyze emergent themes common to all cases (Yin, 2003).

### **Data Collection and Analysis**

Data collection and analysis in qualitative research are often organic processes, and the analysis evolves as the data is collected (Baxter & Jack, 2008; Leedy & Ormrod, 2005). Sources of information for a case study may include interviews, observations, documents, physical artifacts, and reports (Baxter and Jack, 2008; Creswell, 2003; Yin, 2003). In Parts I and II of the study, a content analysis was used to examine “the contents of a particular body of material for the purpose of identifying patterns, themes or biases” (Leedy & Ormrod, 2005, p. 142). I used the following process (Gayton & McEwen, 2010; Leedy & Ormrod, 2005):

1. Identified the specific content to be studied. The following documents were examined: the software, software guides, transcripts, and researcher observations.
2. Defined the characteristics to be examined. In Part I of the study, I evaluated the tools in the virtual learning environments against Britain and Liber’s pedagogical framework. In Part II, I examined how the tools were used to facilitate communication, collaboration and reflection for professional development for K-12 educators.
3. Coded the content for each case. In Parts I and II, I used a table to organize the codes and identify how the tools in each technology were used to promote communication,

collaboration, and reflection. The following guiding questions posed by Britain and Liber's Pedagogical Framework for the Evaluation of Virtual Learning Environments were used:

- a. What tools does the system provide for teachers to present/express their ideas to students?
- b. What tools does the system provide for students to articulate their ideas to the teacher and other students?
- c. Can teachers and learners extend/change their presentations during the modules' time period?
- d. A VLE is not a single tool; it is a structuring and coordination system containing a variety of tools. These questions are about the model of teaching and learning interactions that form the basis of the system. Can a module be structured sequentially and/or hierarchically over time? What facilities are there to organize learners in a variety of ways in the module (whole group/small groups, individuals)? What underlying pedagogical model(s) or approaches does the system encourage?
- e. How are the "rules of the module" expressed and made evident to the student? By this, we mean such things as the learning outcomes, the obligations of the learner and the mutual commitment teacher and student make (e.g., the amount of time a teacher will spend on sending messages each week, the number of assignments a learner will be expected to complete, etc.).
- f. What facilities are there to monitor how well learning is progressing on the module?
- g. What can the learners do on their own, outside of the purview of the teachers? Can they find and manage resources – do they have their own file stores or repositories?

Can they talk to other students (other than in the main module discussion), create their own discussions; create their own learning activities involving peers? Can they locate people with similar interests outside of their own module, course, year or institution? i.e., is information about people available?

h. To what extent is it possible for the teacher to adapt the module structure once teaching is underway? Can you add/change/delete resources? Can you add/change/delete fragments of module structure? Can you add/remove people? Can you split them into different groups? Can you create and assign resources or learning activities to individuals?

4. Identified themes and trends that were reflected in the coding and organized in a table, in an effort to observe how the tools were used to configure an effective learning environment.

The process of data collection and analysis for the study followed the preceding steps: First, I read through “all collected information to obtain a sense of the overall data” (Creswell, 2007, p. 140). Content analyzed included session transcripts, screen shots, Webcasts, and digital artifacts generated by teacher-participants through activities/assignments. An open coding system was used to record key ideas and concepts to code the data as the researcher explored the features of each virtual learning environment. Open coding was also used to analyze and code the documents and digital artifacts retrieved from each case study. Open coding is the process of reducing data to descriptive themes, categories, and subcategories (Creswell, 2003; Leedy & Ormrod, 2005). This information was collapsed into categories and organized in a table. Bogdan and Bilken (1992) suggested using codes for “setting and context, process, activities, strategies, relationships and social

structures” (p. 166 – 172). These categories were reviewed to determine if any themes emerged within each case that represented the use of a virtual learning environment to facilitate a professional learning opportunity for K-12 educators.

One concern of many qualitative researchers is whether the findings of the study represent an accurate account (Maxwell, 1992). To address this concern, I collected data from multiple sources and developed an efficient method to organize the data (Baxter & Jack, 2008; Creswell, 2003; Patton, 2002; Yin, 2003). A summary of the relationship among the major concept areas, research questions, and data is presented in Table 5.

Table 5  
*Relationships Among Questions, Data and Concepts*

Concept Area	Research Question	Data
Pedagogical Framework & Evaluation	1 & 2	Researcher observation Physical and digital artifacts from cases including: transcripts, screen shots, webcasts, activities/assignments Documents such as: program guides, related web resources like Web pages, forums, and wikis
Use of Virtual Learning Environments	2	Researcher observation Physical and digital artifacts from cases including: transcripts, screen shots, webcasts, activities/assignments
Professional Development for K-12 Educators	2	Researcher observation Physical and digital artifacts from cases including: transcripts, screen shots, webcasts, activities/assignments

Creswell (2003) recommended the use of one or more strategies to authenticate the accuracy of the findings. To ensure validity, the three strategies that I used were open coding, evaluations of the workshops by teacher-participants (TPs), and multiple sources of information to create detailed descriptions of the courses (Creswell, 2003). A variety of concepts are used to examine the various kinds of data that addressed the principles of

triangulation. In this study, I used data triangulation (Patton, 2002) by gathering information from multiple sources: researcher observations, digital artifacts, transcripts, and participants' evaluations. The aim was to corroborate the same fact or phenomenon from the different sources (Yin, 2003).

I also used rich, thick descriptions to develop a case description (Creswell, 2003; Yin, 2003). In an effort to provide an understanding of each technology and case study, I provided a detailed description of the evaluation, which illustrates the use of the technology to facilitate professional learning activities for K-12 teachers. The descriptive approach was used to provide a detailed discussion of emergent themes that were identified from the coding process. In a qualitative study, according to Merriam (2002), "providing thick, rich description is a major strategy to ensure external validity" (p. 29). The descriptions include specific illustrations and a discussion of interconnecting themes.

I am a professional development specialist and consultant for e-learning and instructional technology, and also served as the instructor for the three case studies examined in this research study. In qualitative research, like this multiple case study, my knowledge forms an integral part of the understanding of the design, methods and interpretations. Merriam (2002) pointed out that "the researcher is the primary instrument for data collection and analysis" (p. 5). Maxwell (2005) recommended that the research relationship be discussed openly to clarify any ethical points or to address validity threats. There inevitably remains an interpretive aspect to the evaluation of the e-learning tools and systems, which may lead to the potential for bias. This is one disadvantage of implementing a participant research project (Creswell, 2003; Glesne, 1999; Maxwell, 2005; Merriam, 1998).

## CHAPTER 4

### DATA ANALYSIS

#### Introduction

The research findings of this multicase study analysis are presented using two formats. In Question 1, I sought to identify the tools that are available in each e-learning technology, and whether or not they can be used to support a pedagogical framework. In Question 2, I considered how the tools in a VLE could be leveraged to facilitate professional learning opportunities that encourage communication, collaboration, and reflection by K-12 educators. In Part I, a table was used to organize the narrative answers to the first research question. In Part II, the research findings are presented as narrative descriptions of each case. In addition, tables are used to organize the emerging themes and resulting coding system. The data from course transcripts, student-generated learning artifacts, screencasts, tools available in the software, and participant course evaluations provided the foundation for findings related to all questions.

#### **Part I: Pedagogical Evaluation of the e-Learning Technologies**

Part I of Chapter 4 addresses the first research question posed in this study: What tools are available in the three selected e-learning technologies that support a pedagogical framework as defined by Britain and Liber (2004)? The aim of Part I of the study was not to compare the VLEs, but to survey the tools available in each system and how they fit in a pedagogical framework. To answer the question, I identified the specific content to be studied, which included the software, software guides, and Web-based resources, like a Web page or wiki, for Active Worlds, Adobe Connect, and Moodle.

Once the content had been identified, I used a table to organize the collection of data for each technology that was evaluated (See Tables 6, 7, and 8). The information for each technology is reported as follows: a brief description of the system, title and version of the system under evaluation, and an analysis of tools in each system in response to the guiding questions (see Appendix B).

### **E-learning Technology #1: Active Worlds**

**Description of technology.** Active Worlds (AW) is a three-dimensional (3-D) virtual reality platform that runs on Windows. Users assign themselves a unique name to log into the Active Worlds universe and use an avatar, a graphical representation, to explore 3-D virtual worlds and environments that other users have built (Active Worlds, Inc., 2010). Due to the immersive nature of the software, classes generally occur synchronously, although participants can engage in asynchronous activities.

Table 6  
*Use of Pedagogical Framework to Evaluate Active Worlds*

Guiding Questions	Active Worlds (AW) version 5.0
What tools are available for teachers to present their ideas to students?	Teachers can use the building tools to create signs, which can be used as a bulletin board or display space where information can be posted and updated throughout a synchronous class, or between live classes for when participants log in asynchronously. In addition, there is a file share option that lets teachers share files with students when they are online synchronously. During synchronous class sessions, the teacher can use voice chat and instant-messaging (IM).
What tools are available to students to articulate ideas to the teacher and other students?	Students can access the same tools that are available for teachers. In addition, students can use the voice chat and IM to present ideas to both the teacher and the other students and to ask questions.
Can teachers and learners change their presentations during the class?	The creator of a presentation/display can adapt all of his/her materials during synchronous or asynchronous sessions.
Can a module be structured sequentially and/or hierarchically over time?	AW does not rely on a module structure. The environment can be manipulated so that learning can be structured any way, i.e. sequentially or hierarchically. The teacher has full control over the environment.



What facilities are there to organize learners in a variety of ways?	The teacher can create environments for whole group, small group, pairs, or individuals. The voice chat and IM features allow the teacher to communicate with the whole class at one time. The whisper feature allows the teacher to communicate with students individually. In addition, teachers can send a telegram to an individual student, which is like a private note. If students are working in small groups, the IM feature can be set so that only students within a specified distance from each other see the chat.
What underlying pedagogical models does the system encourage?	AW supports social constructivist activities, although the software does not impose a specific pedagogical model. The options for communication, including the IM, voice chat, and whisper, support both student-teacher and student-student interactions. In addition, teachers can create simulated 3-D environments whereby students can interact with content. Similarly, students can utilize the building tools to create environments to demonstrate knowledge.
How are the “rules of the module” made evident to the student?	This option is not a feature of the software. The teacher is responsible for establishing the objectives and expectations for the course and choosing a way to communicate this information to the students.
What facilities are there to monitor how well learning is progressing on the module?	The teacher can generate a transcript of each live class session. This can be used to monitor the written conversation that occurred during a synchronous class. In addition, student progress can be monitored as they build and create a project in the AW environment. There is no grade book feature, nor is there a specific activity report. However, teachers can view the total amount of time students have spent in-world by viewing the citizen attributes.
Can the students find and manage resources? Do they have their own file stores or repositories?	Students can find resources on the Internet and create links from signs and objects to Web-based resources. Students can share files and store them in an online directory by using the file share option, but students must be online synchronously.
Can the students talk to other students, create their own discussions, creating their own learning activities?	Students can log in when class is not in session to meet and work on projects. During this time, the chat is not recorded, so it is outside the purview of the teacher.
Can the students locate people with similar interests outside of their own module, course, year or institution?	There is no option available to search for other citizens. Students can only view the other students on their contact list.
Can the teacher adapt the module structure once teaching is underway, i.e. change resources, fragments of the module, people/groups, or learning	AW does not rely on a modular structure. All aspects of the environment are fully adaptable once the course has begun. The resources can be changed and new resources can be added. Groups can be amended and learning activities can be modified based on the teacher's goals and the students' needs.

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activities?

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### **E-Learning Technology #2: Adobe Acrobat Connect Pro**

**Description of Technology.** Adobe Acrobat Connect Pro software is used to create information and general presentations, online training materials, Web conferencing, learning modules, and user desktop sharing. The product is entirely Adobe Flash based (Adobe Systems Incorporated, 2010). Due to the nature of the software, classes are generally facilitated synchronously, although participants can engage in asynchronous activities.

Table 7

*Use of Pedagogical Framework to Evaluate Adobe Connect Pro*

Features	Adobe Acrobat Connect Pro
What tools are available for teachers to present their ideas to students?	Teachers control the environment by adding pods, which offer different functionality, such as a digital white board, file sharing, link sharing, and IM for chat. In addition, there is an audio chat feature, whereby the teacher can address the whole class. The teacher and the students can also send a private message to a specific participant by selecting a name from a drop down list. The teacher is able to view all communication that occurs via the chat, including private messaging between students.
What tools are available to students to articulate ideas to the teacher and other students?	The teacher can make pods available to students so they can present their ideas. These pods include the digital whiteboard, file sharing, link sharing, and IM for chat. In addition, the teacher can enable voice chat for the participants as a whole or for individual students.
Can teachers and learners change their presentations during the class?	The teacher and the students can change their presentations at any time during the class.
Can a module be structured sequentially and/or hierarchically over time?	The environment can be manipulated so that learning can be structured any way; i.e., sequentially or hierarchically. The teacher has full control over the environment.
What facilities are there to organize learners in a variety of ways?	The teacher can create environments for whole or small group interactions. There is a pod for breakout rooms, which enables small group interaction. The teacher can preset the pods with group participants or randomly generate groups by defining the number of groups and the number of participants per group. The voice chat and IM features allow the teacher to communicate with the whole class at one time.
What underlying pedagogical models does the system	The software does not impose a specific pedagogical model. However, it was designed as a communication tool for

encourage?	participants that are distributed geographically. Thus, there are many options for social interaction, including the IM, voice chat, individual messaging, and the digital whiteboard.
How are the “rules of the module” made evident to the student?	This option is not a feature of the software. The teacher is responsible for establishing the objectives and expectations for the course and choosing a way to communicate this information to the students.
What facilities are there to monitor how well learning is progressing on the module?	The teacher can generate a transcript of the chat that occurs during each live class session. This can be used to monitor the written conversation that occurred during a synchronous class. The teacher can also record the synchronous sessions and then view the video at a later time. There is no grade book feature. The teacher can monitor how much time students have spent in class by viewing a report that shows the date(s) and time(s) the students logged-in and logged-out.
Can the students find and manage resources? Do they have their own file stores or repositories?	Students can find resources on the Internet and add links to the chat box for other participants. When the URLs are added to the chat box they become live and any participant can click on the link to access the resource. Students do not have their own file stores or repositories.
Can the students talk to other students, create their own discussions, creating their own learning activities?	The class can be made available to students 24/7, which means that they can meet to hold discussions and share resources. However, they cannot modify the learning environment; i.e., control the pods.
Can the students locate people with similar interests outside of their own module, course, year or institution?	Students can only view other students enrolled in the class.
Can the teacher adapt the module structure once teaching is underway; i.e., change resources, fragments of the module, people/groups, or learning activities?	The software does not rely on a modular structure. All aspects of the environment are fully adaptable once the course has begun. The resources can be changed and new resources can be added. Groups can be amended and learning activities can be modified based on the teacher's goals and the students' needs.

### E-learning Technology #3: Moodle

**Description of technology.** Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment. It is a free and open-source e-learning software platform, or learning management system, designed for educators to create online courses where students can interact and collaborate to learn and construct content (Moodle Trust, 2010).

Due to the nature of the software, classes generally occur asynchronously, although participants can engage in synchronous activities.

Table 8  
*Use of Pedagogical Framework to Evaluate Moodle*

Features	Moodle version 1.10
What tools are available for teachers to present their ideas to students?	Teachers can add resources to the class by creating Web pages, adding links to files and Web resources, and using guided lessons under the activities menu. In addition, video and audio content can be embedded in the modules.
What tools are available to students to articulate ideas to the teacher and other students?	The teacher can create activities that allow the students to communicate and share information. These activities include wikis, glossaries, forums, and blogs, which can be utilized asynchronously. In addition, the teacher can create a chat for synchronous interaction.
Can teachers and learners change their presentations during the class?	The teacher can change the presentation of materials at any time during the class. In a discussion forum, students can modify their response up to 30 minutes after it has been posted. The teacher controls the option to allow students to resubmit assignments and upload documents.
Can a module be structured sequentially and/or hierarchically over time?	Moodle uses a modular structure to organize the class. Teachers can utilize three different formats for the structure of the class: social, topic, or weekly. Within each of these formats, the content of the modules can be structured sequentially or hierarchically.
What facilities are there to organize learners in a variety of ways?	All activities can be set for whole class or group activities. There is a setting for groups, which enables the teacher to preassign students to groups. In addition, the groups can be created so only the members can view their work, or so the whole class can view each groups' work. The teacher can leave private feedback for individual students in assignments, lessons, quizzes and journals.
What underlying pedagogical models does the system encourage?	Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment. The software was designed based on the principles of social constructivism.
How are the "rules of the module" made evident to the student?	This option is not a feature of the software. The teacher is responsible for establishing the objectives of the course and the expectations of the students and choosing a way to communicate this information with the students.
What facilities are there to monitor how well learning is progressing on the module?	Teachers can use many different activities to monitor student's progress, including quizzes, assignments, and lessons. In addition, teachers can generate reports to view how much time students have spent on each activity. There is also a grade book option where teachers can record, and students can view grades for the activities and assignments.
Can the students find and manage resources? Do they	Students can find resources on the Internet and add links to teacher created activities, such as forums, wikis and glossaries.

have their own file stores or repositories?	Students do not have their own file stores or repositories.
Can the students talk to other students, create their own discussions, creating their own learning activities?	Within the class, students can talk to other students in teacher created spaces, i.e. forums, wikis, and blogs. Generally, the teacher will create a designated forum where students can connect to conduct their own discussions and share resources. The teacher can view all communication that occurs within the class. Outside of the class, students can use messaging to contact one another.
Can the students locate people with similar interests outside of their own module, course, year or institution?	Students can locate people outside of their class if the Moodle site has been configured to allow this option.
Can the teacher adapt the module structure once teaching is underway; i.e., change resources, fragments of the module, people/groups, or learning activities?	All aspects of the environment are fully adaptable once the course has begun. The resources can be changed and new resources can be added. Groups can be amended, and learning activities can be modified based on the teacher's goals and the students' needs.

Each e-learning technology has a unique set of tools that enables teachers and students to communicate and collaborate. All three technologies encourage active student participation and communication by including tools like instant messaging, audio chat, private messaging, signs/labels, file sharing or digital whiteboards. Table 9 provides a comparison of the three technologies in response to the guiding questions.

Table 9  
*Comparison of E-learning Technologies*

Features	Active Worlds	Adobe Connect	Moodle
What tools are available for teachers to present their ideas to students?	Signs, building, file share, IM, audio chat	Screen share, white board, file share, IM, video and camera, audio chat	Labels, resources, Web pages, lessons
What tools are available to students to articulate ideas to the teacher and other students?	IM, file share, whisper, telegram	IM, screen share, file share, groups	Forum, chat, journal, groups, wiki, glossary
Can teachers and learners change their presentations during the class?	Yes	Yes	Yes

Can a module be structured sequentially and/or hierarchically over time?	No modular structure, instructor designs 3-D environment	No modular structure, instructor manipulates pods to organize learning activities	Modular structure can be organized and ordered by instructor
What facilities are there to organize learners in a variety of ways?	NA	Groups	Groups
What underlying pedagogical models does the system encourage?	Social constructivism	Social constructivism	Social constructivism
How are the “rules of the module” made evident to the student?	NA	NA	NA
What facilities are there to monitor how well learning is progressing on the module?	Session transcript, monitoring building, citizen attributes report time online	Session transcript, video recording of session, reports of student time online	Journal, quizzes, lessons, assignment, grade book, teacher reports
Can the students find and manage resources? Do they have their own file stores or repositories?	Students can add links to objects they create. Student can share files in an online directory	Students can add links in the chat box. Students do not have file stores.	Students can add links to teacher created activities. Students do not have file stores.
Can the students talk to other students, create their own discussions, creating their own learning activities?	Yes, students can create their own learning activities.	Yes, in teacher created spaces.	Yes, in teacher created spaces.
Can the students locate people with similar interests outside of their own module, course, year or institution?	No	No	Yes, if the site has been configured to allow this option.
Can the teacher adapt the module structure once teaching is underway, i.e. change resources, fragments of the module, people/groups, or learning activities?	Fully adaptable	Fully adaptable	Fully adaptable

## Part II: Case Studies

This section addressed the second research question posed in this study: How can professional learning specialists leverage the tools available in these technologies to provide

formal professional learning opportunities for K-12 educators that support communication, collaboration, and reflection? To answer the question, I actuated the pedagogical framework for professional learning for K-12 educators in three virtual learning environments (n=30). Each professional learning opportunity was a 15-hour course that was a part of a regional initiative on technology enhanced literacy learning. The teacher-participants (TPs) in each course self-selected to enroll, and received 15 professional development hours upon completing the course. Table 10 has a summary of the e-learning technology, the title of the course, and the number of participants in each course.

Table 10  
*Number of Participants in Each Course*

Technology	Title	n
Active Worlds	21 <sup>st</sup> Century Research and Thinking: Moving Beyond Google	6
Adobe Connect	Engaging Students with 21 <sup>st</sup> Century Technologies	17
Moodle	Publishing 2020.	7

I identified the specific content of each case to be studied, which included the software for Active Worlds, Adobe Connect, and Moodle, transcripts from the classes, screencasts of the classes for Adobe Connect, digital artifacts created by the participants, and teacher-participants' (TPs) evaluations of each course.

Once the content was identified, I began the analysis of each case by reading the transcripts and digital artifacts created by the TPs for each class to get a sense of the data. Next, I read the transcripts and digital artifacts a second time and recorded key ideas and concepts in the margins. Following the second reading, I analyzed the ideas and concepts to identify themes. This information was collapsed into categories and organized in a table.

The categories listed in Table 11 emerged from the analysis. The primary categories I identified were based on the types of interactions that TPs engaged in during the class. These include communication, collaboration, and reflection. Within each category, I identified subcategories, based on the types of interactions between the TPs in the class; i.e., the students and the instructor.

Table 11  
*Summary of Codes*

Interactions	Code*	Definition
Communication (COM)	T>C	Teacher communicated to whole class
	T>S	Teacher communicated to individual students.
	S>T	Students communicated to teacher.
	S>C	Students communicated to whole class.
	S>S	Students communicated to each other individually.
Collaboration (COL)	P	The students worked in pairs.
	SG	The students worked in small groups (3 – 6) participants.
	WC	The whole class worked together.
	IS>S	Informal collaboration between students.
Reflection (REF)	S>T	Only the teacher saw the student's reflection.
	S>C	The student's shared their reflection with the whole class.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

The following analysis of each case includes a description of the course, the characteristics of the teacher-participants (TPs), the course objectives, the teaching methodology I employed as the teacher/instructor, the materials and resources, the procedures used in class each day, coded data for the tools utilized to support the activities of each day, and an overall summary of the results based on the pedagogical framework of virtual learning environments by Britain and Liber.



**Case Study #1: Active Worlds**

**Description of the course.** *21<sup>st</sup> Century Research and Thinking: Moving Beyond Google: Do you rely primarily on Google to help you find information? Learn what other tools are available on the Internet to support student research. In this workshop, participants will learn strategies to efficiently and effectively search, evaluate, and document online educational resources, and will be guided through an investigation of educational materials available online. This workshop is intended to help educators use the resources available on the Internet to nurture curiosity and facilitate knowledge acquisition in their classrooms. Participants will use the research tools and resources to support the development of a 3-D virtual environment for a unit of study of their interest.*

**General characteristics of teacher-participants.** Six educators participated in the course: four teachers and two district-wide administrators (although one of the administrators had a dual role and was also a teacher). Three of the teachers were elementary school teachers, one was a middle school math teacher, and one was a high school Special Education teacher (who was also an administrator). The districtwide administrator was the Director of Technology. The teachers came from diverse school districts in terms of socioeconomic and cultural environments. In addition, the TPs technology skills varied from very basic (i.e., used e-mail) to advanced skills (i.e., the Director of Technology).

The TPs were expected to have the following prerequisite skills:

- Compose and send e-mail;
- Actively participate and collaborate in a professional learning opportunity;
- Navigate independent activities;
- Be interested in using emerging technologies in their classrooms;

- Use the Internet to find information.

**Objectives of the course.**

***Broad goals.***

1. TPs will be active members of a professional development opportunity.
2. TPs will use the information they learn to engage students through the integration of technology in their classrooms.
3. TPs will become leaders in the use and pedagogy of emerging technologies in education.

***Skills and content.*** The TPs learned to:

- Create a “billboard” in Active Worlds
- Use the vocabulary and processes related to conducting searches, like:
  - Metasearch engine, visual search engine, invisible/deep/hidden Web, hoax sites, the Big 6 Skills, and evaluating Websites
- Understand the pedagogy of engaging students in learning with technology

TPs engaged in a hands-on experiential setting as a learner. I guided the participants through the process of building and creating in the Active Worlds environment and learning how to conduct research using Web-based search engines. Discussion centered on the use of diverse search engines to conduct research. The desired outcome was that TPs would create a billboard with resources for students to use to conduct research in a specific content area.

***Learner objectives.***

1. TPs will use the Internet to find information and communicate results.
2. TPs will use Active Worlds to meet and interact with other professional K-12 educators.

3. TPs will build and create in the Active Worlds environment.
4. TPs will build a learning tool for their students to utilize the resources identified during the class.

**Methodology.** The teaching method that was used to facilitate learning was guided inquiry, and entailed five steps which included engagement, exploration, explanation/invention, elaboration/discovery, and evaluation/assessment (Bybee, 1997). I presented guiding questions at the start of each class:

- What types of search engines are available to search the Internet?
- How are they different?
- How can students evaluate the resources that they find?

Guided inquiry was used because the methodology enabled TPs to actively participate in the learning process through hands-on exploration and application of the technology.

**Materials and resources.** In order to participate in the class, TPs needed a PC computer with Internet access, an e-mail address, Adobe Reader, and the Active Worlds software installed on the computer.

***Procedure.***

*Module 1.*

*Step 1: Engagement.*

None of the TPs had experience navigating in the Active Worlds environments. On the first day of class, I (andreatej in the transcript) greeted the TPs (AW1 – 6) as they arrived at class and helped them troubleshoot. The following excerpt from the transcript for Module 1 illustrates how I encouraged the participants to explore the environment while supporting them as they entered class:

AW1: AW5, someone is right behind you. Walk forward.  
AW5: how?  
AW1: arrow keys  
AW1: if you hit control - you run (if you are on a laptop)  
AW5: all that did was move my screen around  
AW5: no I am not on a laptop  
AW1: hold it down while you hit the arrow keys  
andreatej: and if you get stuck and can't move hit shift and then use the arrow keys to move

I began the class with an audio check, followed by an activity to familiarize the TPs with the Active Worlds environment. The activity for the first day was to explore Active Worlds in pairs. To prepare for this activity, I used both audio chat and IM to show the TPs how to use the whisper function:

andreatej: Does everyone have both chat and whisper options?  
AW1: where are those located?  
AW2: yes  
andreatej: The chat box is where you type  
andreatej: and whisper should be right under that  
AW3: no  
AW1: guess I have change then but don't see whisper  
AW4: no whisper  
andreatej: If you don't have whisper  
AW4: I don't see it  
andreatej: go to the show menu at the top of the page and select whisper  
AW1: got it  
AW4: got it  
AW3: got it

Once the TPs learned how to whisper, they were assigned a partner. They worked in pairs to whisper and teleport. It was important for TPs to master these two skills so they could fully participate in the 15-hour class. The whisper function allowed participants (both TPs and instructor) to send private messages to one another. To whisper, the TPs selected the name of another class member from a drop-down menu and typed an instant message in a chat box. It was also important for TPs to learn how to teleport in order to move around the AW environment, which is comprised of many different simulations and learning spaces.

TPs used the teleport function to move from one space to another. In this first module, TPs worked in pairs to teleport to another location in Active Worlds and then return to their starting position.

After the TPs mastered whispering and teleporting, I invited everyone to the main instructional area. I showed the participants the guiding questions for the first day of the workshop: What are metasearch engines? How do search results differ with each search engine?

I asked the TPs what search engine they preferred to use, and the TPs typed their responses in the chat box. Then, I said that, for the first class, they would focus on metasearch engines and provided a definition for *metasearch engine*.

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I created four signs with the name of a different search engine on each sign (Dog Pile, Clusty, Zuula, and Gigablast). The TPs clicked on a sign, and the Website was displayed in a new window that opened in the Active Worlds environment. The left half of the screen displayed the 3-dimensional environment and the right side of the screen displayed the Website (see Figure 3).

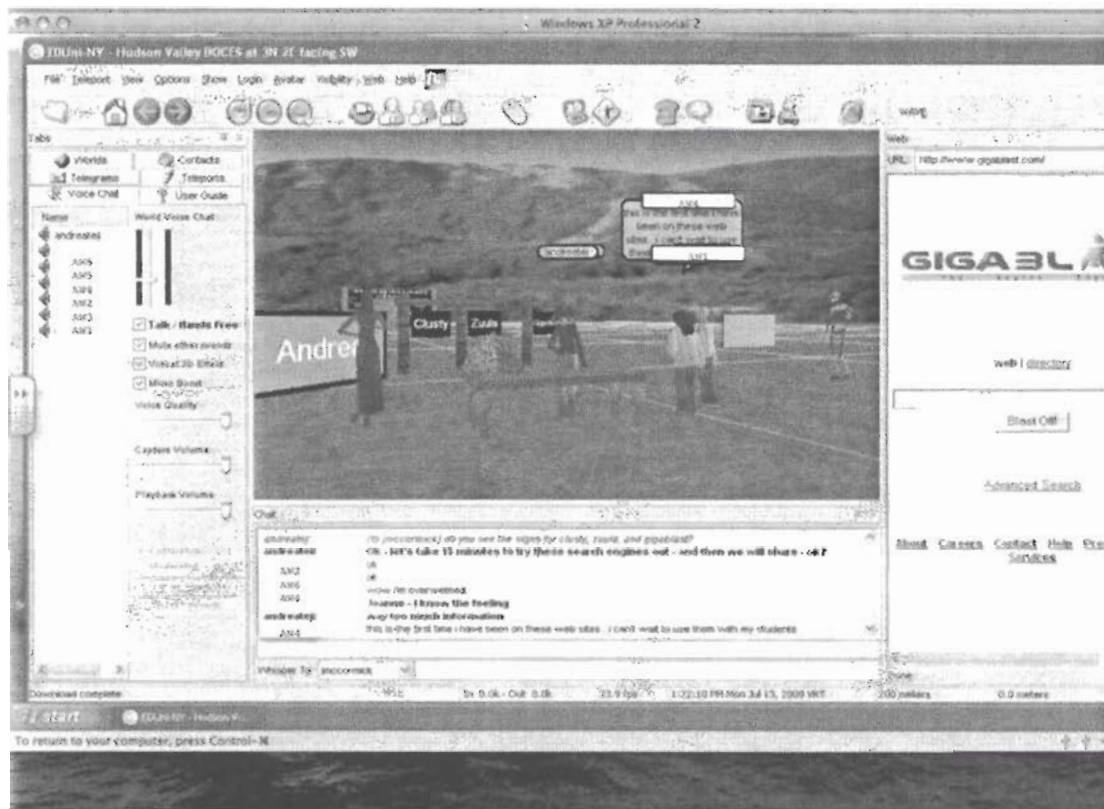


Figure 3. Screen shot of 3D and 2D environments in the same window.

I used the audio chat and IM options to guide the TPs through the process of searching with each metasearch engine. I told the TPs that they were going to focus on metasearch engines, and compare the search results of four different search engines. I told the TPs to select one topic, and to use the topic for each search. The following excerpt of the transcript from session one illustrates this interaction.

andreatej: I find it is best if you use one topic to search throughout the class  
 andreatej: For example - I use Civil War  
 andreatej: So think about the areas that you teach and select a topic to use throughout the class  
 andreatej: What topic do you think you will use?  
 AW5: hmm  
 AW3: with our partner or alone  
 andreatej: alone  
 AW1: colonial america  
 AW2: Internet Safety???  
 AW5: Is this a topic I would have my students research?  
 AW3: Ann Frank

AW4: I will be teaching 5th and 6th grade computers and ELA with special education students? What topic?  
 AW1: How about genres?  
 AW3: You're voice keeps going out  
 andreatej: maybe you want to identify resources for your students  
 AW1: for ELA  
 AW5: something biology ... the lab questions always stump them  
 andreatej: genres for ELA are a good idea  
 AW3: I might change that too - can I try to find math resources or is this too general  
 andreatej: anything that helps you in your classroom  
 andreatej: any area of interest  
 AW1: how about the quincentennial since that will be big this year  
 andreatej: that supports your teaching  
 andreatej: Nancy - that is really big this year  
 andreatej: and since you are teaching 4th grade - it might be really helpful with your curriculum  
 AW1: yes  
 AW5: I will be teaching a Consumer Math/Math Life Skills class so I choose Spending as a topic.

*Step 3: Explanation and elaboration.*

*How will participants use, or practice using, the new knowledge or skills?*

The TPs used the four search engines to conduct a search on their selected topic.

When they had completed the searches, I asked the TPs how the search results differed and if they preferred one search engine to the other. The TPs shared their results and thoughts by typing in the chat box. An excerpt of the discussion is included below.

AW2: Clusty gives you a few extra icons to the right of the found hit: to open in new window, to preview, and to show in clusters. This is nice.  
 AW6: I like Clusty best.  
 andreatej: also - if you click on sources (on the left side of the screen next to clusters) you can see how many results are from Ask, Gigablast, Live, etc  
 AW6: I like the preview and the box in the top left that gives you the type i.e. org, .com.  
 andreatej: and then if you click on sites you can see the .com, .org, .gov  
 andreatej: yes  
 andreatej: AW6 - I find that most teachers like Clusty.  
 andreatej: it is especially good for students who have difficulty narrowing down searches and finding information from a long list  
 AW3: like Clusty the best  
 andreatej: Which search engine did you find most useful - Dog Pile, Clusty, Zuula, and Gigablast?

andreatej: So far - 2 for Clusty  
 AW6: Clusty  
 AW1: I went to Clusty last and it showed me the sites that I already looked at in zuula and gigablast = that was cool  
 AW4: I liked Dog Pile because it gives you a lot of search engines at one time  
 AW5: clusty b/c it narrowed it down before we searched  
 andreatej: AW2 - which do you prefer?  
 AW2: Clusty - I really like the Preview Feature.  
 andreatej: Everyone seems to prefer Clusty  
 AW6: are these three that we are looking at now linked or related to the other search engines we like Dog Pile?  
 AW4: maybe I'd better research Clusty again..  
 AW1: I like Clusty for the kids use because then they will only go to the .orgs etc. – safer if I haven't had a chance to look and preview all of them

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

TPs reflected on their learning during the workshop: Did you find new resources to help you? Do you have any comments about meeting in Active Worlds? Is there anything you would suggest changing?

andreatej: Ok - let's talk for a minute about meeting in active worlds  
 andreatej: has this worked ok today?  
 AW6: yes  
 AW4: great.  
 AW3: yes  
 AW6: I just have a hard time hearing the audio.  
 andreatej: anything that you would suggest changing?  
 AW4: no  
 andreatej: The audio is not working as well as I would have hoped  
 andreatej: but can everyone follow the chat ok?  
 AW3: yes  
 AW4: yes  
 AW5: yes  
 AW6: yes  
 AW1: I like it - think it is like actually fun seeing other people and sitting right at home - I could follow your chat fine - audio was sketchy  
 andreatej: ok - thanks for the feedback  
 AW2: yes  
 andreatej: if you want to enter directly to the class tomorrow you can create "home" here  
 AW6: What a great way to meet and learn!  
 andreatej: go to Teleport and select home



AW3: it went quickly but wasn't overwhelming, just the right pace

*Coded data for Active Worlds Module 1.* The participants' interactions are identified using the codes in Table 11. The results of Module 1 of the first case can be found below in Table 12.

Table 12

*Summary of Tools used to Support Learning Activities in Active Worlds Module 1*

Active Worlds - Module 1			
Interaction	Interaction Code*	Tool	Description
COM	S>T	IM	TPs asked questions to the teacher about how to navigate the AW environment. The whole class could see the questions.
	T>S	IM	I provided instructions and responded to the TPs' questions in the text box area where all TPs could see the instructions and responses.
	T>S	Voice Chat	I provided whole class instruction using the voice chat. The TPs could hear the instructor, but could not use the voice chat to communicate.
	T>S	Whisper	When TPs had a question that required a private response, the teacher would use the Whisper option.
COL	IS>S	IM	When TPs asked a question using IM, often other TPs would respond and help them troubleshoot or find information.
	P	Whisper	The TPs embarked on an exploration of the AW environment in pairs. They used the whisper option to communicate with each other.
REF	S>C	IM	I asked the TPs if they had found a new resource by IMing the whole class. The TPs responded by using IM and everyone could see the response.
	S>C	IM	The TPs reflected on learning in the AW environment and shared their reflections with the whole class using IM.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

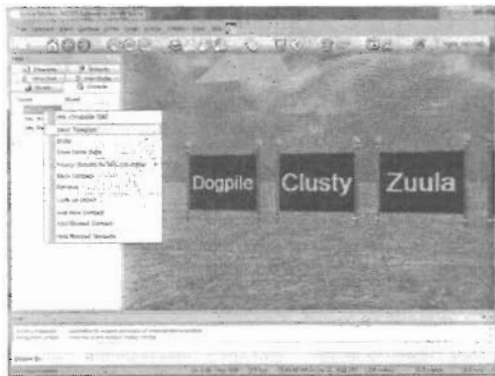
Overall, the TPs and I used IM to communicate. In addition, I used the voice chat to provide direct instruction to the whole class. When the participants needed to communicate

privately they used the whisper option. TPs also used the whisper option to communicate privately with their partner when they collaborated in pairs. TPs reflected by sharing their thoughts with the whole class and posting their comments and thoughts in the chat box by using IM.

### *Module 2.*

#### *Step 1: Engagement.*

I conducted an audio check. Then I began the class with an activity to further familiarize the participants with the Active Worlds environment. For the second day, the participants added each other to their contact list and sent telegrams (see Figure 4).



*Figure 4.* Sending telegrams in Active Worlds.

I guided the participants through both processes by using the audio and chat functions and by providing written directions on a sign in the main instructional area:

- andreatej: Ok - to get started let's add each other to our contact list  
 andreatej: Contacts can be found under the Tabs menu  
 AW6: I have 5. Is someone missing?  
 andreatej: Yes - AC1 will not be with us today  
 AW2: I have right-clicked each person and selected "Add to Contacts"  
 andreatej: The directions to add someone to your contact list are behind me  
 andreatej: To send a telegram - open the contact list under Tabs  
 andreatej: and then right click the person's name and select telegram  
 AW3: what you are saying is not showing on the chat box  
 andreatej: I think there is a delay  
 andreatej: It takes a minute  
 AW3: never mind it was just frozen on my screen

The following message appeared when a participant received a telegram:

Telegram from AW5, sent just now: hello andrea!

I typed the following message in the chat box, because some of the TPs had difficulty viewing the telegrams they received:

andreatej: To view the telegram - select Telegrams under Tabs - and all new Telegrams will have a Star next to them

I created a scavenger hunt for the TPs to practice the skills they needed to navigate the AW environment. In addition to adding contacts and sending telegrams, the TPs followed the clues on several signs to complete a series of tasks by searching the main instructional area in Active Worlds for objects and signs with hyperlinks to information about search engines. After the scavenger hunt, I asked the TPs if they had any questions from the previous class. No one had any questions, so I posted the guiding questions for day two: What are visual search engines? How do search results differ with each search engine?

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I provided the TPs with links to seven different visual search engines by creating “clickable” signs. When the TPs clicked on a sign, the link to the visual search engine opened in a window in the Active Worlds environment. The left half of the screen displayed the 3-dimensional environment, and the right side of the screen displayed the Website. I guided the TPs through the process of searching with each visual search engines using the same process as they used during Module 1, using metasearch engines.

*Step 3: Exploration and Elaboration.*

*How will participants use or practice using the new knowledge or skills?*

The TPs conducted a search on the same topic that they had researched on the first day, using the metasearch engines. When they completed the searches, I asked the TPs how the search results differed, and which search engine they preferred. The TPs shared their results and thoughts by typing in the chat box.

*Step 4: Evaluation.*

*How will you review, reinforce, and wrap up the lesson?*

TPs shared the results of their search. I posed the following questions to the TPs, and asked them to reflect on their learning: Do you have any questions? Was this too much information today?

andreatej: Do you have any questions?

andreatej: Was this too much information today?

AW2: No, it was good

AW5: it was good...I liked the time to play

AW6: no but this is a great lesson to use in my computer classes - comparing and contrasting search engines with my students

AW4: can you send me a copy of this weeks information? Thanks.

AW3: I really liked how you had us keep using the same topic to search - that was very useful to make comparisons.

AW6: I agree

AW4: I had a great time...I am learning new things every day

***Coded data for Active Worlds Module 2.*** I coded the data from the transcripts of the class session and the digital artifacts that the TPs created during the session. The interactions were coded based on the activities the TPs engaged in during class and the tools that I used to facilitate the interactions. See Table 11 for a summary of the codes. The results of Module 2 of the first case can be found below in Table 13.

Table 13

*Summary of Tools used to Support Learning Activities in Active Worlds Module 2*

Active Worlds - Module 2			
Interaction	Interaction	Tool	Description

	Code*		
COM	S>T	IM	TPs asked questions of the teacher about how to navigate the AW environment. The whole class could see the questions.
	T>C	IM	I provided instructions and responded to the TPs' questions in the text box area where all TPs could see the instructions and responses.
	T>C	Voice Chat	I provided whole class instruction using the voice chat. The TPs did not have access to the voice chat option.
	T>S	Telegram	I showed the TPs how to add contacts to the Contact List, and how to send a telegram on someone on the list.
COL	SG	Telegram	The TPs practiced sending and receiving telegrams.
	SG	IM	The TPs went on a Scavenger Hunt and had to share their results as they found the hidden objects.
REF	S>C	IM	I asked the TPs which visual search engine they preferred. The TPs responded by using IM and everyone could see the response.
	S>T	Telegram	The TPs completed reflections on the following question: Which visual search engine did you prefer? How would your students benefit for using these search engines your class(es)? The TPs sent the reflection to the teacher by using a telegram.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

Overall, the TPs and I used IM to communicate. In addition, I used the voice chat to provide direct instruction to the whole class. When the TPs or I needed to communicate privately, we used the whisper option. TPs also used the whisper option to communicate privately with their partner when they collaborated in small groups for the scavenger hunt. TPs reflected by sharing their thoughts with the whole class by posting their comments and thoughts in the chat box by using IM. In addition, TPs used a telegram to send me a private reflection.

### *Module 3.*

#### *Step 1: Engagement.*

I conducted an audio check. Then, I began the class by teaching the TPs how to create a sign. I guided the TPs through the process by using the audio and chat functions, and by providing written directions on a sign in the main instructional area.

andreatej: Right click the sign with your name on it?  
 andreatej: Do you see the object properties box?  
 AW4: yes  
 AW6: yes  
 AW2: yes  
 AW6: yes  
 AW1: yes  
 AW5: no  
 andreatej: (to AW5) right click the sign with your name on it  
 AW5: thank you!  
 andreatej: Did you duplicate the sign?  
 AW6: yes

After the TPs learned how to create a sign, I asked them if they had any questions from the previous class. No one had any questions, so I posted the guiding questions for day three: What is the deep (or hidden) Web and how do we find it? How do search results differ with the deep Web compared to the other search engines we have used?

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I posted signs with information about the deep Web. Then I provided the TPs with links to five different visual search engines creating “clickable” signs. When the TPs clicked on a sign, the link opened in a window in the Active Worlds environment. The left half of the screen displayed the 3-dimensional environment and the right side of the screen displayed the Website. Using audio and the chat box, I provided the TPs with additional information and guided them through the search process.

andreatej: INFOMINE is arranged in nine categories: biology, agriculture and medical sciences, business and economics, cultural diversity, ejournals, government information, maps and GIS, physical science, engineering and mathematics,

- social sciences
- AW1: Infomine is very specific!
- andreatej: yes - AC1 - it is - very targeted content
- AW1: WOW - primary source documents!!
- AW6: I just found some great databases at the bureau of statistics Website through digital librarian
- AW3: Do high school and college libraries usually have links to these
- andreatej: AW3 - they should - these are free
- AW5: I have never heard of them. I will spread the word at school

*Step 3: Explanation and elaboration.*

*How will participants use or practice using the new knowledge or skills?*

The TPs conducted a search on the same topic that they had researched on the two preceding days, using the metasearch and visual search engines. When they completed the searches, I asked the participants how the search results differed, and if they preferred one search engine to the other. The TPs shared their results and thoughts by typing in the chat box. Below is an excerpt of the chat when TPs shared their results of searching with Kartoo, Grokker, and Qunintura.

- andreatej: Let's start with grokker - what do you think?
- AW5: grokker is too distracting for me but i can see how people with that kind of brain would prefer it
- AW3: I didn't find anything special about it - some of the links weren't useful or what I wanted
- AW2: I did like the "concept map" style in Quintura
- AW6: No, that's it.
- AW4: yes..but i was having a hard time finding info on these sites..
- andreatej: What about quintura?
- AW4: even the kids site was demanding more specific word for the search
- AW3: I really liked this - it seemed to find very relevant links - found some things I couldn't find before
- AW2: It also has a kid friendly search engine: <http://quinturakids.com/>
- andreatej: I think that concept map might help students narrow down their search
- AW6: everyone just disappeared
- AW6: now you are back
- AW6: I had a server error
- andreatej: AW5 - did you find anything interesting?
- AW4: on the kids site..they demand that you narrow down the search
- andreatej: ok - thanks

andreatej: So let's take a vote - which did you prefer - grokker, quitura, or kartoo?  
 AW6: grokker  
 AW4: grokker  
 AW2: kartoo for me personally  
 AW3: quintura  
 AW5: quintura

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

TPs shared the results of their search, and reflected with the whole class on their learning during the workshop by typing in the chat box:

andreatej: Any questions or comments about today?  
 AW1: no  
 AW2: no  
 AW1: lots of info - thank you!!!  
 AW3: all set  
 AW4: no it was fun as usual  
 andreatej: great!  
 AW6: Great class, great resources. Thanks Andrea!

***Coded data for Active Worlds Module 3.*** The interactions were coded based on the activities the TPs engaged in during class and the tools that I employed to facilitate the interactions. See Table 11 for a summary of the codes. The results of Module 3 of the first case can be found below in Table 14.

Table 14  
*Summary of Tools used to Support Learning Activities in Active Worlds Module 3*

Active Worlds - Module 3			
Interaction	Interaction Code*	Tool	Description
COM	S>T	IM	TPs asked questions about how to navigate the AW environment. The whole class could see the questions.
	T>C	IM	I provided instructions and responded to the TPs' questions in the text box area where all TPs could see the instructions and responses.



	T>C	Voice Chat	I provided whole class instruction using the voice chat. The TPs did not have access to the voice chat option.
	T>C	Signs	I created a series of signs with written directions on how to duplicate an object and create a sign.
	T>S	Whisper	I answered TPs' questions privately as they created signs to showcase the information they found and to create a hyperlink to a favorite Website.
REF	S>C	Signs	TPs created a sign to reflect on the search engines they had used that day. The sign had the name of their preferred search engine and why liked it, and then linked to a Website related to their topic.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

The TPs and I primarily used IM to communicate. In addition, I used the voice chat to provide direct instruction to the whole class. When we needed to communicate privately, we used the whisper option. TPs reflected by sharing their thoughts with the whole class and posting their comments and thoughts in the chat box by using IM. In addition, TPs reflected by creating a sign with the name of their preferred search engine and an explanation about why they chose it. They also added a hyperlink to the sign that linked to a Website they found as a result of their search with the search engine.

#### *Module 4.*

##### *Step 1: Engagement.*

I conducted an audio check, and then posted the guiding questions for day four: Are there specialized search engines? How can we determine the credibility of a Website?

##### *Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I posted signs with information about specialized search engines. Then, I provided the TPs with links to five different specialized search engines by creating "clickable" signs. When the TPs clicked on a sign, the link opened a window in the Active Worlds

environment. The left half of the screen displayed the 3-dimensional environment and the right side of the screen displayed the Website. Using audio and the chat box, I provided the TPs with additional information and guided them through the search process.

After the TPs used the specialized search engines, I provided them with information on how to determine the credibility of Websites. I provided the TPs with links to two checklists in a PDF format that could be downloaded. The TPs downloaded the forms and used them as a guide throughout the class.

*Step 3: Explanation and elaboration.*

*How will participants use or practice using the new knowledge or skills?*

I provided the TPs with links to eight different hoax Websites, or sites that were created to intentionally mislead the reader. The TPs used the guides that they had downloaded and evaluated the Websites. After evaluating the hoax sites, the TPs used the forms to evaluate some of the sites that they had identified on the previous days.

*Step 4: Evaluation.*

*How will you review, reinforce, and wrap up the lesson?*

TPs shared the results of their search, and reflected on their learning during the course by typing in the chat box:

andreatej: Do you have any questions - or comments - or suggestions?

AW1: great - hoped you would do the hoax sites!

AW3: no

AW6: no

AW4: no

AW1: this is really eye opening - I've learned so much and hope I can do the same for my students this fall!! I think they need to know about hoaxes!

AW6: I agree

AW2: yes

AW4: yes me too

*Coded data for Active Worlds Module 4.* The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interactions. See Table 11 for a summary of the codes. The results of Module 4 of the first case can be found below in Table 15.

Table 15

*Summary of Tools used to Support Learning Activities in Active Worlds Module 4*

Active Worlds - Module 4			
Interaction	Interaction Code*	Tool	Description
COM	S>T	IM	TPs asked questions about how to navigate the AW environment. The whole class could see the questions.
	T>C	IM	I provided instructions and responded to the TPs' questions in the text box area where everyone could see the instructions and responses.
	T>C	Voice Chat	I provided whole class instruction using the voice chat. The TPs did not have access to the voice chat option.
	T>C	Signs	I added text and hyperlinks to signs so TPs could access documents.
	S>C	IM	I presented the Websites the TPs had evaluated and the results of the evaluation to the whole class.
COL	WC	IM	TPs collaborated to complete a scavenger hunt using new search engines and then used IM to communicate their findings and the process they used to find the answers.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

Overall, the TPs and I used IM to communicate. In addition, I used signs and the voice chat to provide direct instruction to the whole class. When we needed to communicate privately, we used the whisper option. The whole class collaborated to complete a scavenger hunt using the new search engines they investigated during Module 4. The TPs communicated using IM.

*Module 5.*

*Step 1: Engagement.*

I began the final class with an audio check. During this class, the TPs learned how to create signs and objects so they could create a customized presentation showcasing the resources they found to support the topic they researched. I guided the participants through the process by using the audio and chat functions, and by providing written directions on a sign in the main instructional area.

andreatej: Let's start with playing with your signs  
andreatej: If you change model - it will change the look of your sign  
AW5: wow that was easy!!!  
andreatej: you can change the model to sign 1, sign2, sign3, sign4, sign5, sign6, sign7, sign10, or sign 11  
andreatej: Great work!1  
AW6: how many different sign types are there?  
andreatej: about 10  
AW5: sign 10 is a mailbox! hah  
AW6: is there a menu for the sign types  
AW6: ?  
andreatej: Now - if you want to make your sign "clickable" then you have to add additional information to the action box  
andreatej: after the bcolor:orange you must have a semi-colon and then write active url <http://www.google.com>  
andreatej: or whatever url you are trying to get to  
andreatej: There is no menu for sign types - but there is a building yard that we could explore  
andreatej: are you interested in going to the building yard?

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I invited each TP to the building yard so they could find objects to use in their display/billboard. After the TPs explored the building yard, they returned to the class work area to build their displays using the new objects/codes they identified while in the building yard. The TPs asked questions by typing in the chat box. I replied by typing in the chat box or using the audio.

*Step 3: Explanation & elaboration.**How will participants use, or practice using, the new knowledge or skills?*

TPs shared the results of their searches during the course by creating a display/billboard for their topic of interest. Each TP presented the results of their work by having their avatar stand in front of the display, and presented the results by typing in the text box and using the audio chat.

andreatej: ok - let's start with AW6  
 andreatej: Can you all join us down by the hot air balloon?  
 andreatej: balloon  
 andreatej: AW6  
 AW6: yes  
 andreatej: can you tell us what you found ?  
 AW6: I chose 3 Websites that related to consumer spending that were kid friendly.  
 andreatej: This is for middle school, right?  
 AW6: yes  
 andreatej: AW6 was it hard to find appropriate sites?  
 AW6: I would need to explore these Websites further to determine what we can get into.  
 AW6: no  
 AW4: I also found that dmoz was very kid friendly  
 andreatej: good - excellent  
 andreatej: Let's go visit AW1's space next

*Step 4: Evaluate.**How will you review, reinforce, and wrap up the lesson?*

TPs reflected to the whole class on their learning during the workshop by typing in the chat box.

andreatej: Let's just talk for a minute about learning in this environment  
 andreatej: What did you think?  
 AW4: I love it  
 AW6: love it  
 AW1: I really liked it and think that it is a great way to teach kids - even if they do it for "homework" - they are on the Web a lot already, they could be learning in this environment and enjoying it.  
 AW4: the children will be totally amazed at what they can achieve on the Internet search engines

*Coded data for Active Worlds Module 5.* The interactions were coded based on the activities TPs engaged in during class and the tools that were used to facilitate the interactions. See Table 11 for a summary of the codes. The results of Module 5 of the first case can be found below in Table 16.

Table 16

*Summary of Tools used to Support Learning Activities in Active Worlds Module 5*

Active Worlds - Module 5			
Interaction	Interaction Code*	Tool	Description
COM	S>T	IM	TPs asked questions about how to navigate the AW environment. The whole class could see the questions.
	T>C	IM	I provided instructions and responded to the TPs questions in the text box area where everyone could see the instructions and responses.
	T>C	Voice Chat	I provided whole class instruction using the voice chat. The TPs did not have access to the voice chat option.
	S>C	IM	TPs talked to each other (formally and informally) about the class.
	T>C	Signs	I created a series of signs with written directions on how to create different objects and modify signs.
	T>S	Whisper	When TPs had a question that required a private response, I used the Whisper option.
	T>S	Invite	When I wanted a TP to join me in a specific area of AW, I used an invitation. When the TP accepted the invite, he/she was automatically teleported to the area.
REF	S>C	Signs	TPs created a series of signs to reflect on their learning throughout the class. Each TP created signs with their topic, preferred search engine, and links to at least three Websites related to their topic.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

Overall, the TPs and I used IM to communicate. In addition, I used signs and the voice chat to provide direct instruction to the whole class. When we needed to communicate privately, we used the whisper option. I used the Invite option to teleport TPs to a specific

location in the building yard. TPs created presentations and reflected to the whole class about what they had created, the resources they chose, and the process they used. They also spoke about how they would use the search engines with their own classes. The TPs used signs, IM and audio chat for their presentations/reflections.

**Evaluation of media.** Media and methods were evaluated during each phase of the lesson. I conducted an informal debriefing session with TPs at the end of each module and asked the TPs the following questions: Do you have any comments about meeting in Active Worlds? Is there anything you would suggest changing?

In addition to the excerpts in the preceding sections, the following excerpts illustrate TPs' reactions to meeting and interacting in the AW environment.

Module 2:

AW3: I love the meeting at a certain place in our virtual world and seeing other "people" there.

Module 2:

andreatej: Is everyone back from the scavenger hunt?

AW5: sort of

AW5: I am in and out...this is unbelievable

AW6: yes

AW5: I could be "lost" forever

andreatej: AW5 - try to log off and then log back on - it might help

AW5: no I mean checking things out!! :)

Module 5:

AW5: this is really great...I thought it was so convenient to just click on your boxes when we looked at the search engines!

Another excerpt from Module 5 indicated that participants were satisfied with the learning experience.

AW4: had a ball

andreatej: and thank you for joining the class

AW6: so we can come back to Active Worlds anytime?  
andreatej: it was a first for me teaching in this environment  
AW3: THIS WAS GREAT  
andreatej: yes - you can come back any time  
AW4: nice to meet all of you  
AW3: You made it very relevant  
AW6: Andrea, you did a great job  
andreatej: Thank you - it was a lot of fun  
AW4: Excellent!!  
AW6: You were very fluid  
AW1: Thanks for everything Andrea, will see you in two weeks!! Loved learning this way!!  
andreatej: I will e-mail everyone a feedback form - so it would be great if you could e-mail me responses to the questions  
AW6: All the information flowed in a very organized logical way

**Evaluation of overall instruction.** The TPs evaluated the overall class by reporting participant satisfaction with the course in terms of organization, content, usefulness, and overall presentation (see Appendix C for the full evaluation). Five TPs completed the evaluation. Given the choices of fair, good, and excellent, all five TPs rated the organization, content, usefulness and presentation of the course excellent.

In Question 8, the TPs were asked, “What did you like most about this session?” Some of the responses were: “The format of this inservice was terrific!” “It was really neat being able to learn through the active worlds forum!!” “I loved taking the class in Active Worlds.” “The workshop updated me on current technology.”

In Question 9, the TPs were asked, “What practical/professional application does this session provide?” Some of the responses were: “This will definitely help my students in finding more information for research and help them in deciding if Websites are reliable or not.” “This taught me how to teach them to be more discerning with the Websites they will be using for information.” “I have ideas on how to reach students that usually are not engaged in the classroom.”



In Question 10, the TPs were asked, “How could this program be strengthened or improved?” Some of the responses were: “This was terrific as it was.” “The forum in active worlds needs to be done for more in-service presentations!!” “Assist in lesson writing.” “More time to develop it and use it in the classroom.”

In Question 11, the TPs were asked, “How will you use this information to strengthen your own districts’ practices?” Some of the responses were: “I am compiling a list of resources to share with other teachers in my building.” “To provide information about learning in virtual environments and to further research beyond Google and Internet Safety.”

In Question 12, the TPs were asked to indicate the degree to which they thought student performance could be improved using the information from the course. Three of the TPs indicated that they thought the information would have an important influence, two indicated a reasonable influence, and none of the TPs chose slight or no influence.

#### **Pedagogy of the environment.**

Table 17

*Use of Pedagogical Framework to Evaluate Case #1*

Features	Active Worlds version 5.0
What tools are available for teachers to present their ideas to students?	AW is an immersive environment, whereby teachers and students can create simulations of real-world environments. In this case, I created a simulated classroom environment by using signs (large bulletin boards) for information and audio chat to provide instruction related to the topic of study. I updated the information on the signs throughout the classes with new information and by adding hyperlinks to the signs for additional information. I also used IM (the chat box) to respond to questions and add information related to the discussions.
What tools are available to students to articulate ideas to the teacher and other students?	The TPs used IM, voice chat, and signs to articulate their ideas to the other participants.
Can teachers and learners change their presentations during the class?	The TPs and I were able to change our presentations at any time during the course.
Can a module be structured	I used guided instruction to facilitate student learning through

sequentially and/or hierarchically over time?	each module of study. Each module began with an activity to engage the TPs in learning. I modeled what the class was going to do during the session. This was followed by TPs exploring the concepts. As the TPs gained an understanding of the concepts, they began to build an explanation and elaborate how they would use the concepts in their classrooms. Each class ended with an evaluation of the content that was presented and learned during the session, and of the learning environment.
What facilities are there to organize learners in a variety of ways?	I organized learners for collaborative activities in small group and pairs. The TPs used whisper and telegrams to communicate during these activities.
What underlying pedagogical models does the system encourage?	I used a socioconstructivist teaching model to guide student learning. By using guided inquiry the TPs were able to engage in hands-on learning, communicate and collaborate with each other, and interact with the environment to reconstruct their knowledge.
How are the “rules of the module” made evident to the student?	This option is not a feature of the software. I established the objectives for each class by posting guiding questions during the engagement phase.
What facilities are there to monitor how well learning is progressing on the module?	I reviewed the transcript from each session to make the necessary adjustments to the learning environment and the content. I also monitored individual TP progress by observing how they utilized the building tools and progressed with creating their final project.
Can the students find and manage resources? Do they have their own file stores or repositories?	TPs do not have their own files stores or repositories. However, the TPs were able to find Web-based resources for the unit of study they researched and then added information and hyperlinks to signs.
Can the students talk to other students, create their own discussions, creating their own learning activities?	The TPs communicated with each other through IM, whisper and telegrams. This resulted in new discussions between the TPs and lead to TP exploration of the content and environment.
Can the students locate people with similar interests outside of their own module, course, year or institution?	The configuration of the AW universe did not allow the TPs to search for anyone outside of the course.
Can the teacher adapt the module structure once teaching is underway, i.e. change resources, fragments of the module, people/groups, or learning activities?	AW does not rely on a modular structure. I was able to adapt the course to meet the needs of the TPs. Due to the low enrollment of the class, I did not use small groups for collaborative activities. In general, the class as a whole participated collaboratively.

**Case Study #2: Adobe Connect**

**Description of course.** *Engaging Students with 21<sup>st</sup> Century Technologies - This was a 15-hour interactive Webinar, conducted for 3 hours a day for 5 days. Registrants were required to have access to a computer, the Internet and a microphone (if possible) in order to participate. During the Webinar, participants explored Web 2.0 technologies in relation to the curriculum, and also explored why they are important in relation to visual literacy. Participants examined students today and their needs as 21st Century learners, and how to begin to embed the 21st Century curriculum into their classroom. The purpose of the course was to give teachers a further understanding of digital literacy and the many educational choices available to them. Participants were provided with a URL in order to connect to the course.*

**General characteristics of teacher-participants.** Seventeen teacher-participants (TPs) enrolled in the workshop: 12 teachers, one preservice student in a graduate education program as school librarian, and four districtwide administrators. The teachers included six elementary school teachers, two middle school teachers (one computer teacher and a math teacher), and four high school teachers (two Spanish teachers, one English teacher, and one Special Education teacher). The four districtwide administrators were technology and staff development directors. In addition, the teachers' technology skills varied from very basic (i.e., used e-mail) to advanced skills (i.e., the Director of Technology).

The TPs were expected to have the following prerequisite skills:

- Compose and send e-mail.
- Actively participate and collaborate in a professional learning opportunity;
- Navigate independent activities;

- Be interested in using emerging technologies in their classrooms;
- Use the Internet to find information.

**Objectives of the course.**

***Broad goals.***

1. TPs will be an active member of a professional development opportunity.
2. TPs will use the information they learn to engage students through the integration of technology in their classrooms
3. TPs will become leaders in the use and pedagogy of emerging technologies in education.

***Skills and content.***

The following skills and content were addressed:

- Create and utilize a wiki to showcase the learning tools created during the course.
- Understand the processes related to creating content using Web 2.0 technologies:
- Understand the pedagogy of engaging students in learning with technology

TPs engaged in a hands-on experiential setting as a learner. I guided the participants through the process of creating using Web 2.0 technologies. Discussion centered on the use of various tools and how they could be used to engage students in learning. The desired outcome was that TPs would create a wiki to showcase the tools they created for student learning in a specific content area or for a specific grade level.

***Learner objectives.***

1. TPs will learn how to create learning tools using several different Web 2.0 technologies.
2. TPs will use Adobe Connect to meet and interact with other professional K-12 educators.
3. TPs will create a wiki to showcase the learning tools for their students to utilize the resources identified during the class.

**Methodology.** The teaching method that was used to facilitate learning was guided inquiry and entailed five steps, which included engagement, exploration, explanation/invention, elaboration/discovery and evaluation/assessment (Bybee, 1997). I presented guiding questions at the start of each class:

- How can Web 2.0 technologies be used to support digital literacy?
- What types of tools are available?
- How can students benefit from interacting and creating with the tools?

Guided discovery was used because the methodology enabled TPs in the learning process through hands-on exploration and application of the technology.

**Materials and resources.** In order to participate in the class, TPs needed a computer with Internet access, a headset (mic and/or headphones), an e-mail address, Adobe Reader, and the URL for the course.

***Procedure.***

*Module 1.*

*Step 1: Engagement.*

I used camera and voice to welcome the TPs as they arrived in the class. TPs used the chat box to type questions or comments as they arrived. Once everyone was present, I

indicated that I would start to record the session. I used the poll pod to poll the TPs on their use of a microphone, headset, or both. I also did an informal poll, asking the TPs to indicate what type of ice cream was their favorite. The TPs introduced themselves by typing their name, school district, and role on the digital whiteboard (see Figure 5).



Figure 5. Screen shot of Adobe Connect class showing the attendee list, the instructor using camera and voice, the chat box, and the poll.

To introduce the TPs to the topic of study for the class, I showed a presentation on the digital whiteboard. I used the pointer to highlight specific information. I told the class that they would be exploring the use of Web 2.0 technologies to create visual learning tools. To get started, I typed a link to a class wiki in the chat box. The TPs clicked on the link to go to the wiki and explored the resources on the class wiki. The resources included examples of instructional tools that were created with the Web 2.0 technologies that the TPs were to use.

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I used the Weblinks pod to post a link to an interactive Webquest about literacy in the 21<sup>st</sup> Century on Jog-the-Web. (I also posted the link in the chat box.) The TPs navigated the jog and shared answers to the guiding questions on the digital whiteboard in Adobe Connect.

In the second part of this step, I posted a link to the class wiki in the chat box. The TPs navigated to the class wiki, and I used the screen share option to demonstrate to the TPs how to add their own page to the class wiki. The TPs explored the resources on the wiki and created an account.

*Step 3: Explanation and elaboration.*

*How will participants use or practice using the new knowledge or skills?*

The TPs created their own page on the wiki and began to add content. When they had questions, they raised their hand and typed the question in the chat box. I responded using audio or typing in the chat box. Upon completion of creating the page in the wiki, the TPs added a link to their wiki from the class wiki.

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I asked the TPs to reflect on the first class by posting comments on the digital whiteboard (see Figure 6 below).

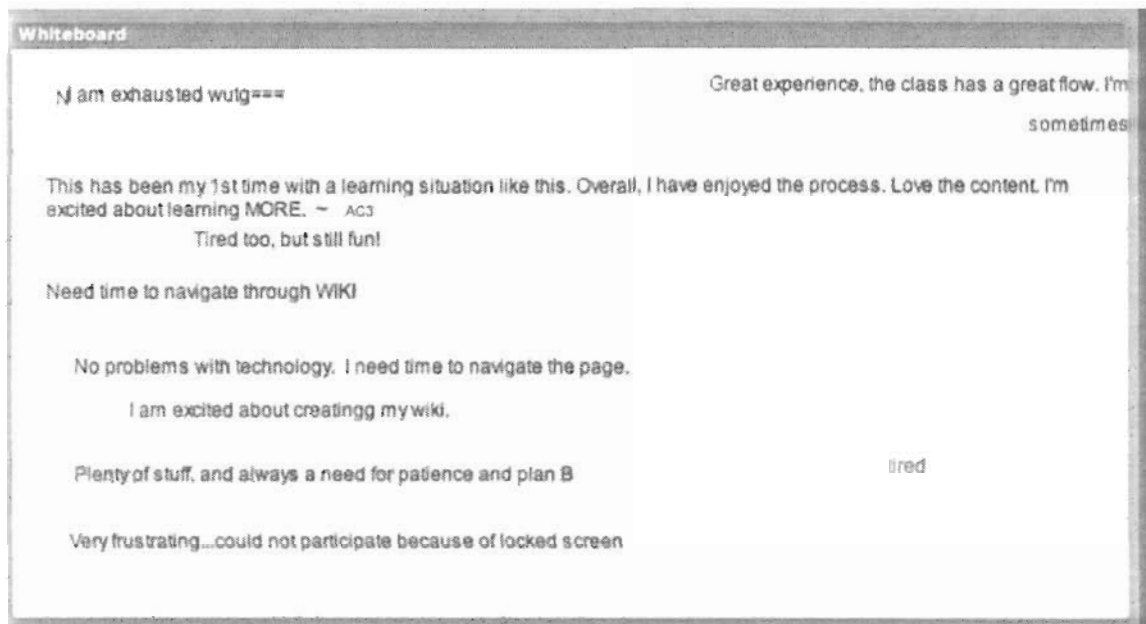


Figure 6. TPs' reflections posted on the digital whiteboard in Adobe Connect.

Some of the TPs expressed that they were frustrated by the technology. Other TPs indicated that the first class had been a great experience, that they enjoyed the process, or that they needed time to navigate through wiki.

**Coded data for Adobe Connect Module 1.** I coded the data from the transcripts of the class session and the digital artifacts that the TPs created during the session. The codes, shown in Table 11, were used to identify when the TPs engaged in communication, collaboration, and reflection. Table 11, which includes the summary of the codes for all cases under study, is replicated below.

Table 11  
*Summary of Codes*

Interaction	Code*	Definition
Communication (COM)	T>C	Teacher communicated to whole class
	T>S	Teacher communicated to individual students.
	S>T	Students communicated to teacher.
	S>C	Students communicated to whole class.
	S>S	Students communicated to each other individually.
Collaboration (COL)	P	The students worked in pairs.
	SG	The students worked in small groups (3 – 6) participants.



	WC	The whole class worked together.
	IS>S	Informal collaboration between students.
Reflection (REF)	S>C	The student's shared their reflection with the whole class.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

The interactions were coded based on the activities the TPs engaged in during class and the tools that were to facilitate the interactions. The results of Module 1 of the second case can be found below in Table 18.

Table 18

*Summary of Tools used to Support Learning Activities in Adobe Connect Module 1*

Adobe Connect- Module 1			
Interaction	Interaction Code*	Tool	Description
COM	T>C	Audio IM	I greeted the TPs as they entered class and did an audio check. I also used the IM to message what was being said on the audio.
	S>T	IM	The TPs asked questions as they entered class by typing in the IM chat box.
	S>S	IM	The TPs welcomed each other as they became familiar with the class setting.
	T>S	Audio IM	I responded to TPs' questions by typing the chat box and/or using audio.
	T>C	Poll	I conducted a poll to determine which TPs had a mic, headset, both, or neither.
	T>C	Whiteboard	I used the whiteboard to post questions.
	S>C	Whiteboard	The TPs used the whiteboard to introduce themselves by writing a few sentences about their school and their interest in the class.
	S>C	Audio	The TPs used audio to narrate what they were presenting on the whiteboard.
	T>C	Whiteboard - PPT	I shared a PowerPoint presentation by uploading it to the whiteboard.
	T>C	Pointer	I used the pointer to draw the TPs' attention to specific information in the PPT.
	T>C	Screenshare	I used the screenshare option to demonstrate how to create an account and use specific Web 2.0 technologies.
	T>C	Weblinks	I posted Weblinks for TPs to access.

COL	IS>S	IM	TPs responded to classmates' questions about how to interact with the environment, offering solutions and helping to troubleshoot.
	WC	Whiteboard	The TPs had to work together to find the answers to the questions I posted on the whiteboard by using one of the tools featured in the class, Jog-the-Web.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

Overall, the TPs and I used IM to communicate. In addition, I used the camera and voice, along with the digital whiteboard, pointer and screen share pods to provide direct instruction to the whole class. When we needed to communicate privately, we used the drop-down box in the chat area to select a specific participant. I used the poll pod to gather information about the TPs. Each TP added a page to the class wiki, and shared the link by posting the URL in the chat box. At the end of the class, the TPs posted comments about the class on a digital whiteboard.

### *Module 2.*

#### *Step 1: Engagement.*

I began class with an audio check. Then, I reviewed how to add a page to the wiki and create a link to the wiki from the main page of the class wiki. I used the camera and audio, and the chat box to communicate with TPs. The TPs used the chat box to communicate. I used the File Share pod to share tutorials for the technologies.

#### *Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

The class was scheduled in two parts. In the first part, the TPs explored Jog-the-Web; and in the second part, Voki.

In the first part of the class, I posted a link to Jog-the-Web using the Weblinks pod. The TPs used the link to navigate to the Website. I used screen share to broadcast the

Website to the TPs. The TPs created an account on Jog-the-Web. I guided the TPs through the creation of a learning tool.

The second tool the TPs explored was Voki. I posted a link to Voki using the Weblinks pod and by posting it in the chat box. The TPs used the link to navigate to the Website. I used screen share to broadcast the Website to the TPs. The TPs created an account on Voki. I guided the TPs through the creation of a learning tool.

*Step 3: Explanation and elaboration.*

*How will participants use or practice using the new knowledge or skills?*

Following the guided exploration of each tool, the TPs created their own learning tool using the technologies I had demonstrated: Jog-the-Web and Voki. When they had questions, they raised their hand and typed the question in the chat box. I responded using audio or typing in the chat box. Upon completion of creating the jog, the TPs posted a link to the job in the chat box so the other members of the class could explore what they had created. The TPs also added the link to their page in the wiki. The TPs embedded the Voki in their wiki.

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I asked the TPs to share their thoughts on the organization of the content and environment of the class:

- AC1: was able to make a Voki and put it in my wiki, now I just need to add it to blended 21...moving forward at a steady pace
- AC2: job the Web is also a great site. I can't wait to use it with my second graders.
- AC3: one thing we have to keep in mind just like we have had time to explore and create...so do our kids :)
- AC4: jog the Web I think I will enjoy once I get used to it.
- AC5: job the Web is so organized
- AC6: embedding a code was great

I used the digital whiteboard and three words: wiki, Voki, and jog-the-Web. I asked the TPs to reflect on the **three technologies and to identify** the point of congruence for all three:

AC7: communication with interest  
 AC4: Nice pace tonight  
 AC1: connecting  
 AC8: I like being able to differentiate with jog the Web  
 AC9: pacing was great  
 AC3: That was a great example  
 AC7: AC9-yes!  
 AC10: Agreed  
 AC6: communicating with different venues  
 AC8: thanks AC7....  
 AC4: I agree nice concept differentiating instruction  
 AC9: I can think of multiple applications for using jog the Web  
 AC11: all very engaging for audience as well as creator  
 AC2: it makes learning more exciting!  
 AC8: same here AC9  
 AC12: keeps kids on task  
 AC8: it's just fun!  
 AC13: <http://www.jogtheweb.com/run/BMtBdJ5VZtHb/To-Kill-a-Mockingbird>  
 AC14: All of these things will capture the interest of the students.  
 AC6: that is so true  
 AC15: kids have many of these skills - this allows them to be put into a different focus  
 AC13: I loved jog the Web  
 AC13: I just finished making one  
 AC8: Thank you **Andrea** for being so easy and flexible  
 AC9: I think I found a **new** niche  
 AC13: great class  
 AC12: yes-thanks again  
 AC6: I just saw jog the Web for the first time today  
 AC8: I struggle and never feel silly asking questions  
 AC3: great job Andrea...

**Coded data for Adobe Connect Module 2.** The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interactions. The results of Module 2 of the second case can be found below in Table 19.

Table 19

*Summary of Tools used to Support Learning Activities in Adobe Connect Module 2*

## Adobe Connect - Module 2

Interaction	Interaction Code*	Tool	Description
COM	T>C	Audio IM	I greeted the TPs as they entered class and did an audio check. I also used the IM to message what was being said on the audio.
	S>T	IM	The TPs asked questions throughout class by typing in the IM chat box.
	S>S	IM	The TPs welcomed each other and chatted before class began.
	S>C	IM	The TPs shared links to the tools they created by posting the link in the chat box.
	T>C	File share	I uploaded files for the class and posted the files in a file share pod.
	T>C	Screen share	I shared my computer screen with the class and completed a step-by-step demonstration of how to create using the Web 2.0 tools.
	S>T	Icons	The TPs clicked on the "raise hand" option at the bottom of the screen and an icon appeared next to their name when they wanted to ask a question.
COL	IS>S	IM	TPs collaborated informally by asking and answering questions in the chat box.
REF	S>C	IM	I prompted the TPs to share what they learned and/or enjoyed during the class. The TPs typed their responses in the chat box.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

Overall, the TPs and I used IM to communicate. In addition, I used the camera and voice, along with the digital whiteboard, file share and screen share pods to provide direct instruction to the whole class. If the TPs had a question, they used the icons at the bottom of the page to place a picture of a person with a raised hand next to their name. I responded by using a private message. When the TPs or I needed to communicate privately, we used the drop down box in the chat area to select a specific participant. Each TP created a learning tool using Jog-the-Web and Voki and added the URL to the chat box so the whole class

could view what they had created. At the end of the class, the TPs posted comments about the class in the chat box.

*Module 3.*

*Step 1: Engagement.*

I posted a riddle on whiteboard that the TPs could see when they entered class. The TPs shared their answers by typing on the whiteboard. The TPs communicated informally and helped each other troubleshoot by typing in the chat box. I used audio and the chat box to advise the class that I was about to start recording the session. I did an audio check. The class started with a review of the wiki and how to add a picture to the wiki.

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

The class was scheduled in two parts. In the first part, the TPs explored Many Eyes; and in the second part Voicethread.

In the first part of the class, I posted two word clouds that I had created in using Many Eyes. The word clouds were generated using the text of the NCTE/IRA Standards for ELA and the NCTE 21<sup>st</sup> Century Curriculum and Assessment. I asked the students to compare the two word clouds and share their observations by typing in the chat box.

- AC16: One seems more people and process oriented and one seems more thing oriented.
- AC6: Literacy pops out at me
- AC12: you could use this on a DBQ
- AC16: You could analyze the level of students writing -- for me in Spanish -- to see the level of their vocabulary.
- AC12: you could use an anchor paper against student work

I shared a link to Many Eyes using the Weblinks pod. The TPs used the link to navigate to the Website. I used screen share to broadcast the Website to the TPs. The TPs

created an account on Many Eyes. I guided the students through the creation of a learning tool.

The second tool the TPs explored was VoiceThread. I posted a link to VoiceThread using the Weblinks pod and by posting it in the chat box. The TPs used the link to navigate to the Website. I used screen share to broadcast the Website to the TPs. The TPs created an account on VoiceThread. I shared a link with the TPs to a collaborative activity in VoiceThread. After the collaborative activity, I guided the TPs through the creation of a learning tool.

*Step 3: Explanation and elaboration.*

*How will participants use, or practice using, the new knowledge or skills?*

Following the guided exploration of each tool, the TPs created their own learning tool using the technologies I demonstrated: Many Eyes and VoiceThread. When they had questions, they raised their hand and typed the question in the chat box. I responded using audio or typing in the chat box. After completing the creation of a visualization in Many Eyes, the TPs embedded it in their wikis. The TPs shared their ideas for using Many Eyes by typing in the chat box:

AC16: I typed a current vocabulary list and repeat several times the high-frequency words.

AC15: I dropped in some data and made a chart

AC12: I started to compare unemployment rate to poverty level

AC14: I'm working on a wordle.

AC6: I uploaded my word wall

The TPs shared the links to their VoiceThreads by posting the URL in the chat box, and by embedding the Voicethread on their wiki.

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I asked the students what they thought about VoiceThread:

- AC12: very cool, want to play  
 AC1: like that  
 AC7: Jr. and Sr. high use it for review. First 2 periods add review info from memory, next two periods add comments from notes, and last period adds review items from book  
 AC17: do educators usually open them to all?  
 AC7: comments usually from students keep it safe  
 AC17: if students don't have email accounts how can you access for them?  
 AC17: can you demonstrate creating multiple identities?  
 AC17: thank you!  
 AC13: awesome site  
 andreatej: questions and comments?  
 AC13: fun night  
 AC5: ooooo this is fun.  
 AC14: Thanks, so many new things out there.

**Coded data for Adobe Connect Module 3.** The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interactions. The results of Module 3 of the second case can be found below in Table 20.

Table 20

*Summary of Tools used to Support Learning Activities in Adobe Connect Module 3*

Adobe Connect - Module 3			
Interaction	Interaction Code*	Tool	Description
COM	T>C	Audio IM	I greeted the TPs as they entered class and did an audio check. The teacher also used the IM to message what was being said on the audio.
	S>T	IM	The TPs asked questions throughout class by typing in the IM chat box.
	S>S	IM	The TPs welcomed each other and chatted before class began.
	S>C	IM	The TPs shared links to the tools they created by posting the link in the chat box.
	T>C	File share	I uploaded files for the class and posted the files in a file share pod.
	T>C	Screen share	I shared my computer screen with the class and completed a step-by-step demonstration of how to create using the Web 2.0 tools.
	T>C	Weblinks	I added links to Websites to a Weblinks pod.



	T>C	Whiteboard	I added a PowerPoint presentation to a whiteboard and showed it to the class.
COL	IS>S	IM	TPs collaborated informally by asking and answering questions in the chat box.
	WC**	Weblinks	I posted a link to a Voicethread where TP's contributed to a thread I posted.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

\*\* I posted the link to the collaborative activity in the Weblinks pod. The actual activity took place in a micro-world outside of the Adobe Connect environment.

Overall, the TPs and I used IM to communicate. In addition, I used the camera and voice, along with the digital whiteboard, file share and screen share pods to provide direct instruction to the whole class. When we needed to communicate privately we used the drop-down box in the chat area to select a specific participant. Each TP created a learning tool using Many Eyes and VoiceThread, and added the URL to the chat box so the whole class could view what they had created. At the end of the class, the TPs posted comments about the class in the chat box.

#### *Module 4.*

##### *Step 1: Engagement.*

I used a whiteboard to post instructions on what the TPs needed to do in order to get ready for class: take a poll, and download two documents from the file share pod. The TPs communicated informally and helped each other troubleshoot by typing in the chat box. I used audio and the chat box to advise the class that I was about to start recording the session. I did an audio check. I reviewed the technologies the TPs had explored to date and asked if they had any questions.

##### *Step 2: Exploration.*

The class was scheduled in two parts. In the first part, the TPs explored Photopeach; and in the second part, Glogster.

In the first part of the class, I used screen share to show the TPs a story I had created using Photopeach. I shared a link to Photopeach using the Weblinks pod. The TPs used the link to navigate to the Website. The TPs created an account on Photopeach, and I guided them through the creation of a learning tool.

The second tool the TPs explored was Glogster. I posted a link to Glogster using the Weblinks pod, and by posting it in the chat box. The TPs used the link to navigate to the Website. I used screen share to broadcast the Website to the TPs. The TPs created an account on Voicethread. I shared a link with the TPs to several different instructional glogs that they could explore to experience how classroom teachers are using them. After the exploration, I guided the TPs through the creation of a learning tool.

*Step 3: Explanation and elaboration.*

*How will participants use or practice using the new knowledge or skills?*

Following the guided exploration of each tool, the TPs created their own learning tool using the technologies I demonstrated: Photopeach and Glogster. When they had questions, they raised their hand and typed the question in the chat box. I responded using audio or typing in the chat box. Upon completion of creating a story in Photopeach the TPs embedded it in their wiki. The TPs shared their thoughts on Photopeach and posted a link to the tool they created in the chat box:

AC2: that's pretty neat :o)  
 AC8: very similar to photo story  
 AC13 : ): <http://photopeach.com/album/14xc9b5>  
 AC13 : ): mine is done!  
 AC13 :): love it  
 AC15: oh my gosh this is fun -I just made one  
 AC7: love the quiz idea  
 AC15: <http://photopeach.com/album/esx7gb>

Figure 7 is an example of an instructional tool a participating 4<sup>th</sup> grade teacher created about colonial life, using photographs she took on a field trip.



Figure 7. Screen shot of instructional tool 4<sup>th</sup> grade teacher created using Photopeach.

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I asked the TPs if they had any questions. I returned to the poll that was opened at the start of class: “What technology would you like to explore the last day of class?” After all of the votes were cast, xtranormal was the chosen technology. I told the class that we would explore xtranormal on the final night. I also asked the TPs to select one tool they created and be prepared to share it with the class.

**Coded data for Adobe Connect Module 4.** The interactions were coded based on the activities the TPs engaged in during class and the tools that were employed to facilitate the interactions. The results of Module 4 of the second case can be found below in Table 21.

Table 21

*Summary of Tools used to Support Learning Activities in Adobe Connect Module 4*

## Adobe Connect - Module 4

Interaction	Interaction Code*	Tool	Description
COM	T>C	Audio IM	I greeted the TPs as they entered class and did an audio check. I also used the IM to message what was being said on the audio.
	S>T	IM	The TPs asked questions throughout class by typing in the IM chat box.
	S>S	IM	The TPs interacted with each other throughout class.
	S>C	IM	The TPs shared links to the tools they created by posting the link in the chat box.
	T>C	File share	I uploaded files for the class and posted the files in a file share pod.
	T>C	Screen share	I shared my computer screen with the class and completed a step-by-step demonstration of how to create using the Web 2.0 tools.
	T>C	Weblinks	I added links to Websites to a Weblinks pod.
	T>C	Whiteboard	I added a PowerPoint presentation to a whiteboard and showed it to the class.
	T>C	Poll	I polled the TPs to determine what technology they wanted to investigate during the final class.
	T>S	Private Chat	I used private chat to address TPs individually, so the other students could not see the communication.
	S>T	Private Chat	The TPs used private chat to communicate with me when they did not want the whole class to see.
COL	IS>S	IM	TPs collaborated informally by asking and answering questions in the chat box.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

Overall, the TPs and I used IM to communicate. In addition, I used the camera and voice, along with the digital whiteboard, file share and screen share pods to provide direct instruction to the whole class. When we needed to communicate privately, we used the drop-down box in the chat area to select a specific participant. Each TP created a learning tool using Photopeach and Glogster and added the URL to the chat box so the whole class could view what they had created. At the end of the class, the TPs posted comments about the class

in the chat box. I also shared the results of the poll, where the TPs voted on the technology that they wanted to explore the final night of class.

*Module 5.*

*Step 1: Engagement.*

I welcomed the TPs and completed an audio check. I used camera, audio, and the chat box to communicate with the TPs. I told the TPs that, based on the results of the poll from the previous class, they would be exploring xtranormal. Then, they would end the class by sharing the tools they created. I facilitated a discussion about the previous technologies the TPs had explored, and how they were thinking of using them with their classes. The TPs typed their questions and comments in the chat box.

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I used File Share pod to share the tutorial for xtranormal with the TPs. In addition, I posted a link to xtranormal using the Weblinks pod, and by posting it in the chat box. The TPs used the link to navigate to the Website. I used screen share to broadcast the Website to the TPs. The TPs created an account on Voicethread. I used Screen Share to broadcast a video I had created for the class using xtranormal. After sharing, I guided the TPs through the creation of a learning tool.

*Step 3: Explanation and elaboration.*

*How will participants use, or practice using, the new knowledge or skills?*

Following the guided exploration of each xtranormal, the TPs created their own learning tool. When they had questions, they raised their hand and typed the question in the chat box. I responded using audio or typing in the chat box. For example, one of the TPs

typed the following question in the chat box: “Where do I choose the kind of voice?” I assisted the TP by using audio, “You click on the characters, who the actors are going to be, and then you scroll down under all the little thumbnails of character options. There is a voice option. And there is a little drop-down arrow next to that and you can choose a voice that’s there.”

After completing the creation of a story in xtranormal, the TPs embedded it in their wikis. Then, the TPs shared their thoughts on xtranormal and posted a link to the tool they created in the chat box:

AC9: that was funny  
 AC1: mine looks blurry  
 AC14: This is really cool, I was just thinking that we're starting fairy tales soon and this would be a cool thing to use with the kids, having them write the script.  
 AC2: good idea AC14 :o)  
 AC13: or an alternate ending to a book  
 AC1: I'll finally be able to clone myself

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I asked the TPs if they had any questions or comments about xtranormal. Then, each TP presented a learning tool he/she created and reflected on learning using Adobe Connect Pro. The TPs presented by posting a URL to the tool they wanted to share in the chat box. I gave the presenting TP rights to the microphone. The TPs presented using audio and the chat box. Fellow classmates asked questions by typing in the chat box. At the end of class, I added a Poll pod with the following question: What was your favorite technology that we experimented with? Of the 17 TPs, 14 responded as follows: 43% (6 TPs) chose Photopeach, 29% (4 TPs) chose Jog-the-Web, 14% (2 TPs) chose Voicethread, 7% (1 TP) chose Glogster,

and 7% (1 TP) chose PBWorks (the class wiki). The TPs and I added final comments about the class using audio and by typing in the chat box

**Coded data for Adobe Connect Module 5.** The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interactions. The results of Module 5 of the second case can be found below in Table 22.

Table 22

*Summary of Tools used to Support Learning Activities in Adobe Connect Module 5*

Adobe Connect - Module 5			
Interaction	Interaction Code*	Tool	Description
COM	T>C	Audio IM	I greeted the TPs as they entered class and did an audio check. I also used the IM to message what was being said on the audio.
	S>T	IM	The TPs asked questions throughout class by typing in the IM chat box.
	S>S	IM	The TPs interacted with each other throughout class.
	S>C	IM	The TPs shared links to the tools they created by posting the link in the chat box.
	T>C	File share	I uploaded files for the class and posted the files in a file share pod.
	T>C	Screen share	I shared my computer screen with the class and completed a step-by-step demonstration of how to create using the Web 2.0 tools.
	T>C	Whiteboard	I added a PowerPoint presentation to a whiteboard and showed it to the class.
	T>C	Poll	I polled the TPs to determine what technology they wanted to investigate during the final class.
	T>S	Private Chat	I used private chat to address TPs individually, so the other TPs could not see the communication.
	S>T	Private Chat	The TPs used private chat to communicate with the teacher when they did not want the whole class to see.
COL	IS>S	IM	TPs collaborated informally by asking and answering questions in the chat box.
REF	S>C	Whiteboard	TPs presented their final project by posting the url for the Website on the whiteboard.

S>C	Audio	TPs used audio for their final presentation/reflection.
S>C	IM	TPs used the chat box to type their reflections about their presentations and the class.

\*\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

Overall, the TPs and I used IM to communicate. In addition, I used the camera and voice, along with the digital whiteboard, file share and screen share pods to provide direct instruction to the whole class. When we needed to communicate privately, we used the drop-down box in the chat area to select a specific participant. Each TP created a learning tool using xtranormal and added the URL to the chat box so the whole class could view what they had created. Each TP used the audio and/or chat box option(s) to present and reflect to the class about their learning experience. At the end of the class, I polled the TPs about their favorite technology using a Poll pod. The TPs posted comments about the class in the chat box.

**Evaluation of media.** Media and methods were evaluated during each phase of the lesson. I conducted an informal debriefing session with TPs at the end of each module and asked them the following questions: Do you have any comments about meeting in Adobe Connect? Is there anything you would suggest changing?

At the end of the first module, the TPs expressed that they were frustrated with the connection and use of audio. During the second module, the TPs advised me, and some of the other participants that they did not have access to several of the wikis:

AC1: Think I may have added my wiki  
 AC9: access denied  
 AC12: said access denied  
 AC13: access denied  
 AC12: can't add wiki  
 AC11: Mine says access denied too  
 AC1: how to allow people to view the wiki



AC17: Thank you, Andrea. Great class!  
 AC1: thanks

The necessary adjustments were made to the wikis so everyone had access. In terms of using Adobe Connect, the TPs indicated that they were pleased with the class:

AC7: great class  
 AC15: thank you very much for your time!  
 AC9: Thank you Andrea, good night  
 AC13: thanks  
 AC8: thank you everybody  
 AC4: great class thank you! Talk to you Tuesday.  
 AC5: the class was awesome... thank you!  
 AC10: night.....  
 AC11: thanks & good night  
 AC16: Thanks.  
 AC12: thanks u too, gonna try jogging again  
 AC2: Thanks great class!

**Evaluation of overall instruction.** The TPs evaluated the overall class by reporting participant satisfaction with the course in terms of organization, content, usefulness, and overall presentation (see Appendix D for the full evaluation). Eight TPs completed the evaluation. Given the choices of fair, good, and excellent, all eight TPs rated the organization, content, usefulness and presentation of the course excellent.

In Question 8, the TPs were asked, “What did you like most about this session?” Some of the responses were: “I enjoyed the ability to share ideas with others during the Webinar.” “First of all I liked the fact that I was taught completely on-line. Also, the instructor did not just give an overview of the material and the need to involve 21<sup>st</sup> Century technology in learning, but created assignments for us where we had to use the technology to create our own presentations, blogs, etc.”

In Question 9, TPs were asked, “What practical/professional application does this session provide?” Some of the responses were: “I continue to get ideas and new things to do

with my resource students.” “This session provided many educational tools that I can modify and use in my classroom.”

Question 10 asked the TPs, “How could this program be strengthened or improved?” Some of the responses were: “I would like to have a chunk of time added onto the workshop where we can work in a lab with supports.” “Less people in the class.” “I would love to see a follow-up session.”

In Question 11, TPs were asked, “How will you use this information to strengthen your own districts’ practices?” Some of the responses were: “The information will strengthen my district’s practices when I share with my colleagues and use the new technology to enhance my student’s interests in various topics.” “I was immediately able to incorporate the projects I created for this class into my classroom.”

In Question 12, TPs were asked to indicate the degree to which they thought student performance could be improved using the information. Five of the TPs indicated that they thought the information would have an important influence, three indicated a reasonable influence, and none of the participants chose slight or no influence.

#### **Pedagogy of the environment.**

Table 23

*Use of Pedagogical Framework to Evaluate Case #2*

Features	Adobe Connect
What tools are available for teachers to present their ideas to students?	I used the camera and voice, along with the chat box, whiteboard, Weblinks, file share and screen share pods to provide direct instruction to the whole class. When I needed to communicate privately with a TP, I used the drop down box in the chat area to select a specific participant.
What tools are available to students to articulate ideas to the teacher and other students?	The TPs used IM, audio, and the white board to articulate their ideas to the other participants.
Can teachers and learners change their presentations	The TPs and I were able to change our presentations at any time during the course.

during the class?

Can a module be structured sequentially and/or hierarchically over time?	In each module, I structured the learning sequentially by using guided instruction. Each module began with an activity or discussion to engage the TPs in learning. I modeled what the class was going to do during the session. This was followed by TP exploration of the concepts/technologies. As the TPs gained an understanding they created learning tools for use in their classrooms. Each class ended with an evaluation of the content that was presented and learned during the session, and of the learning environment.
What facilities are there to organize learners in a variety of ways?	I organized collaborative activities for the whole class. I did not organize learners in small group and pairs. However, there is an option in Adobe Connect Pro to create pre-assigned groups, or to randomly group participants.
What underlying pedagogical models does the system encourage?	I used a socioconstructivist teaching model to guide student learning. By using guided inquiry, the TPs were able to engage in hands-on learning, communicate and collaborate with each other, and interact with the environment to reconstruct their knowledge.
How are the “rules of the module” made evident to the student?	This option is not a feature of the software. I established the objectives for each class by posting guiding questions during the engagement phase.
What facilities are there to monitor how well learning is progressing on the module?	I reviewed the transcript from each session to make the necessary adjustments to the learning environment and the content. I also monitored individual student progress by observing how they utilized the technologies and progressed with creating learning tools.
Can the students find and manage resources? Do they have their own file stores or repositories?	TPs did not have their own files stores or repositories; they shared links to resources by posting the URL in the chat box.
Can the students talk to other students, create their own discussions, creating their own learning activities?	The TPs communicated with each other through IM and private chat. This resulted in new discussions between the TPs and lead to student exploration of the content.
Can the students locate people with similar interests outside of their own module, course, year or institution?	The TPs could only interact with the other participants in the class.
Can the teacher adapt the module structure once teaching is underway, i.e. change resources, fragments of the module, people/groups, or learning activities?	Adobe Connect Pro does not rely on a modular structure. The teacher was able to adapt the course to meet the needs of the students.

**Case Study #3: Moodle**

**Description of the course.** *Publishing 2020: Publishing in the 21st Century has moved from a print medium to a virtual or electronic one. Subsequently, online learning is quickly growing as an option and opportunity for students in the K-12 environment. This course will introduce teachers to the tools available for the online environment, especially sites for Web 2.0 and publishing media such as video, audio, images, and text. Teachers will have hands-on activities to learn these tools and learn the pedagogy that works best with online environments. Whether teachers want to create a blended face-to-face class or a fully online course, they will gain the fundamental knowledge needed to publish and showcase student work in a virtual environment allowing individuals to communicate and collaborate.*

**General characteristics of participants.** Seven K-12 teacher participants (TPs) enrolled in the course. Three were elementary school teachers, two were middle school teachers, one was a high school Special Education teacher, and one participant was a graduate student in a library studies program. The TPs from the elementary schools included a librarian, a reading specialist, and a 3<sup>rd</sup> grade classroom teacher. The TPs from the middle schools included a math teacher and a librarian. The TPs came from diverse school districts in terms of socioeconomic and cultural environments. In addition, the TPs' technology skills varied from very basic (i.e., used e-mail) to advanced skills (i.e., used Web 2.0 technologies to create interactive Web pages).

The TPs were expected to have the following prerequisite skills:

- Compose and send e-mail;
- Actively participate and collaborate in a professional learning community;
- Navigate independent activities;

- Be interested in using Web 2.0 technologies with their students;
- Use the Internet to find information.

**Objectives of the course.*****Broad goals.***

1. TPs will be active members of a professional development community.
2. TPs will use the information they learn to engage students through the integration of technology in their classrooms.
3. TPs will become leaders in the use and pedagogy of emerging technologies in education.

***Skills and content.***

The following skills and content were addressed:

- Create a digital portfolio of emerging technologies for publishing.
- Understand the technologies that are shaping publishing and the processes related to using them.
- Understand the pedagogy of engaging students in learning with technology.

TPs engaged in a hands-on experiential setting as a learner. I guided the TPs through the process of learning in an asynchronous environment. Discussion centered on the use of diverse technologies to support student research and publish student work. The desired outcome was that TPs would create a portfolio of published work related to their content area.

***Learner objectives.***

1. TPs will learn how to utilize Web-based technologies to conduct research, organize resources, collaborate online, create presentations, and publish and manage digital content.
2. TPs will use Moodle to meet and interact with other professional K-12 educators.
3. TPs will create a digital portfolio to showcase the digital media they create during class.

**Methodology.** The teaching method that was used to facilitate learning was guided inquiry and entailed five steps, which included engagement, exploration, explanation/invention, elaboration/discovery, and evaluation/assessment (Bybee, 1997). I presented guiding questions at the start of each class:

- How can Web-based technologies be used to support publishing?
- What types of tools are available?
- How can students benefit from interacting and creating with the tools?

Guided inquiry was used, because the methodology enabled TPs to participate in the learning process through hands-on exploration and application of the technology.

**Materials and resources.** In order to participate in the class, TPs needed a computer with Internet access, an e-mail address, and Adobe Reader.

***Procedure.******Module 1.******Step 1: Engagement.***

I used the summary option at the beginning of the module to add a title to the module and an explanation of the content and activities for the week.

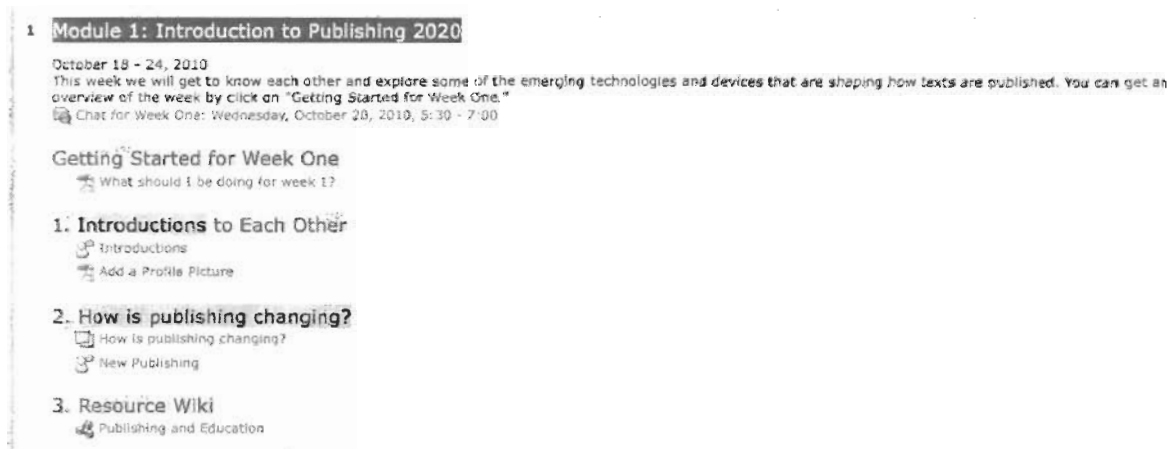


Figure 8. Screen shot of introduction of Module 1 in Moodle.

In Module 1, I wrote that the TPs would get to know each other and explore some emerging technologies in publishing. I included a checklist of all of the activities and assignments for the module in a PDF format that the TPs could download. The initial assignment for module one was to upload a picture to their profile and to introduce themselves in the forum, “Introductions.” I added a tutorial with step-by-step directions on how to add a picture to the profile. I created a Webpage with content (text and video) on how publishing is changing.

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I added several activities for TPs to complete on the Web page. For example, after watching a video on Google Fast Flip, the TPs were instructed to go to Fast Flip and try it.

*Step 3: Explanation and elaboration.*

*How will participants use, or practice using, the new knowledge or skills?*

After interacting with the Web page, the TPs added their thoughts to a forum, “New Publishing,” by responding to the question, “How do you think the emerging technologies showcased in the videos will impact instruction in the K-12 classroom?” Figure 8 illustrates the threaded discussion and how TPs responded to the guiding question and to each other’s comments.

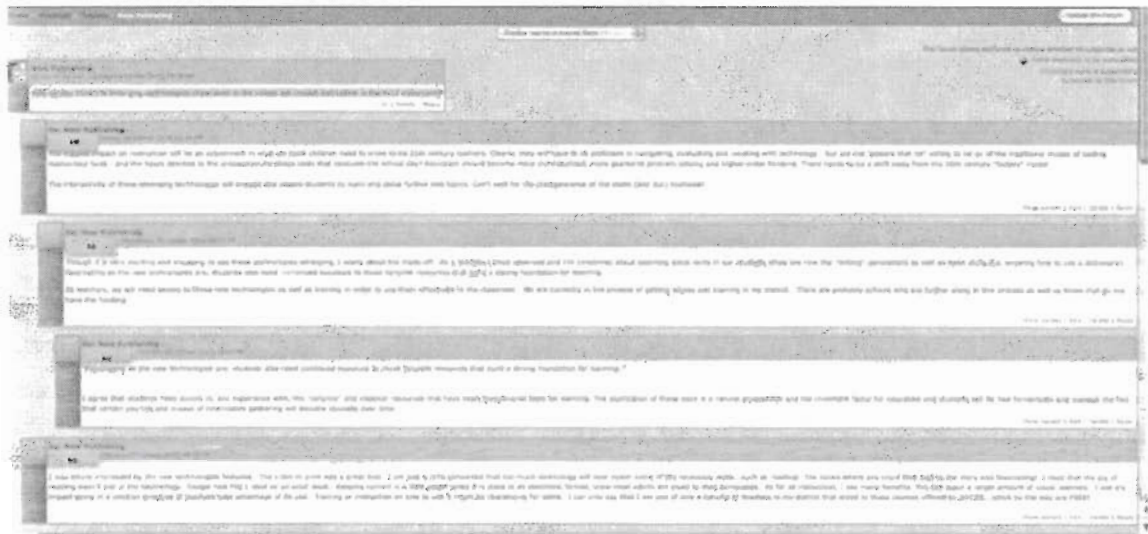


Figure 9. Screen shot of threaded discussion using a forum for Module 1 in Moodle.

I created a wiki, “Publishing and Education.” The TPs added a link and an annotated description of a Website related the use of emerging technologies for publishing for K-12 education to the wiki.

*Step 4: Evaluation.*



*How will the instructor review, reinforce, and wrap up the lesson?*

I used the messaging option to contact TPs individually regarding their learning and the use of Moodle for the first module. I asked the TPs if they had any questions about the use of Moodle or the requirements of the course.

**Coded data for Moodle Module 1.** I coded the data from the transcripts of the class session and the digital artifacts that the participants created during the session. The following codes were used to identify when the participants engaged in communication, collaboration, and reflection. Table 11, which includes the summary of the codes for all cases under study, is replicated below.

Table 11  
*Summary of Codes*

Interaction	Code*	Definition
Communication (COM)	T>C	Teacher communicated to whole class
	T>S	Teacher communicated to individual students.
	S>T	Students communicated to teacher.
	S>C	Students communicated to whole class.
	S>S	Students communicated to each other individually.
Collaboration (COL)	P	The students worked in pairs.
	SG	The students worked in small groups (3 – 6) participants.
	WC	The whole class worked together.
	IS>S	Informal collaboration between students.
Reflection (REF)	S>T	Only the teacher saw the student's reflection.
	S>C	The student's shared their reflection with the whole class.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interactions. The results of Module 1 of the third case can be found below in Table 24.

Table 24

*Summary of Tools Used to Support Learning Activities in Moodle Module 1*

Moodle - Module 1			
Interaction	Interaction Code*	Tool	Description
COM	T>C	Module Summary	I posted an announcement to introduce the topic of the module.
	T>C	Forum	I posted a guiding question for class discussion using a forum.
	S>S	Forum	The TPs posted a response to the guiding question that I posted in the forum, and then responded to each other's posts.
	T>S	Forum	I responded to TPs' posts and ongoing discussion.
	T>C	Resources	I posted a file for TPs. The file was a document with directions on how to add a picture to the profile.
	T>C	Webpage	I created a Webpage with content.
	T>S	Messaging	I contacted the TPs individually to ask them if they had any questions about the content of the course or the use of Moodle.
	T>S	Chat	I hosted a synchronous chat so students could stop by and ask questions.
COL	SG/WC	Wiki	TPs created a wiki with resources on presentation tools. Each TP added a link to the resource and wrote an annotated bibliography.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

I used several different tools to communicate the content of the module to the TPs. To provide the TPs with direction for the module, I added a summary and a resource, which was a checklist of the activities and assignments. I created a Web page with specific content for the module. I used a forum to pose guiding questions that the TPs used as the basis for a discussion. The TPs and I participated in the forum. The TPs collaborated during the module by creating a wiki with resources to support the area of study. When the TPs or I needed to communicate privately, we used the messaging option. In addition, I hosted a synchronous chat. During Module 1, one TP logged in to the chat (see Figure 10).



Figure 10. Screen shot of chat for Module 1 in Moodle.

## *Module 2.*

### *Step 1: Engagement.*

I added a summary introducing the module to the TPs. I included a checklist of all of the activities and assignments for the module in a PDF format that the TPs could download. To engage the students, I embedded a video into the module by using a label, and added a link to article, “Is Google Making Us Stupid?” The TPs exchanged ideas in the forum, “Thoughts on the Google Article.”

### *Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I created a Web page that contained information on how to conduct a search using several tools on Google: Touchgraph, Google Wonder Wheel and Google Squared. I asked the TPs to view the Web page and to use the various search tools in Google.

*Step 3: Explanation and elaboration.*

*How will participants use, or practice using, the new knowledge or skills?*

I added a Web page with information on visual search tools and links to 20 different visual search engines. The TPs were instructed to use at least eight of the visual search engines. After using the search engines, the TPs added their comments about the ease of use and search results to a “Glossary for Visual Search Engines.” I provided the TPs with a downloadable tutorial on how to add a comment to a glossary entry. In addition to the glossary, the whole class collaborated to build a resource wiki by adding links to and descriptions for other interesting search engines.

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I used the messaging option to contact TPs individually regarding their learning and the use of Moodle for the first module. I asked the TPs if they had any questions about the use of Moodle or the requirements of the course.

**Coded data for Moodle Module 2.** The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interactions. The results of Module 2 of the third case can be found below in Table 25.

Table 25

*Summary of Tools used to Support Learning Activities in Moodle Module 2*

Moodle - Module 2			
Interaction	Interaction Code*	Tool	Description
COM	T>C	Announcements	I posted an announcement to introduce the topic of the module.
	T>S	Chat	I hosted office hours by create a chat and invited TPs to stop by to connect synchronously.
	T>C	Resources	I posted several resources as links to articles on the Web or uploaded documents.
	T>C	Label	I posted content for the class by embedding a video in a label.
	T>C	Forum	I posted a guiding question for class discussion using a forum.
	S>S	Forum	The TPs posted a response to the guiding question that I posted in the forum, and then responded to each other's posts.
	T>S	Forum	I responded to TPs' posts and ongoing discussion.
	T>C	Webpage	I created two Web pages with content.
	T>S	Messaging	I contacted the TPs individually to ask them if they had any questions about the content of the course or the use of Moodle.
	T>S	Chat	I hosted a synchronous chat so students could stop by and ask questions.
COL	SG/WC	Glossary	The TPs added the name and url of visual search tools to the glossary. Then, they commented on the visual search engines that other TPs had added to the glossary.
	SG/WC	Wiki	TPs created a wiki with resources on presentation tools. Each TP added a link to the resource and wrote an annotated bibliography.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

I used several different tools to communicate the content of the module to the TPs.

To provide the TPs with direction for the module, I added a summary and a resource, which was a checklist of the activities and assignments. I created a Web page with specific content for the module. I used a forum to pose guiding questions, which the TPs used as the basis for

a discussion. The TPs and I participated in the forum. The TPs collaborated during the module by creating a glossary of virtual search engines and a class wiki with resources to support the area of study. When the TPs or I needed to communicate privately, we used the messaging option. In addition, I hosted a synchronous chat. During Module 2, none of the students logged in to the chat.

*Module 3.*

*Step 1: Engagement.*

I added a summary communicating the topic of the module to the TPs: Tools for Planning & Organization. I included a checklist of all of the activities and assignments for the module in a PDF format that the TPs could download. I organized the content into three subtopics: organizing resources, collaborative tools to create an outline, and collaborative tools for mind mapping. To engage the TPs, I used the summary to provide background information and a link to additional information.

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

In the first subtopic, I listed eight social book-marking tools. The TPs explored two of the tools and then participated in the forum, Thoughts on Social Bookmarks. The TPs discussed the following questions: Do you use social bookmarks with your students? If you do, which one(s)? How do you use the site? What social bookmark tool did you explore? What did you think?

For Subtopics 2 and 3, I listed five web-based outline tools and five online mind-mapping tools. The TPs explored two of the tools on each list.

*Step 3: Explanation and elaboration.*

*How will participants use or practice using the new knowledge or skills?*

After exploring the sites for social bookmarks, the TPs participated in the forum, Thoughts on Social Bookmarks. The TPs discussed the following questions: Do you use social bookmarks with your students? If you do, which one(s)? How do you use the site? What social bookmark tool did you explore? What did you think?

In Subtopics 2 and 3, the TPs created accounts and collaborated to create an outline using Knowcase and a mind map using Mindmeister.

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I posted a journal, and asked the TPs to reflect on their learning: Reflect on the tools you explored for organizing resources, outlining, and mind-mapping. Are these tools you are already using with your students? If you are, how are you using them? What is the students' response? If you are not using these tools, are you interested in trying to use them? Are there barriers to using these tools with your students? What are they?

In the TPs' reflections, they noted that they were experimenting with some of these tools in their classroom and/or libraries, especially the social bookmarks. However, many of the tools were blocked at their schools due to district-wide filtering.

**Coded data for Moodle Module 3.** The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interaction. The results of Module 3 of the third case can be found below in Table 26.

Table 26

*Summary of Tools used to Support Learning Activities in Moodle Module 3*

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Moodle - Module 3

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Interaction	Interaction	Tool	Description
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		Code*	
COM	T>C	Module Summary	I posted an announcement to introduce the topic of the module.
	T>S	Chat	I hosted office hours by creating a chat and invited students to stop by to connect synchronously.
	T>C	Resources	I posted several resources as links to Websites or uploaded documents.
	T>C	Label	I posted content for the class by embedding a video in a label.
	T>C	Forum	I created one forum and posted a guiding question for class discussion using a forum.
	S>S	Forum	The TPs posted a response to the guiding question that I posted in the forum and then responded to each other's posts.
	T>S	Forum	I responded to TPs' posts and ongoing discussion.
COM	T>S	Journal	I added a journal for TPs to use to reflect on their learning experience. I provided the TPs with private feedback by responding to the TPs' individual entries.
COL	SG/WC**	Resource	I added links to Websites where TPs collaborated to create an outline and a mind map.
REF	S>T	Journal	The TPs reflected privately on their learning experiences during the module. The journal was private and could not be viewed by other members of the class.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

\*\* I posted the links to the collaborative activities as resources in the module. The actual activities took place in micro-worlds outside of the Moodle environment.

I used several different tools to communicate the content of the module to the TPs. To provide the TPs with direction for the module, I added a summary and a resource, which was a checklist of the activities and assignments. Rather than use a Web page for content, I subdivided the module into three subtopics, and added a summary and resources to each subtopic. I used a forum in one of the subtopics to pose guiding questions, which the TPs used as the basis for a discussion. The TPs and I participated in the forum. The TPs collaborated during the module by using one of the resources in Subtopics 2 and 3. I hosted



a synchronous chat. During Module 3, none of the TPs logged into the chat. The TPs reflected on their learning in a journal.

*Module 4.*

*Step 1: Engagement.*

To engage TPs in Module 4, I added a summary about the topic: Creating Presentations. I also included a checklist of all of the activities and assignments for the module in a PDF format that the TPs could download.

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I created two Web pages that contained information on story tools and presentation tools for TPs to explore. In addition, the TPs collaborated to create a resource wiki by adding links and summaries of additional presentation tools.

*Step 3: Explanation and elaboration.*

*How will participants use or practice using the new knowledge or skills?*

I directed the TPs to create two presentations, using the story and presentation tools for content they would be teaching in the future. The TPs shared links to the presentations they created in the forum, "Sharing Your Presentations," and also shared how they planned to use the tools with their students.

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I posted a journal and asked the TPs to reflect on their learning: Reflect on the tools you explored for organizing and creating presentations this week. Are these tools you are already using with your students? If you are, how are you using them? What is the overall

student response? If you are not using these tools, are you interested in trying to use them?

Are there barriers to using these tools with your students? What are they?

The following is an excerpt from a journal reflection:

M5: I really enjoyed this week's module. I love using new tools with my students. It always keeps things fresh for all of us. I have used voki.com, zimmertwins.com, bannermaker.com and toondoo.com with my students before and almost all of them love it. Our school's network is very sensitive and it blocks a majority of these tools which often feels very frustrating when preparing lessons, so that is one barrier that I experience and the other is that our students do not have access to email accounts, nor is there a generic account set up for students to sign up for any of these programs. I have to either create a class account if the program will allow more than one person to be logged on at a time, or the students need to finish their work in one class period, so I can embed it into our Moodle before the end of the period. But, overall, it is worth the trouble because the students really enjoy it.

**Coded data for Moodle Module 4.** The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interaction. The results of Module 4 of the third case can be found below in Table 27.

Table 27

*Summary of Tools used to Support Learning Activities in Moodle Module 4*

Moodle - Module 4			
Interaction	Interaction Code*	Tool	Description
COM	T>C	Module Summary	I posted an announcement to introduce the topic of the module.
	T>S	Chat	I hosted office hours by creating a chat and invited TPs to stop by to connect synchronously.
	T>C	Resources	I posted a document with directions on how to add a discussion and embed presentations in the forum.
	T>C	Webpage	I created two Web pages with content.
	T>C	Forum	I created a forum where the TPs shared the presentations they created using the Web-based presentation tools.
	S>C	Forum	The TPs created their own discussion thread in the forum and embedded the presentations they created using the Web-based presentation tools.

	T>S	Journal	I added a journal for TPs to use to reflect on their learning experience. I provided the TPs with private feedback by responding to the TPs' individual entries.
COL	SG/WC	Wiki	TPs created a wiki with resources on presentation tools. Each student added a link to the resource and wrote an annotated bibliography.
REF	S>C	Forum	The TPs reflected on the processes they used to create their sites and how they would use the tools they created with their students.
	S>T	Journal	The TPs reflected privately on their learning experiences during the module. The journal was private and could not be viewed by other members of the class.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

I used several different tools to communicate the content of the module to the TPs. To provide the TPs with direction for the module, I added a summary and a resource, which was a checklist of the activities and assignments. I created two Web pages with specific content for the module. I used a forum to pose guiding questions that the TPs used as the basis for a discussion. The TPs and I participated in the forum. The TPs collaborated during the module by creating a wiki with resources to support the area of study. The teacher hosted a synchronous chat. During Module 4, none of the TPs logged into the chat. The TPs reflected on their learning publicly to the whole class by posting in the forum and privately to the instructor using a journal.

#### *Module 5.*

##### *Step 1: Engagement.*

To engage TPs in Module 4, I added a summary about the topic: Publishing. I also included a checklist of all of the activities and assignments for the module in a PDF format

that the TPs could download. The module was divided into two areas: publishing and tools to manage digital content.

*Step 2: Exploration.*

*What will learners actually do to work with the new material presented in this lesson?*

I created two Web pages that contained information on publishing options and managing digital content for TPs to explore.

*Step 3: Explanation and elaboration.*

*How will participants use or practice using the new knowledge or skills?*

The teacher added two forums. In the first forum, the TPs discussed the following questions: How do you manage your digital content? Do you have a teacher Web page, or blog or wiki? How do you use it? Do you post student-created content or do you use it as a communication tool? Please share your ideas on how you manage digital content in your classrooms.

In the second forum, the TPs shared links to a Web page, blog, or wiki they created to manage the digital content they created during class.

*Step 4: Evaluation.*

*How will the instructor review, reinforce, and wrap up the lesson?*

I posted a journal and asked the TPs to complete a final reflection on their learning: Reflect on how you manage and publish content using the digital tools that we have explored over the past few weeks. What are the challenges with managing digital content? I posted feedback for the TPs.

**Coded data for Moodle Module 5.** The interactions were coded based on the activities the TPs engaged in during class and the tools that were used to facilitate the interactions. The results of Module 5 of the third case can be found below in Table 28.

Table 28

*Summary of Tools used to Support Learning Activities in Moodle Module 5*

Moodle - Module 5			
Interaction	Interaction Code*	Tool	Description
COM	T>C	Announcements	I posted an announcement to introduce the topic of the module.
	T>S	Chat	I hosted office hours by creating a chat and invited TPs to stop by to connect synchronously.
	T>C	Resources	I posted several resources as links to uploaded documents.
	T>C	Forum	I created a forum for a class discussion and posted a guiding question.
	S>S	Forum	The TPs posted responses to the guiding question that I posted in the forum, and then responded to each other's posts.
	T>S	Forum	The teacher responded to TPs' posts and ongoing discussion.
	T>C	Webpage	I created two Web pages with content.
	T>C	Forum	I created a forum where the TPs shared the links to the sites they created.
	S>C	Forum	The TPs created their own site to manage the digital content that they created. The TPs added a discussion thread to the forum and posted a link to their site.
	T>S	Journal	I added a journal for TPs to use to reflect on their learning experience. I provided the TPs with private feedback by responding to the TPs' individual entries.
REF	S>T	Journal	The TPs reflected privately on their learning experiences during the module. The journal was private and could not be viewed by other members of the class.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

I used several different tools to communicate the content of the module to the TPs. To provide the TPs with direction for the module, I added a summary and a resource, which was a checklist of the activities and assignments. I created two Web pages with specific content for the module. I used a forum to pose guiding questions, which the TPs used as the basis for a discussion. The TPs and I participated in the forum. The teacher hosted a synchronous chat. During Module 5, none of the TPs logged into the chat. The TPs completed a final reflection on their learning privately to the instructor using a journal, and the teacher posted feedback.

**Evaluation of media.** Media and methods were evaluated during each phase of the lesson. I conducted an informal debriefing session with participants at the end of each module, and asked the participants the following questions: Do you have any comments about meeting in Moodle? Is there anything you would suggest changing?

None of the TPs expressed any concerns about using Moodle.

**Evaluation of overall instruction.** The TPs evaluated the overall class by reporting participant satisfaction with the course in terms of organization, content, usefulness, and overall presentation (see Appendix E for the full evaluation). Four participants completed the evaluation. Given the choices of fair, good, and excellent, all four participants rated the organization, content, usefulness and presentation of the course excellent.

In Question 8, the participants were asked, “What did you like most about this session?” Some of the responses were: “I liked that there was a great deal of information, but had the ability to view it when time was available.” I never felt rushed and information was easily accessed.” “The depth and range of subjects and material covered.”

In Question 9, participants were asked, “What practical/professional application does this session provide?” Some of the responses were: “I enjoyed using the presentation tools.” “It was exciting to use different sites to present instead of only PowerPoint.”

In Question 10, the participants were asked, “How could this program be strengthened or improved?” Some of the responses were: “I don’t believe this workshop needed to be improved in anyway.” “The workload was just enough.” “It would be useful to meet in person once or twice during the course.”

In Question 11, participants were asked, “How will you use this information to strengthen your own districts’ practices?” Some of the responses were: “I will integrate what I learned into my day-to-day instruction and will also offer to instruct teachers in how to use some of the tools.”

In Question 12, participants were asked to indicate the degree to which they thought student performance could be improved using the information. Three of the participants indicated that they thought the information would have an important influence, one indicated a reasonable influence, and none of the participants chose slight or no influence.

In addition to the survey, the TPs included the following comments in their final reflections about the course.

- M2: I thoroughly enjoyed the course, at times overwhelming but overall, I do have a Better understanding of the amazing technology available and less fearful of delving into this world.
- M4: I have thoroughly enjoyed this course, Andrea! I learned a lot and have plenty to try out in the weeks to come. Thank you for all the great resources.
- M3: I found the past month to be very enjoyable and full of information. The amount of work was refreshing...usually the content and workload is so demanding. It would take more than 20+ hours to complete the 15 hours stated in My Learning Plan. This was perfect...I was able to go back an hour here...two hours there...and play around with the many sites. I loved trying out all the links you posted.

**Pedagogy of the environment.**

Table 29

*Use of Pedagogical Framework to Evaluate Case #3*

Features	Moodle
What tools are available for teachers to present their ideas to students?	I utilized the following tools to present ideas to the TPs: module summary, Web page, resources, labels, and the synchronous chat.
What tools are available to students to articulate ideas to the teacher and other students?	The TPs used forums to articulate their ideas to the class.
Can teachers and learners change their presentations during the class?	I could change the presentations and all learning materials at any time during the course. Learners have 30 minutes to change their posts in a forum; and they may or may not have the option to change presentations or files, this would depend upon how I configured the assignment. In this case I did not use the assignment option, and TPs did not have to upload files.
Can a module be structured sequentially and/or hierarchically over time?	I structured the modules sequentially by using guided instruction. Each module began with an activity to engage the TPs in learning. I provided resources for the students to explore. As the students gained an understanding of the concepts, they began to build an explanation and elaborate how they would use the concepts in their classrooms. Each class ended with an evaluation of the content that was presented and learned during the session, and of the learning environment.
What facilities are there to organize learners in a variety of ways?	Due to the size of the class (seven participants), I did not organize students into small groups. In this case, the whole class participated in collaborative activities using forums, wikis, and glossaries.
What underlying pedagogical models does the system encourage?	I used a socioconstructivist teaching model to guide the learning. By using guided inquiry, the TPs were able to engage in hands-on learning, communicate and collaborate with each other, and reflect on their learning.
How are the “rules of the module” made evident to the student?	This option is not a feature of the software. I established the objectives for each class by posting a summary of the topic during the engagement phase.
What facilities are there to monitor how well learning is progressing on the module?	I reviewed the forums and TP tasks from each session to make the necessary adjustments to the learning environment and the content. There are quiz and grade book options available in Moodle that I did not use for the course.
Can the students find and manage resources? Do they have their own file stores or repositories?	TPs did not have their own files stores or repositories. However, the TPs were able to find Web-based resources and share them in the forums, wikis, and glossary.



Can the students talk to other students, create their own discussions, creating their own learning activities?	The TPs communicated with each other through the forums. This resulted in new discussions between the TPs and lead to participant exploration of the content and environment. The TPs were able to create their own threads in the forums. If TPs wanted to communicate privately, they could use the messaging option.
Can the students locate people with similar interests outside of their own module, course, year or institution?	The configuration of Moodle did not allow the TPs to search for TPs outside of the class.
Can the teacher adapt the module structure once teaching is underway, i.e. change resources, fragments of the module, people/groups, or learning activities?	I was able to adapt the module structure at any time during the course to meet the needs of the TPs. Due to the low enrollment of the class, I did not use small groups for collaborative activities. In general, the class as a whole participated collaboratively.

### Summary

The research findings related to the use of virtual learning environments to facilitate professional learning opportunities for K-12 educators revealed commonalities in the use of three diverse e-learning technologies to support communication, collaboration, and reflection. The tools in each technology enabled communication activities to be configured between the: (a) instructor and the whole class, (b) instructor and individual TPs, (c) TPs and instructor, (d) TPs and the whole class, (e) TPs and individual TPs. Table 30 summarizes the interactions and the tools used in the technologies to support communication. The primary tool I used for communication when using the synchronous technologies (AW and Adobe Connect) was audio chat. The TPs used IM. When using Moodle (an asynchronous technology), I used text-based tools like a module summary, labels and resources to communicate with students. The TPs primarily communicated in forums in Moodle. All three technologies had some tool the the TPs and I could use to communicate privately; in

Active Worlds participants used whisper or telegrams to communicate privately, and in

Adobe Connect participants used private chat, and in Moodle participants used messaging.

Table 30

*Comparison of Tools for Communication*

Code for Interaction*	Definition	Tools		
		Active Worlds	Adobe Connect	Moodle
T>C	Teacher communicated to whole class	Signs/building, file share, IM, voice chat	Screen share, white board, pointer, file share, IM, video and camera, audio chat, poll, Weblinks	Module summary, labels, forum, resources, Web pages, chat
T>S	Teacher communicated to individual students.	IM, whisper, telegram, invite	Private chat	Messaging, journal
S>T	Students communicated to teacher.	IM, whisper, telegram, invite	IM, icons	Messaging
S>C	Students communicated to whole class.	Signs/building, IM	IM, audio chat	Forum
S>S	Students communicated to each other individually.	Whisper, telegram	IM, private chat	Messaging, forum

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

In addition to communication activities, the tools in the e-learning technologies were used to facilitate collaboration activities between pairs of participants, small groups, and the whole class. Table 31 summarizes the interactions and the tools used in the technologies to support collaboration. The three technologies under study had very different ways to organize participants for collaboration activities. AW does not have a tool to group participants, so the process used was very similar to the process used in a face-to-face class. I told the TPs whom they would be working with using audio or by posting the groups on a sign. To collaborate, the TPs used IM, whisper, telegrams, or invites. While there is a

grouping option in Adobe Connect, I did not use the option for small group collaboration.

Instead, I facilitated whole class collaborations by using the whiteboard and Weblinks. The

Weblinks option was used to connect TPs to collaborative activities outside of the Adobe

Connect environment.

Table 31

*Comparison of Tools for Collaboration*

Code for Interaction*	Definition	Tools		
		Active Worlds	Adobe Connect	Moodle
P	The students worked in pairs.	Whisper, telegram		
SG	The students worked in small groups (3 – 6) participants.	IM, whisper, telegram, invite		Wiki, glossary, resource**
WC	The whole class worked together.	IM	Whiteboard, Weblinks**	Wiki, glossary, resource**
IS>S	Informal collaboration between students.	IM	IM	

\*S refers to the teacher-participants (TPs) who were the students in the course.

\*\* I posted the links to the collaborative activities. The actual activities took place in micro-worlds outside of the virtual environment.

In addition to the activities summarized above, the tools in the e-learning technologies were used to facilitate participant reflection. Reflective activities were designed, so TPs could reflect privately to the instructor or publicly to the whole class. Table 32 summarizes the interactions and the tools used in the technologies to support reflection. In Active Worlds, TPs reflected privately using telegrams. There were no tools available to the instructor to create a private reflection activity for the students in Adobe Connect. In Moodle, the TPs used journals to reflect privately. All three technologies had IM or forums that could be used to facilitate participant reflection to the whole class.

Table 32

*Comparison of Tools for Reflection*

Code for Interaction	Definition	Tools		
		Active Worlds	Adobe Connect	Moodle

S>T	Only the teacher saw the student's reflection.	Telegram		Journal
S>C	The students shared their reflection with the whole class.	IM, audio chat, signs	IM, whiteboard, audio	Forum

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

All of the technologies had tools that could be used for communication, collaboration, and reflection. However, each virtual learning environment offered a customized experience for learners. By using the tools, I was able to create an adapted professional learning opportunity based on the needs of the students.

## **CHAPTER 5**

### **INTERPRETATIONS AND CONCLUSIONS**

#### **Overview**

In 1999, Britain and Liber first reported that first generation VLEs “lacked the flexibility to be adapted to the variety of different teaching and learning situations” (2004, p. 7). Today, we have a myriad of technologies that can be configured to create learning environments based on the needs of instructors and learners. The findings in this study provide a beginning for understanding how e-learning technologies can be used to construct virtual environments to engage K-12 educators in professional learning. “By creating online environments the teachers can and will use in productive ways, we can begin to make opportunities to participate in learning and professional communities available for all teachers” (Schneider, 2009, p. 105). The primary purpose of this case study was twofold: first, to utilize a pedagogical framework to evaluate three e-learning technologies; and second, to examine three cases and analyze how the tools could be leveraged to create professional learning opportunities for K-12 educators for communication, collaboration, and reflection.

#### **Summary of Findings**

##### **Pedagogical Framework of VLE**

The first research question of this study asked about the tools available in each of the three selected e-learning technologies that support a pedagogical framework as defined by Britain and Liber (2004). The Britain and Liber framework provided a means to evaluate the virtual learning environments by analyzing the tools that enabled resource negotiation, coordination, monitoring, reflection, self-organization, and adaptation (see Figure 2).

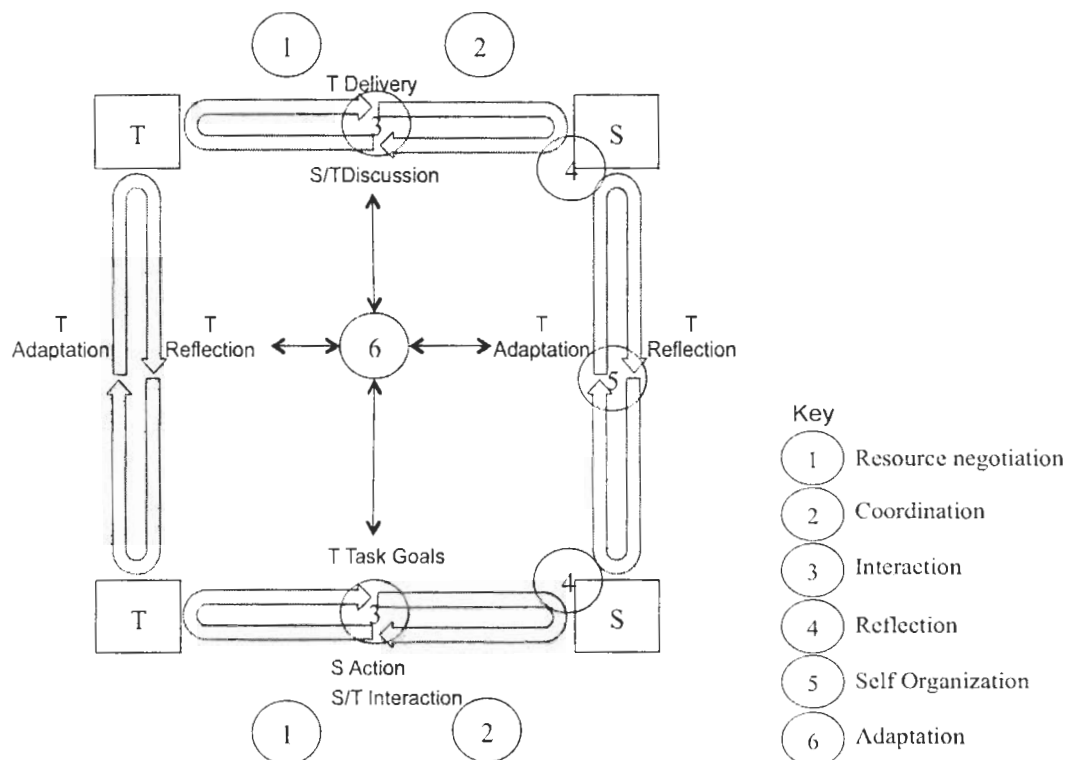


Figure 2. Diagram of the Britain & Liber framework: Integrating elements of VSM's organization framework and CF's learning process.

Table 33 displays a list of the tools available in each VLE to support the pedagogical framework. I found that each technology (or VLE) considered in this study had a unique set of tools that could support the preceding framework to encourage active learner participation and multidimensional interactions. Instant messaging, audio chat, private messaging, file sharing, digital whiteboards and journals are available to support the participants' needs at the various stages of the learning process.

Table 33

*The Tools Available in the VLE to Support Each Element of the Pedagogical Framework*

Element	Descriptor	Active Worlds	Adobe Connect	Moodle
1	Resource negotiation	Signs, building, file share, IM, audio chat	Screen share, whiteboard, file share, IM, video and camera, audio chat	Labels, resources, Web pages, lessons
2	Coordination	NA	NA	NA
3	Interaction	IM, file share, whisper, telegram, invite	IM, screen share, file share, groups	Forum, chat, journal, groups, wiki, glossary
4	Reflection	Telegram	NA	Journal, assignment
5	Self-organization	Informal groups	NA	NA
6	Adaptation	Fully adaptable	Fully adaptable	Fully adaptable

However, the application of the framework also exposed potential deficiencies in the VLE. For instance, none of the technologies have a specific tool for the coordination of participant access to the instructor, resources, or workflow (Element 2). The instructor must decide how to use the tools in the VLE to explain the coordination of the learning environment to the students. For Element 5, self-organization, the participants are able to form independent study groups within the AW environment; however, this is not possible in Adobe Connect or Moodle unless the instructor uses the tools to create learning spaces specifically for the students to meet. Lastly, Adobe Connect does not have a specific tool for participants to engage in private reflection. The instructor must utilize resources outside of the VLE to incorporate student reflection in the learning process.

To compensate for the deficiencies of the VLEs, other Web-based applications can be used to support participation in activities for professional learning; i.e., communication, coordination, and reflection. These tools can be incorporated in the VLE as hyperlinks. For instance, blogs and wikis can be used for discussions and reflections, or concept-mapping applications can be used to brainstorm, share ideas, and plan. Table 34 lists some of the Web-based tools currently available for asynchronous and/or synchronous communication.

Table 34  
*Web-based Tools for Communication*

Tool	Type of Communication	Web-based Examples
Audio/Video Chat	Synchronous	Skype Oovoo Dimdim YackPack
Blogs	Asynchronous	Blogger Wordpress
Discussion Forums	Asynchronous	Tangler Talki
Social Networks	Asynchronous or Synchronous	Facebook Linked-In
Micro-blog	Asynchronous or Synchronous	Twitter Plurk Tumblr
Presentation/Publishing	Asynchronous	Slideshare SlideBoom Glogster Scrapblog

Table 35 lists some of the Web-based tools that are currently available for asynchronous and/or synchronous collaboration.

Table 35  
*Web-based Tools for Collaboration*

Tool	Type of Communication	Web-based Examples
Wikis	Asynchronous	PBWorks Wikispace



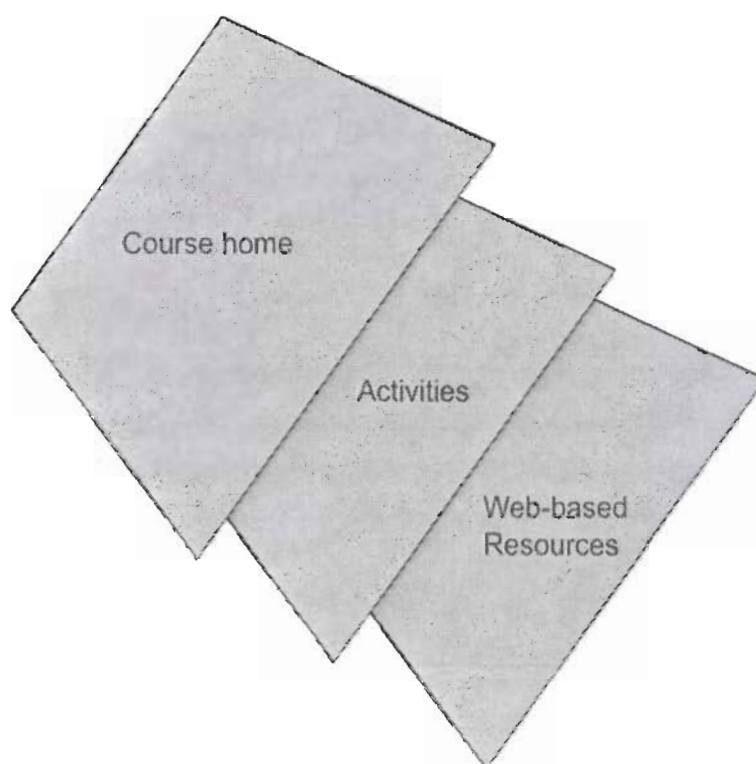
Organization/Planning	Asynchronous or Synchronous	Mindmeister Mindomo Mind42 WiseMapping Bubbl Knowcase Slatebox Squareleaf NotePub
Mixer	Asynchronous	VoiceThread Vuvox Collage
Document Sharing	Asynchronous	Zoho Docs Google Docs Crocdoc Docstoc 4shared
Real-time Editor	Synchronous	Zoho Docs Google Docs Entri Primary Pad Type With.me Sync.in
Project Management	Asynchronous or Synchronous	Enter the Group Edmodo OneHub

Table 36 lists some of the Web-based tools that are available for private and/or public reflection.

Table 36  
*Web-based Tools for Reflection*

Tool	Type of Communication	Web-based Examples
Blogs	Asynchronous	Blogger Wordpress
Journals	Asynchronous	Loggel Penzu LiveJournal
Audio	Asynchronous	Voki Vocaroo
Publishing	Asynchronous	Yudu Issuu Calameo Scribd Imageloop

By using the Web-based applications outside of the VLE, the instructor is able to create layers of activities and resources to support participant interaction with the content, as illustrated in Figure 11. The course home in the VLE is the first layer, the tools/activities within the VLE are the second layer, and the Web-based resources outside of the VLE are the third layer. Additional layers, or resources, can be added based on the needs of the learners and the limitations of the VLE.



*Figure 11:* Model of layering learning activities and outside resources in a VLE

By layering the resources, the instructor is able to capitalize on learning objects outside of the VLE to create activities to support student learning. While it has been determined that all of

the technologies evaluated in this study have tools to support the pedagogical framework, each of the technologies offer a distinct environment for professional learning.

### **Best Practices for Design of Professional Learning Using VLEs**

The second research question asked about leveraging the tools in the VLEs to engage K-12 educators in communication, collaboration, and reflection for professional learning. To answer the question, I studied the transcripts, screencasts, digital artifacts, and participants' evaluations from three different courses that were taught using the technologies.

As a result of the research, a coding scheme emerged that identified the interactions between the participants in the course (see Table 11). The codes revealed how the tools were configured to create participant interactions for communication, collaboration, and reflection.

Table 11  
*Summary of Codes*

Interactions	Code*	Definition
Communication (COM)	T>C	Teacher communicated to whole class
	T>S	Teacher communicated to individual students.
	S>T	Students communicated to teacher.
	S>C	Students communicated to whole class.
	S>S	Students communicated to each other individually.
Collaboration (COL)	P	The students worked in pairs.
	SG	The students worked in small groups (3 – 6) participants.
	WC	The whole class worked together.
	IS>S	Informal collaboration between students.
Reflection (REF)	S>T	Only the teacher saw the student's reflection.
	S>C	The student's shared their reflection with the whole class.

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

The codes were used to identify the types of interactions that occurred, and between whom, during each class. Tables 37 to 39 display the codes and how they are aligned to each stage of guided inquiry.

The teacher-participants (TPs) in the Active Worlds class met synchronously for 15 hours, three hours a day for five consecutive days. The primary interaction that the TPs engaged in was communication. I identified 17 instances of communication over the course of the 15 hours. Within these 17 instances, the communication occurred publicly and privately between the TPs and me, and between the TPs. Many different tools, including IM, voice chat, whisper, signs, and telegrams, were used to facilitate the interactions. The communication primarily aligned with Components 1 (resource negotiation) and 2 (coordination) of the Britain and Liber framework. Thus, it appears that I utilized the tools to communicate with the TPs to organize the activities and provide instructions on how the TPs should interact with the resources and one another. I identified three instances of collaboration, comprised of five interactions. One interaction was informal, whereby TPs assisted one another with navigating in the AW environment and four of the interactions were formal, or was instructor-designed. TPs used IM for the informal collaboration, and whisper, telegrams, and IM for the formal collaborations. The collaborative interactions aligned with component three (interaction) of the Britain and Liber framework, whereby TPs interacted with each other and the environment to explore the content under study. Lastly, I identified five instances of reflection. TPs used IM and signs to share their reflections with the whole class and telegrams to reflect privately with only instructor view. During the class, TPs self-organized to assist one another with navigating the AW environment; however, they did not meet outside of the scheduled time for class. I used many different tools—like IM, voice chat, whisper, signs, and telegrams—to adapt the resources and instruction based on feedback from the TPs. Adaptation occurred primarily during the exploration, explanation

and elaboration phases of the lessons. Table 37 below displays the coded and tabulated data for the interactions in Active Worlds.

Table 37  
*Analysis of Interactions in Active Worlds*

Class	Stage of GI	Interaction	Code*	Tool	B & L Component						
					1	2	3	4	5	6	
AW1	Engagement	COM	S>T	IM	x	x					
			T>S	IM	x		x				
			T>S	Voice Chat	x		x				
			T>S	Whisper			x				
			T>C	Signs	x	x					
		COL		IS>S	IM			x		x	
				P	Whisper			x			
	Exploration	COM		T>C	Signs	x					x
				T>S	IM	x	x				x
				T>S	Voice Chat	x	x	x			x
				S>T	IM	x		x			x
	Explanation & Elaboration	COM		T>C	IM		x	x			x
				T>C	Voice Chat		x	x			x
				S>C	IM			x			x
	Evaluation	REF		T>C	IM		x				
T>C				Voice Chat		x					
S>C				IM				x			
					B & L Component						
Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6	
AW2	Engagement	COM	T>C	IM	x	x					
			T>C	Voice Chat	x	x					
			T>C	Signs	x	x					
			T>S	Telegrams			x				
			S>T	IM	x	x					
		COL		SG	Telegrams			x			
				SG	IM	x		x			x
	Exploration	COM		T>C	IM	x	x				
				T>C	Audio Chat	x	x				
				T>C	Signs	x	x				
	Explanation & Elaboration	COM		T>C	IM		x				
					Audio		x				
	Evaluation	COM		S>C	IM			x			
				T>C	IM		x				
		REF		T>C	Audio		x				
S>C				IM				x			
			S>T	Telegram				x			
					B & L Component						

Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6	
AW3	Engagement	COM	S>T	IM	x	x					
			T>C	IM	x	x					
			T>C	Voice Chat	x	x					
			T>C	Signs	x	x					
			T>S	Whisper				x			x
	Exploration	COM	T>C	IM	x	x					x
			T>C	Voice Chat	x	x					x
			T>C	Signs	x	x					x
			S>T	IM	x			x			
	Explanation & Elaboration	COM	T>C	IM		x					
			T>C	Voice Chat		x					
			S>C	IM				x			
	Evaluation	REF	T>C	IM		x					
			T>C	Voice Chat		x					
			S>C	IM					x		
			S>C	Signs					x		
B & L Component											
Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6	
AW4	Engagement	COM	T>C	IM	x	x					
			T>C	Voice Chat	x	x					
			T>C	Signs	x	x					
			S>T	IM	x						
	Exploration	COM	T>C	IM	x	x					x
			T>C	Voice Chat	x	x					x
			T>C	Signs	x	x					x
	Explanation & Elaboration	COM	T>C	IM	x	x	x				x
			T>C	Voice Chat	x	x	x				x
			T>C	Signs	x	x	x				x
			S>T	IM	x		x				
	Evaluation	REF	WC	IM	x			x			
			T>C	IM		x					
			T>C	Voice Chat		x					
			S>C	IM						x	
	B & L Component										
Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6	
AW5	Engagement	COM	T>C	IM	x	x					
			T>C	Voice Chat	x	x					
			T>C	Signs	x	x					
			S>T	IM	x						x
	Exploration	COM	T>S	Invite		x	x				
			S>T	IM	x			x			
			T>S	IM				x			
			T>S	Voice Chat				x			
	Explanation	COM	S>C	Signs				x			

& Elaboration		S>C	IM	x	x
		S>C	Voice Chat	x	x
Evaluation	COM	T>C	IM	x	
		T>C	Voice Chat	x	
	REF	T>C	IM	x	
		T>C	Voice Chat	x	
	REF	S>C	IM		x
		S>C	Signs		x

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

The TPs in the Adobe Connect class met synchronously for 15 hours, three hours a day for five days, which were scheduled during a two-week period. The primary interaction that the participants engaged in was communication. I identified 20 instances of communication over the 15 hours. Within these instances, the communication occurred publicly and privately between the TPs and me, and between the TPs. Many different tools, including IM (public and private), camera, voice chat, poll, whiteboard, pointer, web links, screen share, icons, and file share, were used to facilitate the interactions. The instructor-to-student (TP) communication primarily aligned with components one (resource negotiation) and two (coordination) of the Britain and Liber framework. Student (TP)-to-instructor communication was more aligned to component three (interaction) of the framework, when TPs were seeking feedback on their progress and confirmation of their understandings. The TPs used IM and icons to communicate with me. I identified seven instances of collaboration, which included eight interactions. Six of the interactions (using IM) were informal, whereby TPs assisted one another with navigating the AC environment and the tools under study. The TPs used Weblinks and the whiteboard to collaborate in two instructor-designed activities. The collaborative interactions aligned with component three (interaction) of the Britain and Liber framework. Lastly, I identified three instances of reflection. TPs used IM and the whiteboard to reflect to the whole class. AC does not have a





			T>C	IM		x				
			T>S	Private IM		x				x
			T>C	File Share	x					x
	Exploration	COM	T>C	Web Links	x					x
			T>C	Screen Share	x					x
			S>T	IM	x					x
		COL	IS>S	IM					x	
	Explanation & Elaboration	COM	S>T	Icons			x			
			S>T	IM			x			x
			T>S	Voice Chat			x			x
			T>S	IM			x			x
			S>C	IM			x			x
		COL	IS>S						x	
	Evaluation	COM	T>C	Voice Chat	x					
			T>C	IM		x				
			T>C	White Board			x			
		REF	S>C	IM				x		
			S>C	White Board				x		
B & L Component										
Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6
AC3	Engagement	COM	T>C	White Board		x				
			S>C	White Board			x			
			T>C	Voice Chat	x	x				x
			T>C	IM	x	x				x
			S>S	IM					x	
		COL	IS>S	IM					x	
	Exploration	COM	T>C	White Board	x					x
			T>C	Voice Chat	x	x				x
			T>C	IM	x	x				x
			S>C	IM	x					x
			T>C	File Share	x					x
			T>C	Web Links	x					x
			T>C	Screen Share	x					x
		COL	WC	Weblinks**	x					x
	Explanation & Elaboration	COM	S>T	Icons			x			
			S>T	IM			x			x
			T>S	Voice Chat			x			x
			T>S	IM			x			x
			S>C	IM			x			x
	Evaluation	COM	T>C	Voice Chat	x					
			T>C	IM		x				
			S>C	IM			x			
B & L Component										
Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6
AC4	Engagement	COM	T>C	White Board	x	x				

			T>C	Poll						x
			T>C	File Share		x				
			S>S	IM					x	
			T>C	Voice Chat						x
			T>C	IM						x
Exploration	COM		T>C	Voice Chat	x	x				x
			T>C	IM	x	x				x
			S>C	IM	x					x
			T>C	File Share	x					x
			T>C	Weblinks	x					x
			T>C	Screen Share	x					x
			S>T	IM	x					x
			T>S	Private IM	x					x
Explanation & Elaboration	COM		S>T	Icons					x	
			S>T	IM					x	x
			T>S	Voice Chat					x	x
			T>S	IM					x	x
			S>C	IM					x	x
	COL		IS>S	IM					x	x
Evaluation	COM		T>S	Voice Chat						x
			T>S	IM						x
			S>C	IM						x
B & L Component										
<b>Class</b>	<b>Stage of GI</b>	<b>Interaction</b>	<b>Code</b>	<b>Tool</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
AC5	Engagement	COM	T>C	Voice Chat					x	
			T>C	IM					x	
			T>C	Camera					x	
			S>C	IM					x	
Exploration	COM		T>C	Voice Chat	x	x				x
			T>C	IM	x	x				x
			S>C	IM	x					x
			T>C	File Share	x					x
			T>C	Web Links	x					x
			T>C	Screen Share	x					x
			S>T	IM	x					x
			T>S	Private IM	x					x
Explanation & Elaboration	COM		S>T	Icons					x	
			S>T	IM					x	x
			T>S	Voice Chat					x	x
			T>S	IM					x	x
			S>C	IM					x	x
	COL		IS>S	IM					x	x
Evaluation	COM		T>S	Voice Chat					x	
			T>S	IM					x	
	REF		S>C	IM					x	

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

\*\*The interaction occurred outside of the AC environment.

The TPs in the Moodle class met asynchronously. The class was designed with five modules of study, with a new module opening each week for five consecutive weeks. It was expected that the TPs would spend approximately 15 hours completing the activities and assignments in the class. The primary interaction that the TPs engaged in was communication. I identified 17 instances of communication throughout the course. Within these instances, the communication occurred publicly and privately between the TPs and me, and between the TPs. Many different tools, including summary, resources, webpage, forum, messaging, chat, and labels, were used to facilitate the interactions. The communication aligned with Components 1 (resource negotiation), 2 (coordination), and 3 (interaction) of the Britain and Liber framework. I utilized the tools to provide the TPs with a checklist of the assignments and framework for navigating the activities. I identified four instances of collaboration. All of the instances were instructor-designed activities for the whole class. The tools used for collaboration were wikis, glossaries, and resources. The resources were links to other web-based tools, and the actual collaboration occurred outside of the Moodle environment. Lastly, I identified three instances of reflection. TPs used forums to reflect with the whole class and journal to reflect privately. The TPs did not self-organize in the Moodle environment. Adaptation occurred during the exploration, explanation, elaboration, and evaluation phases of the lessons. The TPs and I used forums, wikis, and glossaries to adapt learning resources. Further, I adapted Webpages, resources, and forums based on interactions with the students. Table 39 below displays the coded and tabulated data for the interactions in Moodle.

Table 39  
*Analysis of Interactions in Moodle*

					B & L Component							
Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6		
Moodle1	Engagement	COM	T>C	Summary	x	x						
			T>C	Resources	x	x						
			T>C	Webpage	x							
	Exploration	COM	T>C	Webpage	x					x		
	Explanation &	COM	T>C	Forum		x					x	
			S>C	Forum				x			x	
	Elaboration	COL	WC	Wiki				x			x	
	Evaluation	COM	T>S	Messaging		x					x	
						B & L Component						
	Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6	
Moodle2	Engagement	COM	T>C	Summary	x	x						
			T>C	Resources	x	x						
			T>C	Label	x							
			T>C	Resources	x							
			T>C	Forum			x					
			S>C	Forum					x		x	
			S>S	Forum					x		x	
	Exploration	COM	T>C	Webpage	x	x				x		
	Explanation &	COM	T>C	Webpage	x	x					x	
			S>C	Glossary	x			x			x	
	Elaboration	COL	T>C	Resources		x					x	
			WC	Wiki				x			x	
	Evaluation	COM	T>S	Messaging		x					x	
					B & L Component							
Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6		
Moodle3	Engagement	COM	T>C	Summary	x	x						
			T>C	Resources	x	x						
			T>C	Label	x							
	Exploration	COM	T>C	Resources	x						x	
			T>C	Forum			x				x	
			S>C	Forum					x		x	
			S>S	Forum					x		x	
			T>C	Forum			x					
	Explanation & Elaboration	COM	T>S	Forum							x	
			S>T	Forum					x		x	
			S>C	Forum					x		x	
			S>S	Forum					x		x	
			COL	WC	Resources**				x			x
			Evaluation	REF	S>T	Journal					x	
					B & L Component							
Class	Stage of GI	Interaction	Code	Tool	1	2	3	4	5	6		

Class	Stage of GI	Interaction	Code	Tool	B & L Component					
					1	2	3	4	5	6
Moodle4	Engagement	COM	T>C	Summary	x	x				
			T>C	Resources		x				
	Exploration	COM	T>C	Webpages	x					x
		COL	WC	Wiki			x			x
	Explanation & Elaboration	COM	T>C	Forum	x	x				
			T>S	Forum			x			x
			S>T	Forum			x			x
			S>C	Forum			x			x
			S>S	Forum			x			x
	Evaluation	REF	S>C	Forum				x		x
			S>T	Journal				x		x
Moodle5	Engagement	COM	T>C	Summary	x	x				
			T>C	Resources	x	x				
	Exploration	COM	T>C	Webpages	x				x	
	Explanation & Elaboration	COM	T>C	Forum		x				
T>S			Forum			x			x	
S>T			Forum			x			x	
S>C			Forum			x			x	
S>S			Forum			x				
	Evaluation	REF	S>T	Journal				x		

\*Where T represents me as the teacher/instructor and S refers to the teacher-participants (TPs) who were the students in the course.

\*\*The interaction occurred outside of the Moodle environment. The primary interactions that occurred in all three cases were related to communication.

I used many different tools to provide content related information to the TPs.

Communication in this sense was not related to discussion, but rather how I used the tools to relay concepts and ideas related to the course. This correlates with Components 1, 2 and 3 in Britain and Liber's pedagogical framework. In AW, the primary tools I used were IM, audio, and signs, with hyperlinks to content specific websites. In AC the primary tools I used were IM, audio, Weblinks, file sharing, and whiteboard. In Moodle, the primary tools I used were module summary, labels and Web pages.

The coding identifies the category of interaction; i.e., communication, collaboration, or reflection; who participated in the interaction, and the tools (micro-worlds) that facilitated the interaction. However, it does not reflect when the teacher-participants (TPs) interacted

with the micro-worlds to foster their own learning on an individual basis. A finer level of granularity is required to identify the specific activities and corresponding micro-worlds that the TPs interacted with as individuals. Future research should consider a fourth interaction labeled Exploration. Exploration could be used to represent instances when TPs were individually interacting with the micro-worlds to explore the content under study. The code for this interaction might be S>Co, to represent TPs' (students') exploration of the content through micro-worlds. By adding this fourth interaction, future analysis can occur at the activity level to determine how the participants engaged with the micro-worlds, and used this information in their other interactions; i.e., communication, collaboration, and reflection.

### **Future Directions for Research**

The ideas and insights gained from these cases impact the future direction of research, practice and policy in the use of VLEs to facilitate professional learning opportunities for K-12 educators. One unique aspect of teaching in a virtual environment versus a face-to-face environment is a record of the interactions that occur during the class. A transcript, audio or video recording, or written record of discussions can be generated. For example, I saved the chat that occurred during each class meeting in Active Worlds and Adobe Connect. In addition, the class forums in Moodle yielded a written record of participants' questions, responses, and discussions. These artifacts provide instructors and researchers with data that can be analyzed to determine how teaching and learning transpire in virtual environments. While this research relied on a qualitative content analysis, future studies could examine the same data using quantitative research methods. In a quantitative study, researchers could tabulate the frequency and percentage of the interactions for communication, collaboration, and reflection. Statistical analysis could be used to analyze whether significant differences

exist between the types of interactions and learning outcomes, to compare the types of interactions that occur in the different virtual learning environments, or to evaluate participant satisfaction with learning in a virtual environment.

While the coding revealed that teacher-participants engaged in communication, collaboration, and reflection, and the participants' evaluations of the courses indicate they unanimously rated the content and usefulness/applicability of the workshops excellent, ultimately professional learning needs to correlate to improving teacher's effectiveness in raising student achievement (Learning Forward, 2011). The courses reviewed in this study provided educators with immersive and participatory experiences as content creators with Web 2.0 tools to foster literacy. Follow-up research in three areas needs to be conducted to: 1) identify how the teacher-participants used the content they studied in the courses; 2) determine if teacher participation in the classes yielded increased student learning outcomes, and 3) investigate how teacher-participant experiences in virtual learning environments impacts their use of technology in the classroom.

There is evidence in the transcripts of each course that the participants used, or intended to use, the information under study. For example, in the first course that was facilitated using Active Worlds, one of the teacher-participants (TPs) commented, "this is a great lesson to use in my computer classes—comparing and contrasting search engines with my students." Similarly, in the course that was facilitated in Adobe Connect, several TPs indicated that they would like to use the resources with their students, "I could really use Glogster." "I think I could really use this with my second graders to present material." "I think the kids will think it's cool to add their comments, pictures or videos to a group project

[using VoiceThread].” The Adobe Connect course was scheduled during the school year; so one of the TPs used the resource she created with her students and shared the results,

AC11: I posted everything to my wiki...I have an example of everything but voicethreads. Had some trouble with that one. I had the most fun with the video because it was easy and quick. Spent the most time on jog the web that I actually got to use that same week in the classroom.

andreatej: did you students use it yet?

AC3: wonderful job!

AC2: I like this - I liked jog the web also

AC11: yes

AC9: What grade is this for?

AC8: Very good!

AC11: 7

AC5: Did you show this in class or take the kids to the lab?

AC11: Used the laptops

AC3: I bet your students will love it.

AC13: great use of jog the web!

AC13: good topic!

AC11: They had never seen it before, so it did take some getting use to for them

AC5: Where'd they write the responses?

AC11: paper

AC11: seems so old fashion!

AC5: Nice job

AC11: thanks

AC11: yes, individually

In the Moodle course, the TPs created learning resources with many different web-based tools, and reported using them with their students, “I created this glog to introduce classroom rules and expectations.” “I created this animoto to use 1st with the parents of my students during open house. Then with my students to start off my unit on cyber safety. I love animoto because of its ease to use and professional look. Impressive product but so simple to create. The second is made on xtranormal. My students wrote their own Greek myths in English and I had the produce them in my class.”

While there is evidence that the TPs either used, or were thinking about using, the content with their students, it does not provide information on how the teacher used the tools.



For example, did the teacher show the students the content he/she created to the whole class, was it posted on the teacher's webpage, or did the students create their own presentation? Further, it would be helpful to receive feedback from the students in the classrooms on whether or not they found the tools helpful, and ultimately if the use of the tools resulted in increased learning outcomes.

Next, researchers need to examine how the experiences the TPs had while participating in the VLEs translated into their use of instructional technologies to engage students in learning. Can teachers' immersions in VLEs build new knowledge about today's students, and will this new knowledge translate to the use of web-based technologies to engage students in learning? The previous excerpts from the transcripts indicate that some of the teachers used the web-based tools with their students, but was this a one-time event while they were enrolled in the course or was it ongoing? Did their experience with these technologies make it easier for them to use different technologies in the future? Did the teachers use Active Worlds, Adobe Connect, or Moodle with their students?

#### **Future Directions for Practice and Policy**

In terms of practice, the research yielded a three-dimensional student-centered planning model for the identification of tools and the coordination of interactions and activities in a virtual learning environment that focuses on the unit of activity. While the learning design may not transfer explicitly from one technology to another, the planning process and selection of tools does. This approach moves the focus away from managing content to designing opportunities for learning at the activity level. Figure 12 provides a student-centered model for planning interactions for professional learning. Using the model,

the instructor can identify how participants (students) will interact, the types of activities, and the appropriate tools (micro-worlds).

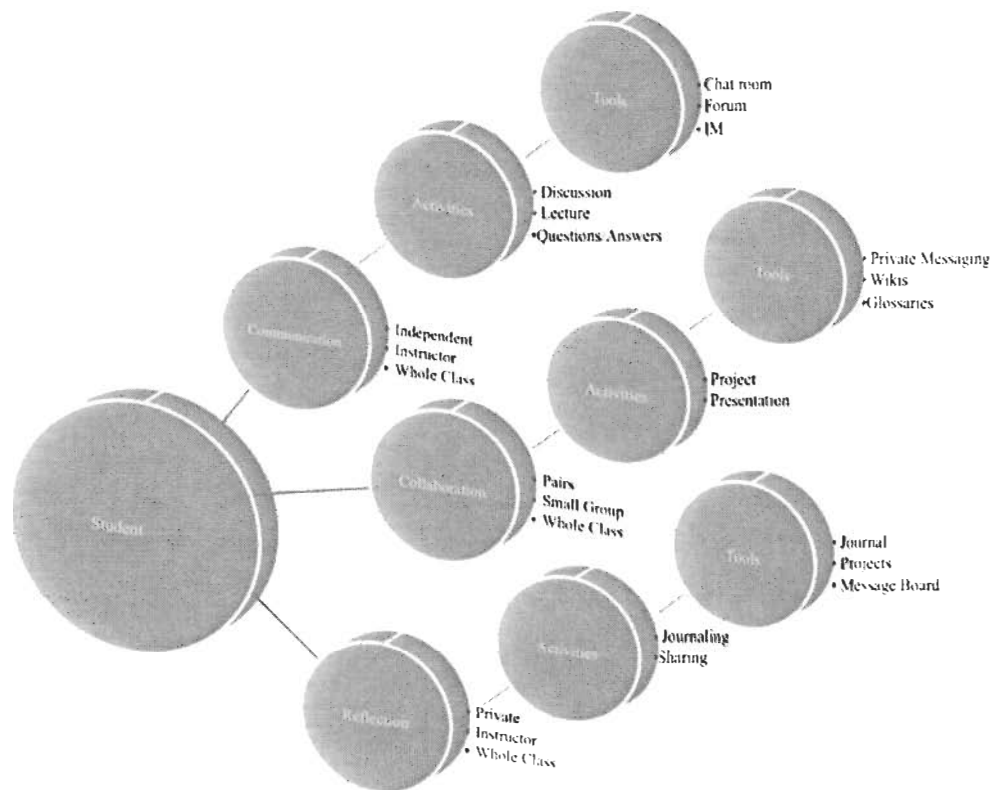


Figure 12. 3-D model for planning interactions for professional learning activities.

While it is important to coordinate the three activities to create a meaningful learning environment for K-12 educators, it may be helpful to consider the types of interactions for each activity individually.

To create activities to support communication, I utilized the tools in the VLEs for communication between: (a) instructor and student, (b) student and student, and (c) student and the whole class. Each activity was configured based on the types of student interactions. Communication activities can be designed according to the interactions in Figure 13,

whereby the instructor utilizes the tools to create an environment for students to independently initiate communication with other members of the class, communicate with the instructor privately, or communicate with the class at large.

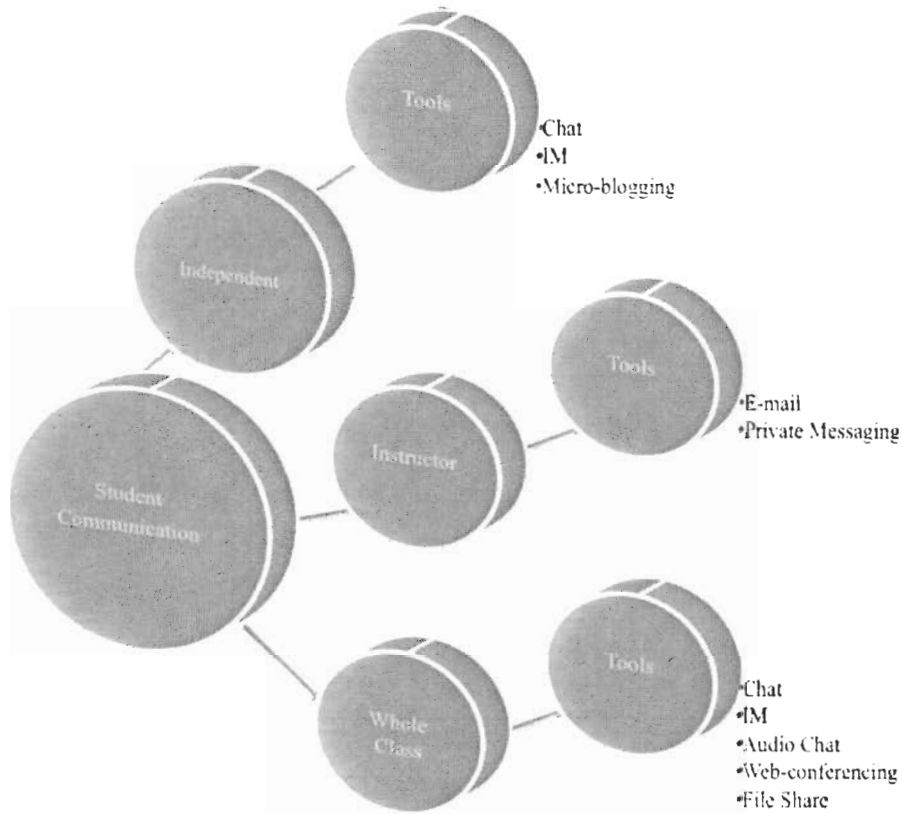


Figure 13. Interactions for activities that encourage communication.

Similarly, the instructor can organize participants (students) for collaborative activities, as illustrated in Figure 14. In the preceding cases, I utilized the tools available in the VLE to organize students in many different ways to encourage collaboration; i.e., pairs, small group, or whole class.

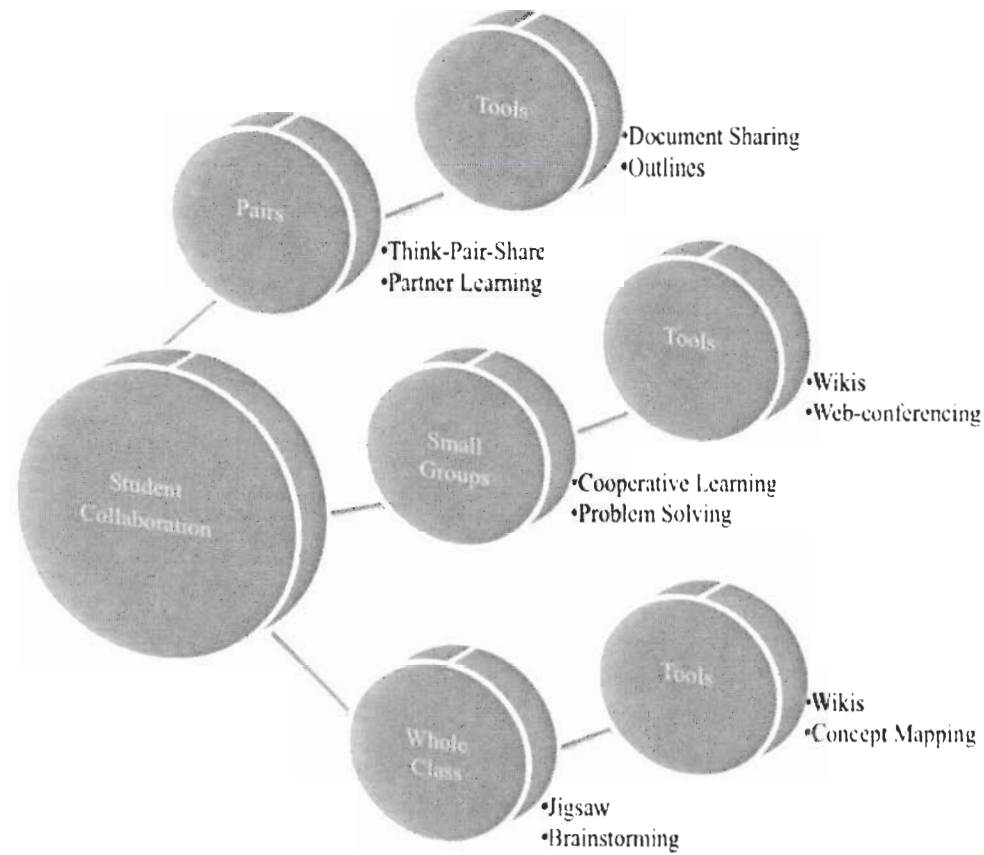


Figure 14. Student interactions for activities that encourage collaboration.

Finally, the instructor can use the tools to configure reflective activities, as illustrated in Figure 15. These activities can be designed so that the students can reflect privately outside the purview of the teacher, reflect in a space where the instructor provides feedback, or reflect in a public space where students can benefit from each other's experiences and growth as learners.

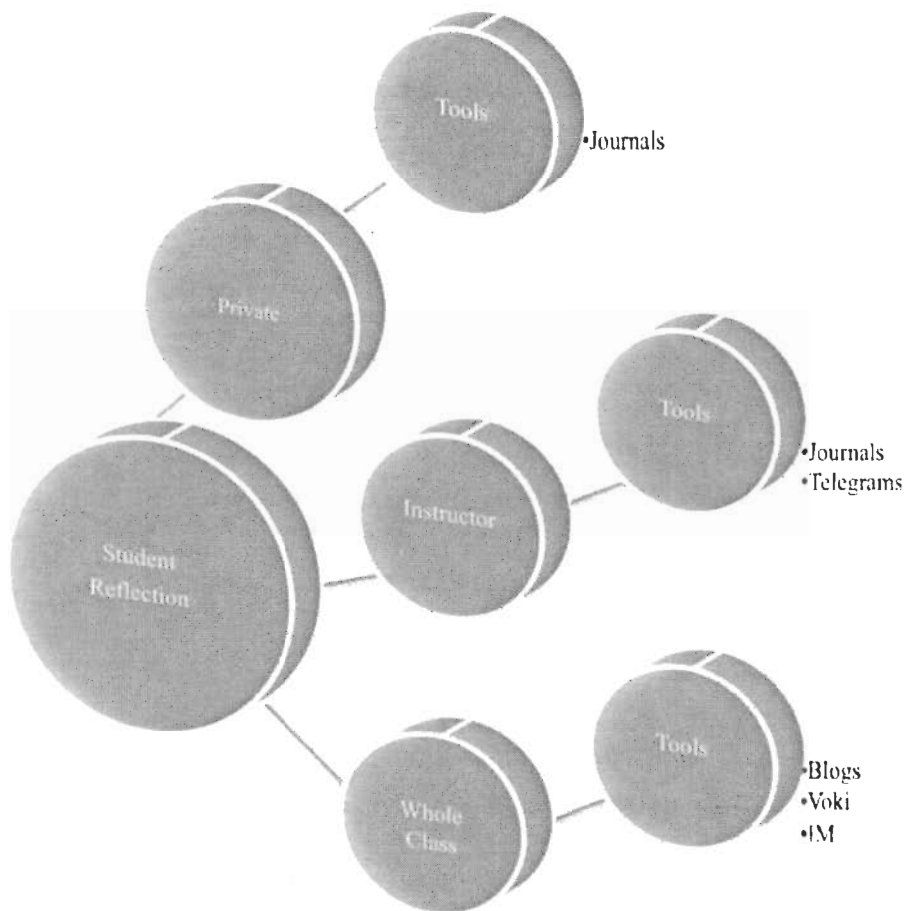


Figure 15. Student interactions for activities that encourage reflection.

The model can be translated to a planning guide, as depicted in Table 40, to assist instructors and course designers in selecting tools to design learning activities (micro-worlds) that support communication, collaboration, and reflection.

Table 40  
*Planning Guide for Selecting Technologies to Support Professional Learning Activities*

Interactions	Activities	
Communication	<input type="checkbox"/> Synchronous	<input type="checkbox"/> Individual Students
	<input type="checkbox"/> Asynchronous	<input type="checkbox"/> Instructor
		<input type="checkbox"/> Whole Class
	Activity Description	Technology
Collaboration	<input type="checkbox"/> Synchronous	<input type="checkbox"/> Pairs
	<input type="checkbox"/> Asynchronous	<input type="checkbox"/> Small Group
		<input type="checkbox"/> Whole Class

	Activity Description	Technology
Reflection	<input type="checkbox"/> Private <input type="checkbox"/> Instructor <input type="checkbox"/> Whole Class	
	Activity Description	Technology

In this analysis, I studied three cases in which technology was used to facilitate professional learning opportunities for K-12 educators to learn a new skill. In practice, these technologies, or other emerging technologies, can be used to support other forms of professional development, like professional learning communities, institutes, networks, or conferences. Action research needs to be used to study the practice of using these tools to engage teachers in professional learning. For instance, if a school district hosts a conference, Web-conferencing software like Adobe Connect can be used to bring in a live speaker to present to the faculty and staff at large. Another example is the use of technology to support professional learning communities that are distributed geographically or need to meet asynchronously. A learning management system, like Moodle, provides many options to create learning networks and the facilitator can use the tools to engage teachers in conversations or activities related to a common theme. Finally, administrators and educators can use tools like wikis, blogs or forums to build a common body of knowledge related to instruction or curriculum. In this way, each participant can edit the contents of the document and contribute to the larger learning community. Future research needs to expand the study to include the use of the technologies to facilitate communication, collaboration, and reflection scenarios for long-term professional learning communities. The research conducted in this study focused on three 15-hour courses. As school districts begin to

embrace embedded models of professional learning, a study is needed to uncover how the utilization of technology can successfully engage educators in extended learning opportunities to foster professional growth. Can the teacher satisfaction realized in this study be replicated in long-term professional learning communities?

The planning model for the use VLEs to facilitate professional learning for K-12 educators needs to be applied and evaluated when using alternative technologies in practice. The evolution of technology impacts daily practice and how administrators, staff developers, and educators engage in professional learning. As such, all stakeholders in the educational process need to experiment with innovations in new media to determine how it can be leveraged to support learning for all members of the community. Emerging Web-based technologies provide the “ultimate architecture for participation” (Kamel-Boulos & Wheeler, 2007, p. 2). Well-planned evaluation research is still needed, in order to identify models for leveraging virtual learning environments to engage educators in ongoing communities of practice that perpetuate professional learning. This is a needed area of study, not only for staff development specialists and course designers, but also for K-12 educators who need to gain an understanding of how the technologies give today’s students a voice in a participatory culture where virtual interactions are routine.

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APPENDICES



Appendix A

Proposed Amendments to Section 9101 (34) of the Elementary and Secondary Education Act  
as Reauthorized by the No Child Left Behind Act of 2001 as per NSDC (2009)

Proposed Amendments to Section 9101 (34) of the Elementary and Secondary Education Act as reauthorized by the No Child Left Behind Act of 2001 as per NSDC (2009):

(34) PROFESSIONAL DEVELOPMENT— The term “professional development” means a comprehensive, sustained, and intensive approach to improving teachers’ and principals’ effectiveness in raising student achievement --

(A) Professional development fosters collective responsibility for improved student performance and must be comprised of professional learning that:

(1) is aligned with rigorous state student academic achievement standards as well as related local educational agency and school improvement goals;

(2) is conducted among educators at the school and facilitated by well-prepared school principals and/or school-based professional development coaches, mentors, master teachers, or other teacher leaders;

(3) primarily occurs several times per week among established teams of teachers, principals, and other instructional staff members where the teams of educators engage in a continuous cycle of improvement that —

(i) evaluates student, teacher, and school learning needs through a thorough review of data on teacher and student performance;

(ii) defines a clear set of educator learning goals based on the rigorous analysis of the data;

(iii) achieves the educator learning goals identified in subsection (A)(3)(ii) by implementing coherent, sustained, and evidenced-based learning strategies, such as lesson study and the development of formative assessments, that improve instructional effectiveness and student achievement;

(iv) provides job-embedded coaching or other forms of assistance to support the transfer of new knowledge and skills to the classroom;

(v) regularly assesses the effectiveness of the professional development in achieving identified learning goals, improving teaching, and assisting all students in meeting challenging state academic achievement standards;

(vi) informs ongoing improvements in teaching and student learning; and

(vii) that may be supported by external assistance.

(B) The process outlined in (A) may be supported by activities such as courses, workshops, institutes, networks, and conferences that:

(1) must address the learning goals and objectives established for professional development by educators at the school level;

(2) advance the ongoing school-based professional development; and

(3) are provided by for-profit and nonprofit entities outside the school such as universities, education service agencies, technical assistance providers, networks of content-area specialists, and other education organizations and associations. (p. 10).

Appendix B

Britain and Liber's Framework for the Pedagogical Evaluation of Virtual Learning  
Environments

A Framework for the Pedagogical Evaluation of Virtual Learning Environments  
Britain and Liber (2004) created a revised pedagogical framework for the pedagogical evaluation of virtual learning environments based on the conversational framework and VSM. The guiding questions for the evaluation are:

1. What tools does the system provide for teachers to present/express their ideas to students?
2. What tools does the system provide for students to articulate their ideas to the teacher and other students?
3. Can teachers and learners extend/change their presentations during the modules' time period?
4. A VLE is not a single tool; it is a structuring and coordination system containing a variety of tools. These questions are about the model of teaching and learning interactions that forms the basis of the system.
  - a. Can a module be structured sequentially and/or hierarchically over time?
  - b. What facilities are there to organize learners in a variety of ways in the module (whole group/small groups, individuals)?
  - c. What underlying pedagogical model(s) or approaches does the system encourage?
5. How are the "rules of the module" expressed and made evident to the student? By this we mean such things as the learning outcomes, the obligations of the learner and the mutual commitment teacher and student make (e.g. the amount of time the teacher a teacher will spend message each week, the number of assignments a learner will be expected to complete, etc.).
6. What facilities are there to monitor how well learning is progressing on the module?
7. What can learner do on their own, outside of the purview of the teachers?
  - a. Can they find and manage resources – do they have their own file stores or repositories?

- b. Can they talk to other students (other than in the main module discussion), create their own discussions; create their own learning activities involving peers?
- c. Can they locate people with similar interests outside of their own module, course, year or institution? I.e., is information about people available?
- 8. To what extent is it possible for the teacher to adapt the module structure once teaching is underway?
  - a. Can you add/change/delete resources?
  - b. Can you add/change/delete fragments of module structure?
  - c. Can you add/remove people? Can you split them into different groups?
  - d. Can you create and assign resources or learning activities to individuals?

Appendix C

Evaluation of Case #1: Active Worlds

### Instructional Services Activity Evaluation

**Interactive Viewer**

**Activity Information**

**\*\*TELL Program course\*\***

**21ST Century Research Skills:MovingBeyond**

**\*\*TELL Program course\*\***

**\*\*Open to all, but Summer Institute participants will be given registration priority\*\***

Learn what tools besides Google are available on the Internet to support student research.

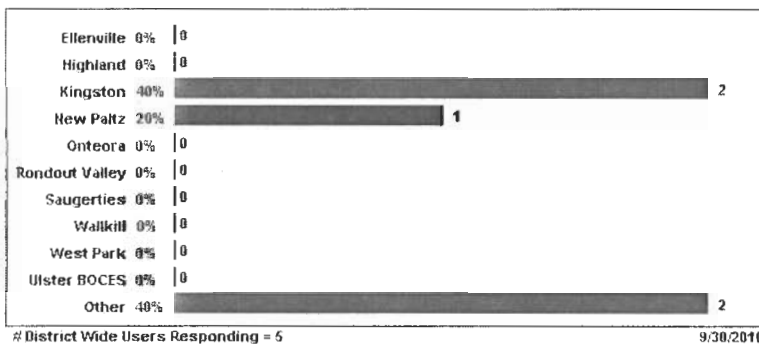
This workshop will take place in a multi-user virtual environment known as ActiveWorlds. Participants will interact and learn synchronously in this immersive virtual environment. Upon registering, participants will receive instructions and a link to download the necessary software. The workshop is PC-based. If you are Mac-based please contact the instructor for additional requirements.

In addition, there will be 2 non mandatory introductory sessions available, one face-to-face at the Harriman Learning Center at OU BOCES on 6/29 and the other in ActiveWorlds on 7/6 to introduce participants to the ActiveWorlds interface.

Dates: **Jul 13 - Jul 17** Hours: **0.00** # Enrolled: **6/22** Cost: **\$0**

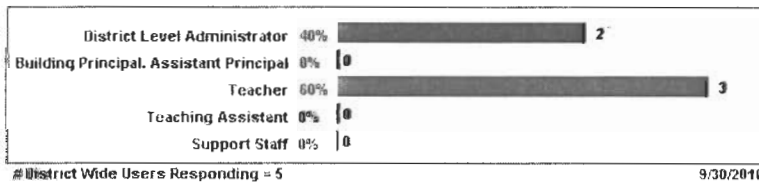
**Question #1**

**What District are you from?**



**Question #2**

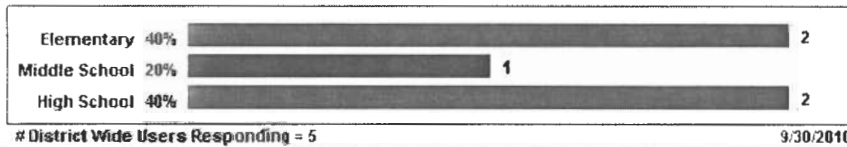
**What is your position?**



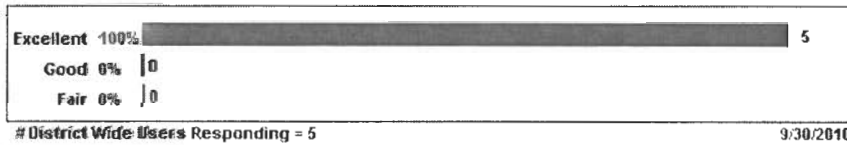


**Question #3**

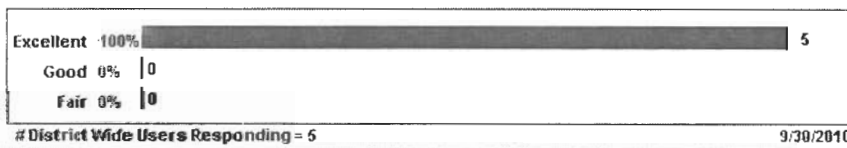
What grade Level do you work with the most?

**Question #4**

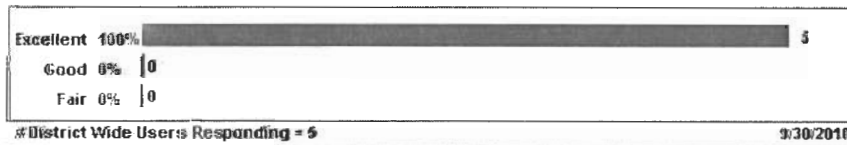
How would you rate the organization of this workshop?

**Question #5**

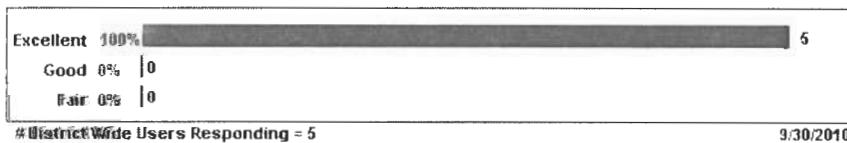
How would you rate the content of this workshop?

**Question #6**

How would you rate the usefulness/applicability of this workshop?

**Question #7**

How would you rate the overall presentation of this workshop?

**Question #8**

What did you like most about this session?

# Responses are Anonymous

1. The format of this in-service was terrific! It was really neat being able to learn through the active worlds forum!!
2. I loved taking the class in Active Worlds/
3. This was my first "virtual" workshop that was conducting in Active Worlds.

4. *The workshop updated me on current technology.*
5. *This session allowed me to be the "student" in Active Worlds and learn how to make the classroom more interesting for the students.*

**Question #9**

**What practical/professional application does this session provide?**

# Responses are Anonymous

1. *This will definitely help my students in finding more information for research and help them in deciding if websites are reliable or not. This taught me how to teach them to be more discerning with the websites they will be using for information.*
2. *I was able to gather many resources for research.*
3. *Research Internet Safety as well as the course content.*
4. *I will incorporate many web 2.0 tools into my lessons.*
5. *I have ideas on how to reach students that usually are not engaged in the classroom.*

**Question #10**

**How could this program be strengthened or improved?**

# Responses are Anonymous

1. *This was terrific as it was. The forum in active worlds needs to be done for more in-service presentations!!*
2. *NA*
3. *Not sure at this time.*
4. *Assist in lesson writing.*
5. *More time to develop it and use it in the classroom.*

**Question #11**

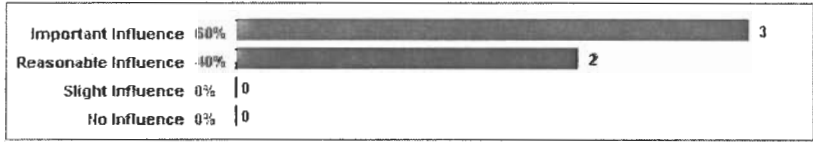
**How will you use this information to strengthen your own districts' practices?**

# Responses are Anonymous

1. *This will help for my district as it will teach students better research skills.*
2. *I am compiling a list of the resources to share with other teachers in my building.*
3. *To provide information about learning in virtual environments and to further research beyond Google and Internet Safety.*
4. *I will continue to incorporate technology into my lessons.*
5. *I am hoping to change the way I structure my resource room.*

**Question #12**

**Degree to which you think student performance can be improved using this information and/or materials?**



# District Wide Users Responding = 5

9/30/2010

**Options**

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Appendix D

Evaluation for Case #2: Adobe Connect

**Instructional Services Activity Evaluation**

**Interactive Viewer**

**Activity Information**

**\*\*TELL Program course\*\* Engaging Students with 21st Century Technologies**

**\*\*TELL Program course\*\***

**\*\*Open to all, including TELL participants!**

This is a completely online interactive webinar that is scheduled for 3-hours a day, for 5-days, for a total of 15 hours. Registrants need to have access to a computer, the Internet and a microphone (if possible) to participate. During the webinar, teachers will look at:

Web 2.0 technologies and sites that are becoming an integral part of youth culture: young people today create, remix, and share content with other creators.

Teachers will develop multi-media projects using several different web-based presentation tools. Some of the tools to be explored include: VoiceThread, Voki, Zoho, PhotoPeach, Xtra Normal, and Storybird

Today's youth are using Web 2.0 tools to create and communicate via blogs, wikis, podcasts, and digital video. In an era of globalization and a world that is increasingly flat, effective use of social media is rapidly becoming a vital 21st Century skill.

Teachers will use several different social media technologies as a way to communicate and share what they have created.

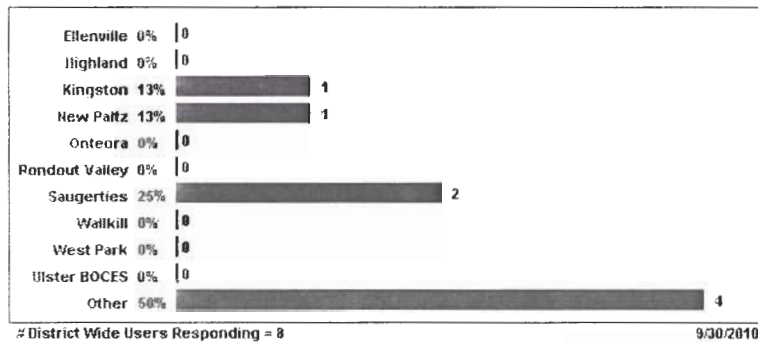
Participants will create their own wiki using PBWorks and embed the content they create using Web 2.0 technologies.

Directions on how to access the course will be sent to all participants upon registration. If this is your first time participating in a webinar, the instructor will host three practice sessions so you can learn how to access the course, login, and communicate with the instructor and other classmates. Dates and times for practice sessions: December 30, 2009, 11:00 a.m. - 1:00 p.m. EST, December 31, 2009, 11:00 a.m. - 1:00 p.m. EST, January 4, 2010, 5:00 - 9:00 EST - by appointment. You can contact the instructor via email. [atejedor@ouboces.org](mailto:atejedor@ouboces.org)

Dates: **Jan 5 - Jan 19** Hours: **0.00** # Enrolled: **10/11** Cost: **\$0**

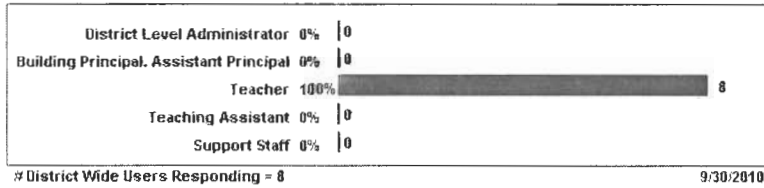
**Question #1**

**What District are you from?**



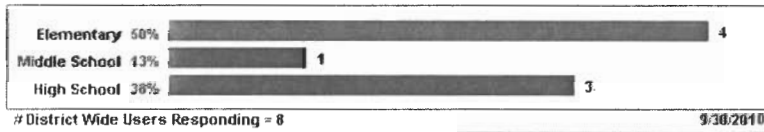
**Question #2**

**What is your position?**



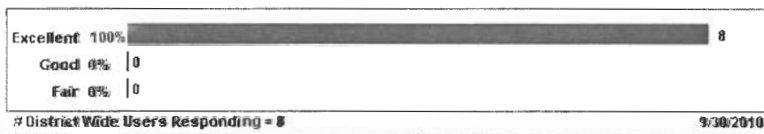
**Question #3**

What grade Level do you work with the most?



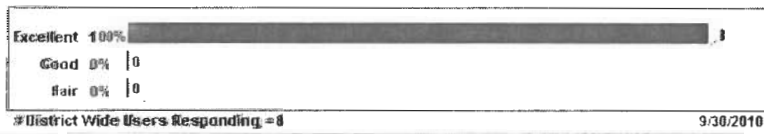
**Question #4**

How would you rate the organization of this workshop?



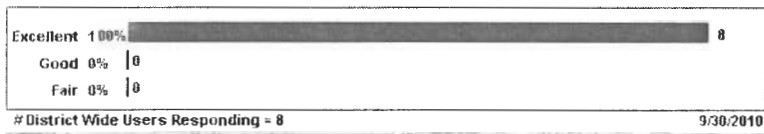
**Question #5**

How would you rate the content of this workshop?



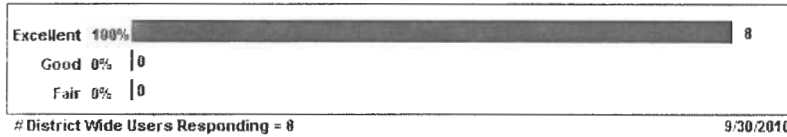
**Question #6**

How would you rate the usefulness/applicability of this workshop?



**Question #7**

How would you rate the overall presentation of this workshop?

**Question #8****What did you like most about this session?**

# Responses are Anonymous

1. Andrea is so helpful especially with the new programs she had us using.
2. I enjoyed the ability to share ideas with others during the webinar.
3. I learned so many different sites I can create for my classroom.
4. First of all I liked the fact that it was taught completely on-line. Also, the instructor did not just give an overview of the material and the need to involve 21st Century technology in learning, but created assignments for us where we had to use the technology to create our own presentations, blogs, etc.
5. informative
6. Andrea presented material clearly and effectively.
7. I loved all of the interactive websites and wikis that we learned to implement within he classroom.
8. New web based options for student/teacher use

**Question #9****What practical/professional application does this session provide?**

# Responses are Anonymous

1. I continue to get ideas and new things to do with my resource students.
2. This session provided many educational tools that I can modify and use in my classroom.
3. Technology in the classroom.
4. The material presented is highly applicable for today's schools.
5. excellent ways to incorporate technology
6. Students will benefit from and enjoy being engaged with the interesting and useful 2.0 web tools.
7. We learned jogtheweb.com which is a great tool to use with students during computer lab to organize/jlimit websites and material you could have your students research.
8. integrate into curriculum

**Question #10****How could this program be strengthened or improved?**

# Responses are Anonymous

1. I would like to have a chunk of time added onto the workshop where we can work in a lab with supports.
2. The presenter did a wonderful job at organizing the information and answering questions in a timely manner.
3. Less people in the class.
4. I would love to see a follow-up session.
5. more hours
6. Part 2 - a continuation would be wonderful!
7. It could have been done over a longer period of time because there was a lot of information to absorb.
8. offer second session

**Question #11****How will you use this information to strengthen your own districts' practices?**

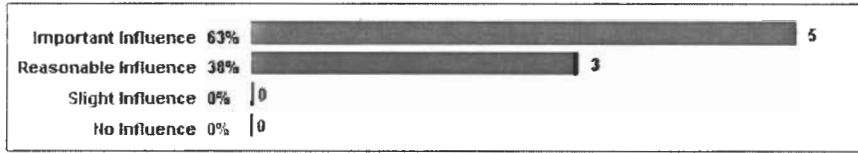
# Responses are Anonymous

1. I will show my students some of the programs and software learned.
2. The information will strengthen my district's practices when I share with my colleagues and use the new technology to enhance my student's interests in various topics.
3. Share the information with faculty and staff in my building.
4. I was immediately able to incorporate the projects I created for this class into my classroom.

- 5. *integrating technology*
- 6. *Have already passed along some of the information and their applications.*
- 7. *I will share all of the internet websites and technologies with my fellow co-workers.*
- 8. *use sites for instruction*

**Question #12**

**Degree to which you think student performance can be improved using this information and/or materials?**



# District Wide Users Responding - 8

9/30/2010

**Options**

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Appendix E

Evaluation for Case #3: Moodle



## Instructional Services Activity Evaluation

### Interactive Viewer

#### Activity Information

##### Publishing 2020

This is a 5 week course taught entirely online in Moodle. There are five weekly modules which will open on the following dates: Module 1 - October 18: Introduction to Publishing 2020; Module 2 - October 25: Tools for Research; Module 3 - November 1: Tools for Planning and Organization; Module 4 - November 8: Creating and Hosting Presentations; and Module 5 - November 15: Publishing.

Publishing in the 21st Century has moved from a print medium to a virtual or electronic one. Subsequently, online learning is quickly growing as an option and opportunity for students in the K-12 environment. This course will introduce teachers to the tools available for the online environment, especially sites for Web 2.0 and publishing media such as video, audio, images, and text. Teachers will have hands-on activities to learn these tools and learn the pedagogy that works best with online. Whether teachers want to create a blended face-to-face class or a fully online course, they will gain the fundamental knowledge needed to publish and showcase student work in a virtual environment allowing individuals to communicate and collaborate.

Start date: Oct. 18  
End date: Nov. 19

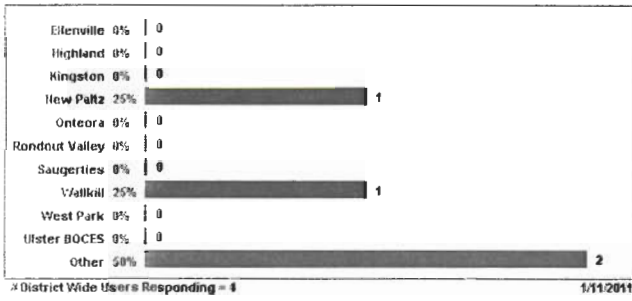
Moodle URL: <http://moodle.ucbores.org/course/view.php?id=709>

Enrollment key: elearning

Dates: **Oct 18 - Nov 19** Hours: **0.00** # Enrolled: **9/30** Cost: **\$0**

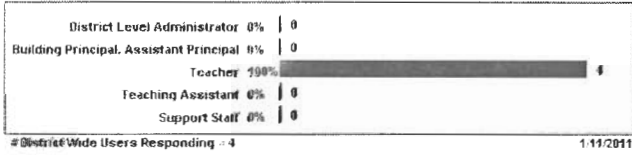
#### Question #1

What District are you from?



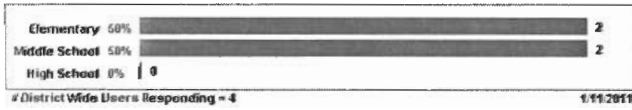
Question #2

What is your position?



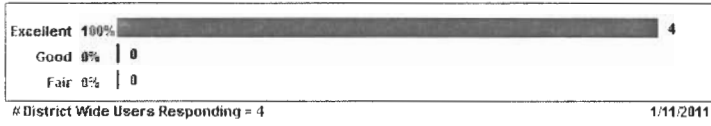
Question #3

What grade Level do you work with the most?



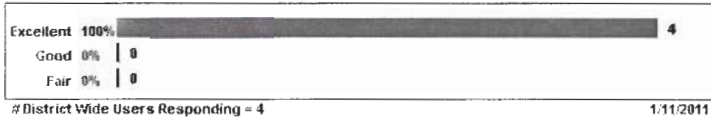
**Question #4**

How would you rate the organization of this workshop?



**Question #5**

How would you rate the content of this workshop?



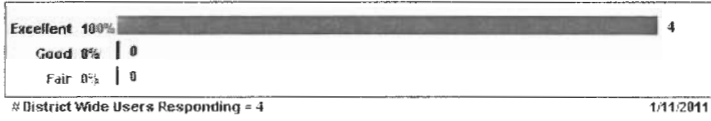
**Question #6**

How would you rate the usefulness/applicability of this workshop?



**Question #7**

How would you rate the overall presentation of this workshop?



**Question #8****What did you like most about this session?****# Responses are Anonymous**

1. *I liked that there was a great deal of information, but had the ability to view it when time was available. I never felt rushed and information was easily accessed.*
2. *very useful*
3. *I thoroughly enjoyed learning about all the tools available as resources on the internet.*
4. *The depth and range of subjects and material covered.*

**Question #9****What practical/professional application does this session provide?****# Responses are Anonymous**

1. *I enjoyed using the presentation tools. It was exciting to use different sites to present instead of only PowerPoint.*
2. *I've already used many of the resources with my students*
3. *I envision myself using some of the presentation tools in the classrooms I service*
4. *I am now familiar with a number of new online publishing tools, tools that I can teacher to students and teachers.*

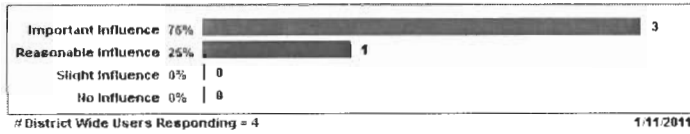
**Question #10****How could this program be strengthened or improved?****# Responses are Anonymous**

1. *I don't believe this workshop needed to be improved in anyway. The work load was just enough.*
2. *n/a*
3. *I have no suggestions.*
4. *Strengthened. It would have been useful to meet in person once or twice during the course.*

**Question #11****How will you use this information to strengthen your own districts' practices?****# Responses are Anonymous**

1. *I plan on using a selection of the presentation tools. Students will enjoy several of the new sites.*
2. *I use the resources with my students and share with my staff*
3. *I will share this information with colleagues in order to expose them to the resources that they are not familiar with at this time, in order to enhance and supplement the curriculum*
4. *I will integrate what I learned into my day-to-day instruction and will also offer to instruct teachers in how to use some of the tools.*

**Question #12****Degree to which you think student performance can be improved using this information and/or materials?**



Options

Back View/Print All Download All To Excel Admin Tools

BACK