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**THE EFFECTS OF A CONSTRUCTIVIST INTERVENTION ON
PRE-SERVICE TEACHERS' CONFIDENCE AND
PERCEPTIONS OF THE EXPERIENCE**

A Dissertation
Presented for the
Doctor of Philosophy Degree
The University of Tennessee, Knoxville

Kathryn Ann DiPietro
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Dedication

This dissertation is lovingly dedicated to my son,
Christopher John DiPietro.

Acknowledgements

*A teacher who can arouse a feeling for one single good action,
for one single good poem, accomplishes more than he who fills
our memory with rows and rows of natural objects, classified
with name and form- Johann Wolfgang von Goethe.*

Most sincere thanks to my teacher, Ed Counts.

*To be a teacher in the right sense is to be a learner. Instruction
begins when you, the teacher, learn from the learner, put yourself
in his place so that you may understand what he understands
and in the way he understands it- Soren Kierkegaard..*

For patiently teaching me, thank you my students.

*To teach is to be tender, loving, strong, and giving to all who
rely on you; to encourage and praise. But to teach well is to
believe in what and whom you teach- Donna Bulger.*

For believing in me, thank you Norma Mertz and Mary Jane Connelly.

A good leader, it is said, inspires other people with confidence in the leader, a great leader inspires them with confidence in themselves-Raymond Dreyfack,

For inspiring me with confidence in myself, thank you Ronald Taylor.

The glory of friendship is not the outstretched hand, nor the kindly smile, nor the joy of companionship; it is the spiritual inspiration that comes to one when you discover that someone else believes in you and is willing to trust you with a friendship- Ralph Waldo Emerson.

For believing in me and trusting me with your friendship, thank you Sharon Husch.

Put into one scale the pleasures which any object may offer, but put fairly into the other the pains which are to follow, & see which preponderates. The making an acquaintance is not a matter of indifference. When a new one is proposed to you, view it all round. Consider what advantages it presents, & to what inconveniences it may expose you. Do not bite at the bait of pleasure till you know there is no hook beneath it. The art of life is the art of avoiding pain: he is the best pilot who steers clearest of the rocks & shoals with which he is beset- Thomas Jefferson

For thinking with your head, yet listening to your heart,
thank you William F. Bird

*The bond that links your true family is not one of blood,
but of respect and joy in each other's life- Richard Bach.*

For your respect and love, thank you Mom, Dad,
Jennifer, Chris, P.J. , Bob, Katie, Erika, and Liisa.

*I am irritated by my own writing. I am like a violinist whose ear is
true, but whose fingers refuse to reproduce precisely the sound*

he hears within- Gustave Flaubert.

For helping me tune the violin and play the melody,
thank you Laurie Knox.

Abstract

The purpose of this study was, first, to determine the effect of a constructivist intervention supported by technology on pre-service teachers' confidence in their own ability to plan and create six constructivist learning activities supported by technology and, second, to understand their perceptions of the experience.

Participants were 23 pre-service teachers accepted into the College of Education's Masters program at the University of Tennessee Knoxville and enrolled in an introduction to instructional computing course during the summer of 2001.

A survey was used to assess pre-intervention confidence levels and experience with six constructivist learning activities supported by technology. Students were then situated in a class that employed constructivist methodology supported by technology to facilitate their own exploration of constructivist pedagogy supported by technology. Once students completed the class, they were asked to re-take the portion of the survey that focused on their confidence to plan and create constructivist learning activities supported by technology. A paired samples t-tested was used to compared pre-intervention confidence levels with post-intervention confidence levels. The results revealed a significant difference, $p \leq .001$, in each of the six areas.

Journals, focus groups, and interviews were used to gain insight into the participants' perceptions of the experience and suggested a reflective process. Participants engaged in thinking about, comparing, and adapting their constructs of teaching, learning, and the use of technology. They were self-motivated to analyze how their constructs of teaching and learning might work in future classes, the

processes they used while situated in a constructivist learning environment, the instructor's role in their learning, their collaborative/collegial relationships with peers, how specific materials supported learning, and their technology skills.

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Chapter 1

Introduction

Perhaps the real benefit of educational technology will be an institutional transformation to a more student-centered and learning-focused educational process, where the tools for inquiry-based teaching and learning are more practically available. At least the potential is there (Johnson, Schwab, & Foa, 1999).

Background of the Problem

On March 31, 1994, in an effort to raise student achievement scores, Congress and former President Clinton signed into law Goals 2000: The Educate America Act. This came partly as a response to the 1983 report A Nation at Risk (The National Commission on Excellence in Education, 1983), which described the performance of United States students as lagging behind that of students in other countries. Further, the act was an effort to focus educational improvement by establishing national goals, grants, and incentives by which states could work toward increasing student academic performance. One of the ways Congress proposed to minimize gaps in education was by passing the Technology for Education Act of 1994 (United States Congress, 1994). In this act, Congress asserted that technology was an effective instructional tool and that its use was critical to meeting the national educational goals. The Technology for Education Act of 1994 called for a long-range plan that targeted specific areas, among them the professional development of teachers in the use of technology in instruction (United States Congress, 1994). To further facilitate meeting the goals of the Technology for Education Act of 1994, the Department of Educational Technology was created within

the Department of Education. The Department of Educational Technology defined four foci/pillars: equipment, connection to the Internet, software, and teacher training. Pillar IV, “Teachers will be ready to use and teach with technology,” specified teacher training as a critical factor in improving education (United States Department of Education, Office of Educational Technology, 1998). Thus, the importance of technology as a tool in education and teacher training was acknowledged.

To address the integration of technology into educational systems, the United States Department of Education allocated \$958 million for the year 2000 (United States Department of Education, Office of Educational Technology, 2001). These funds were earmarked to equip schools with technology and Internet connectivity, to develop innovative uses of the technology and to train teachers (United States Department of Education, Office of Educational Technology, 2001). Since 1995, over \$8 billion in federal funds has gone into placing the latest technologies in the hands of educators and training them to use those technologies (United States Department of Education, Office of Educational Technology, 2001). For the year 1999-2000, an estimated \$5.67 billion was spent purchasing hardware, software, and staff development (Market Data Retrieval, 2000). Due in part to these incentives, there has been a dramatic increase in the availability of microcomputers in education. Only 30% of schools had computers in 1982, while over 98% of schools had computers in 2000 (Market Data Retrieval, 2000). Over 94% of schools are connected to the Internet, and over 80% of teachers have Internet access in their classrooms (Market Data Retrieval, 2000). Also, the student-to-computer ratio has decreased from 125-to-1 in 1981, to approximately 5-to-1 in 2000. (Market Data Retrieval, 2000).

However, counting computers and Internet connections does little to capture the reality of how technology is being used in schools. The value of any instructional tool in a school depends on the way it is used. In general, educators have not adopted technology as an instructional tool. At The Secretary's Conference on Educational Technology, Goldman, Cole, and Syer (1999) spoke to the use of technology by teachers:

Most teachers and students use word processors. We see teachers who use spreadsheets, simulations, CAD systems, and multimedia software....While we have seen many demonstrations of the content learning we know is possible, we have not seen a large-scale adoption of technology in core subject areas (para. 2).

In summary, as early as 1983 educators began to look for ways to resolve lagging student performance, including the use of computers and technology. For the last thirteen years, there have been multiple efforts to advocate and promote the dissemination and the use of instructional technology. Notably a Congressional act was passed that asserted technology has become a critical instructional tool. This act, the Technology for Education Act of 1994, has led to the development and adoption of national and state technology plans. The Department of Educational Technology was created to oversee and guide the infusion of technology into educational systems. Funds have been allocated-- over \$8 billion since 1995 in federal funds alone-- to assist with the integration of computers into education. In one year, 1999-2000, over \$5.67 billion in state and local funds was used to subsidize educational technology in K-12. Computers are now commonplace in classrooms and accessible; teachers are receiving training. "On the average schools offer 19 hours of technology-related professional development" per year (Data Market Retrieval, 2001). Accrediting institutions such as the Southern Association

of Colleges and Schools (SACS) require that all students enrolled in teacher preparation programs must take a course in educational technology.

Despite these large-scale efforts, the problem remains: in general, teachers are not adequately prepared to use technology effectively as a resource. The National Center for Educational Statistics reports that only one in five teachers feels well-prepared to integrate technology (1998). These findings are echoed throughout the literature. In a 1999 survey conducted by Education Week teachers reported that they felt unprepared to use technology (1999). In 1988, The Office of Technology Assessment (OTA) reported that less than half of all teachers were using computers in their teaching despite beliefs about their effectiveness and desires to use them. OTA released a compilation of these findings in a report titled “Power on! New Tools for Teaching and Learning” (1988). OTA reported that teachers were not using technology to present curriculum due to inadequate training. In 1995, OTA released “Teachers and Technology: Making the Connection,” a report of its study of teacher education system and training programs. OTA (1995) found that although over 89% of teacher training institutions offered some form of computer training, these programs were inadequate:

Teacher education programs in the United States do not prepare graduates to use technology as a teaching tool. For example, although the majority of colleges surveyed offer a course in information technology (educational computing, educational media, or instructional technology), only slightly half require that their students take such a course (1995, pg. 184).

Seventy-one percent of graduates did not feel the training sufficiently prepared them to use computers in their teaching (Office of Technology Assessment, 1995).

Traditionally, the emphasis in teacher-training regarding the use of technology has been on technology-related knowledge and skills. Content has centered on training teachers how to operate a computer. OTA found this approach deficient and insisted that “teachers need both training and education. They need to know not only how to work the technology, but how to use it in their instructional practices” (George, 1995, para. 6). To better prepare teachers, the President’s Committee of Advisors on Science and Technology: Panel on Educational Technology (1997) encouraged a switch in focus to “learning *with* technology, not *about* technology” (para. 70).

Teachers want to know how to use technology within an instructional paradigm that enhances student achievement. Research indicates that teachers whose pedagogical beliefs are consistent with constructivist learning theory are more likely to use technology in their practices. Fisher (1997) surveyed 287 Colorado public school teachers to determine the degree of importance they assigned to 10 technology literacy competencies. These teachers viewed the ability to use constructivist teaching pedagogy supported by technology as the most critical technology competency. Becker (1999) surveyed approximately 2,250 teachers to determine Internet use. As part of the study, Becker examined teachers’ pedagogical beliefs and practices in relationship to Internet use. What he found was “the more constructivist the teacher the greater their average use and the more positively they viewed the Internet” (para. 56). Teachers’ pedagogical beliefs and understanding of constructivism are critical factors for determining if and how technology is used to enhance learning.

The challenge is how best to prepare teachers so that they can create constructivist learning activities supported by technology. In general teachers adopt instructional

methods that emulate those they have experienced. A policy report by North Central Regional Educational Laboratory (NCREL) (1994) describes the impact of prior instructional experiences on teachers:

Critics of higher education also are frustrated with the way teachers are trained -- specifically, the didactic approach to undergraduate instruction. They contend that, because teachers teach the way they were taught, the passive lectures that students experience in college leave them ill-prepared for the active learning approaches (with the teacher serving as coach) that are being adopted in schools throughout the country. During pre-service preparation, few students are provided with experiences in school management, curriculum development, and diverse pedagogical strategies (such as team-teaching, using technology to supplement instruction, or integrating curriculum (1994, para. 1).

Cognitive psychology and constructivist models suggest an approach to learning that emphasizes (a) active participation; (b) constructed knowledge (learning by doing, exploring, trying, failing, changing and adapting strategies); (c) a context for not only what is learned, but how it will be used (problem-solving and processes); (d) modeling (novice/expert teaming); (e) context in which the learning occurs; and (f) cooperative strategies (collaborative/conversational) (Jonassen, Peck, & Wilson, 1999; McKenzie, 2000; Berryman, 2001; Trondle, Mandl, Fischer, Koch, Schlichter, & Teeger, 2001). In a discussion of meaningful constructivist learning and the use of technology, Jonassen, Peck, & Wilson (1999) outline five interdependent attributes for meaningful learning:

- Active (Manipulation/Observant): Participants “actively [manipulate] the objects and tools of the trade and [observe] the effects of what they have done” (p. 8).

- Constructive (Articulative/Reflective): Participants construct meaning by reflecting on the process and articulating their experiences and conceptual understandings.
- Intentional (Reflective/Regulatory): Participants engaging in intentional learning while trying to achieve a cognitive goal, reflecting, evaluating, and articulating the process, “decisions they make, strategies they use, and the answers they found” (Jonassen, Peck, & Wilson, 1999, p. 9).
- Authentic (Complex/Contextual): Participants engage in learning activities that are complex and contextual.
- Cooperative (Collaborative/Conversational): Participants engage in collaborative activities during which they dialog about a task, the methods they will use to accomplish the task, as well as seeking out alternative ideas and opinions.

Statement of the Problem

Evidence from research, theory, and practice indicates that technology has the potential to enhance learning. Critical to its effective use, however, is teacher training. Despite multiple efforts to advocate the use of instructional technology and billions of dollars spent to make technology accessible and fund training, teachers still report that they are not confident in their ability to use technology to enhance learning. Teachers identified the ability to use constructivist teaching pedagogy supported by technology as the most critical technology competency (Fisher, 1997). Teachers tend to emulate the instructional strategies of their instructors (National Central Regional Educational Laboratory, 1994). Attributes of meaningful constructivist learning have been identified (Jonassen, Peck, & Wilson, 1999). However, previous research has not focused on how

situating pre-service teachers in a learning environment that models constructivist methods supported by technology affects pre-service teachers' confidence in their own ability to plan and create constructivist learning activities supported by technology. Research is needed in order to arrive at a more complete understanding of how such a method may affect pre-service teachers' confidence to plan and create constructivist activities supported by technology.

Purpose of the Study

The purpose of this study is to determine the effects of situating pre-service teachers in a constructivist learning environment supported by technology first, on those pre-service teachers confidence in their own ability to plan and create constructivist lessons that integrate technology and second, their perceptions of that experience. Guided by the problem and the purpose of the study, the following research questions emerge:

- What is the effect of an instructional approach that focuses on constructivist pedagogy supported by technology on pre-service teachers' confidence in their own ability to plan and develop constructivist learning activities supported by technology?
- How do pre-service teachers perceive the experience of participating in an instructional technology course that employs a constructivist pedagogical approach and uses?

Significance of the Study

This study has the potential to suggest instructional methods that may enhance teachers' confidence in their ability to use instructional technology. The current study may, in addition, prove significant by pointing out methods that are ineffective by giving a voice to pre-service teachers and seeking to understand their perception of their learning. This is a significant contribution in view of the following findings. First, many teachers are not currently using the computers for more sophisticated student-centered applications such as data analysis, exploration, simulations, or other high order thinking skills that develop conceptual understandings (Education Week, 1999; Fulton & Torney-Purta, 1999; Cuban 1999). Second, teachers whose pedagogical practices are constructivist in nature are more likely to use technology to enhance learning (Becker, 1999). Third, teachers report that their ability to employ a constructivist approach is the most critical factor in determining their use of technology instructionally (Fisher, 1997). Fourth, cognitive psychology and constructivist models suggest an approach to learning that is active, constructive, intentional, authentic, and cooperative (Jonassen, Peck, & Wilson, 1999; McKenzie, 2000; Berryman, 2001; Trondle, Mandl, Fischer, Koch, Schlichter, & Teeger, 2001). Fifth, teachers tend to adopt instructional strategies that emulate those they have experienced as learners (NCREL , 2001). Finally, there is currently a lack of research outlining methodology to enhance teachers' use of constructivist pedagogy integrated with technology (Norris, Smolka, & Soloway, 1999).

Methods and Procedures

Constructivism and adult learning theory provided the conceptual framework for the study and guided the design, execution, and framework for the analysis of data. Using a quasi-experimental approach, this study explored the effect of a constructivist pedagogical intervention on the confidence of pre-service teachers in their own ability to develop constructivist learning activities that use technology to enhance learning as well as the participants' perceptions of the experience.

The participants in the study were 23 pre-service teachers who had been accepted into the University of Tennessee Knoxville (UTK) College of Education's teacher education program and were enrolled in Instructional Technology, Curriculum, and Evaluation 486: Introduction to Instructional Computing (ITCE 486) Section 26986 for the Summer 2001 semester. To answer the research questions, a variety of methods were used: pre- and post-intervention surveys, journal entries, interviews, and focus groups. Participants were given a pre-intervention survey and asked to rank their confidence in their ability to plan and create various constructivist learning activities supported by technology. After the intervention, they were given a post-intervention survey and again asked to rank themselves in the same areas. The pre-intervention survey and the post-intervention survey were used, in part, to determine the effect of the intervention. A two-sample paired t-test was used to analyze the difference in pre-intervention and post-intervention results. Because one of the goals of this study was to give a voice to pre-service teachers situated in a course that used constructivist methodology as well as to understand their perceptions of being situated in such a course, participants were asked to keep a weekly journal of their thoughts about the experience. Data were also gathered

from the journal entries. Once data were analyzed, themes were identified and shared in focus groups with all the members of the study or used to develop interview questions. Journal entries, focus groups, and interview data were used to reveal participants' experience of being situated in such a course.

Assumptions

The following assumptions apply to this study:

- Participants are honest and conscientious in completing the surveys, answering interview questions, and writing their journal entries.
- The interviewer will not ask questions that lead or bias the participants.
- The participants in this study are representative of pre-service teachers accepted into the College of Education at The University of Tennessee, Knoxville.

Limitations

The following limitations apply to this study:

- The principal researcher is also the instructor of the course (intervention) and, thus, may bias the study despite attempts to not do so.
- This study is limited to pre-service teachers at The University of Tennessee, Knoxville who have been admitted into the College of Education's Master of Education program.

Definition of Terms

- A constructivist approach

Involves having students work on complex projects, often in groups, and often with different groups working on different projects. In this model, students learn skills and concepts in the context of using them to do something—for example, in making a project. These projects follow from a constructivist theory of learning that suggests that subject-matter becomes meaningful, and therefore understandable, only when it is used in context-rich activities. Teachers whose instructional plan follows from constructivist learning theory not only use group projects more than other teachers; they will, for example, emphasize the student's own responsibility for designing their own tasks, for figuring out their own methods of solving problems, and for assessing their own work—all as a means of making learning tasks more meaningful to students (Becker, 1999, para. 53).

- The terms 'pre-service teacher,' 'students,' and 'participants' are used interchangeably throughout the study and are students who are currently accepted into a teacher education program and enrolled in coursework at The University of Tennessee, Knoxville in the College of Education. Successful completion of such coursework will lead to professional teaching licensure.
- ITCE is an acronym used by the College of Education at The University of Tennessee, Knoxville to denote their Instructional Technology, Curriculum, and Evaluation department.
- Grade level is used to mean the grade level that the pre-service teachers would like to teach.

Organization of the Study

This study is organized in five chapters. Chapter One introduces the problem, gives the rationale for the study, states the problem and significance of the study, poses research questions, summarizes the methods and procedures used to answer those questions and identifies assumptions, limitation, and definitions. Chapter Two provides a critical review of related research on technology availability and use in K-12 schools and classrooms, pre-service teacher training and technology; and teacher beliefs, practices and technology use. Chapter Three describes the methods and procedures used, including the design of the study, the questions that guided the research and methodology, and the methods used to analyze the data, including the statistical procedures. Chapter Four provides a summary of all the data as well as the results in relationship to the guiding questions. Chapter Five presents a synopsis of the study, the conclusions and implications that can be drawn from the study as well as some recommendations for further research. A reference section and an appendix follow these five chapters. The appendix contains forms and other materials used in the study.

Chapter 2

Review of the Literature

This chapter provides a review of the research and literature related to (a) technology availability and use in classrooms, (b) pre-service teacher training and technology, and (c) teacher beliefs, practices, and technology use.

Technology Availability and Use in K-12 Schools and Classrooms

It is undeniable that many gains have been made in the availability of technology in K-12 schools. Computer-to-student ratios have dropped from 125-to-1 in 1981, to approximately 5-to-1 in 2000 (United States Department of Education National Center for Educational Statistics, 2000). Both Macintosh and Windows platforms are commonly found in public schools (United States Department of Education National Center for Educational Statistics, 2000). Forty-eight percent of all computers are DOS or Windows machines and 38% are Macintosh (United States Department of Education National Center for Educational Statistics, 2000). In elementary and middle schools Windows/DOS and Macintosh computers are more evenly distributed than in high schools, where Windows/DOS machines are the predominate platform (United States Department of Education National Center for Educational Statistics, 2000). While there has been a dramatic increase in computer technology in schools, many of the computers have limited capacity. Fifty-one percent of all computers available in K-12 schools are unable to run multimedia applications effectively and are outdated (Education Week, 1999). Nevertheless, the dramatic increase in the number of computers available in

classrooms is undeniable. A trip to an average school will attest to the presence of technology. Ninety-nine percent of all public school teachers have access to computers somewhere in their schools and 84% have computers in their classrooms (United States Department of Education National Center for Educational Statistics, 2000). Forty-three percent of the computers in K-12 schools are found in computer labs and 48% are located in classrooms (Anderson & Ronnkvist, 1999). Principals, secretaries, media specials, guidance counselors, and support personnel have fewer than 9% of the computers located in schools, a change from the practice that prevailed when computers first found their way into our nations' schools and were used predominately for administrative functions (Anderson & Ronnkvist, 1999). Over 94% of schools and 80% of classrooms have Internet access (Market Data Retrieval, 2000). While the recent increase in the number of computers in schools and classrooms may lead one to draw the optimistic conclusion that technology has been successfully infused into K-12 education, a review of related literature on how technology is used in classrooms paints a different picture.

National surveys reveal limited instructional use of technology in both K-12 settings and in teacher education programs (Education Week, 1999; Trotter, 1999; United States Department of Education, 2000). In a 1999 national survey, K-12 teachers were asked how often their students used technology during a typical week: forty percent said not at all, and 30% reported that their students used computers just one hour per week (Education Week, 1999). Similarly, fourth grade, eighth grade, and twelfth grade students were asked how often they used computers for schoolwork. Fifty-five percent of fourth graders reported never or hardly ever using computers for schoolwork, while 34% of eighth graders and 22% of twelfth graders reported never or hardly ever using

computers for schoolwork (Education Week, 1999). Kindergarten-12 teachers are more likely to use computers and the Internet when they are in their classrooms than when they are outside of them, but students are more likely to use them outside. Teachers and students with computers in their classrooms are more likely to also use computer resources outside their classrooms than those who do not have computers in their classrooms. The greater the number of computers in the classroom, the more frequently technology is used (United States Department of Education, 2000). The most common use of technology in K-12 schools among all teachers is word processing. Yet only half of the nations' teachers use word processing in three or more lessons per year. Skill-practice games are the next most commonly used application, by just over one in four teachers in three or more lessons per year, followed by simulations and exploratory type software, which are used by only 23% of teachers three or more times per year. Spreadsheets and databases are used rarely: only 16 % of teachers reported using spreadsheets or databases in three or more lessons a year (Education Week, 1999). Even in secondary science classrooms where data analysis and simulations are valuable tools, word processing software was the predominately-used computer technology. Forty-one percent of teachers reported using word processing in three or more lessons per year, compared to 22% using simulation/exploration environments and 17% using data-analysis software such as spreadsheets and databases in three or more lessons per year (Education Week, 1999). When asked to identify their objectives for student computer use, teachers were more likely to identify research, word processing or improving computer skills than information analysis or skill mastery (Education Week, 1999). Thus, teachers are not using the computer for more sophisticated applications such as data

analysis, exploration, simulations, or other high order thinking skills that develop conceptual understanding (Education Week, 1999; Fulton & Torney-Purta, 1999). Concerning the issue of whether the increase in the availability of computers in the classroom may motivate teachers to use them more effectively, one provocative study has suggested that a shortage of classroom technology may actually have positive effects, forcing technology-integrating teachers to reorganize and restructure lessons in ways that move away from whole-class instruction to collaborative student-centered instruction (Johnson, Schawab, & Foa, 1999).

Pre-Service Teacher Training in Technology

Over the next decade there will be a large scale hiring of teachers. The National Council for Accreditation of Teacher Education (NCATE) estimates that over two million teachers will be hired during that time (Education Week, 1999). These two million new teachers will comprise over half of the nations' educators (Gerald & Husser, 1991). In regard to training these teachers to use technology, the question has moved beyond "if" to "how" (Scheffler & Logan, 1999). NCATE requires all teacher education institutions to include technology training in their programs and further emphasizes technology as central to the teacher preparation process (Wise, 1997). By 1999, forty-two states were requiring teacher preparation programs to include a course in instructional technology, although there is wide discrepancy among states in exactly what kind of training is required. Even with these efforts, a survey of 416 colleges of education found that pre-service teachers are not adequately taught to integrate technology into their teaching practices (Milken, 2001). Although most teachers believe technology is a

valuable and important teaching tool, fewer than 20% of all teachers feel adequately prepared to integrate technology into the curriculum (Scheffler & Logan, 1999). A lack of confidence in their ability to use technology as well as a lack of skills in using technology in a meaningful integrated manner have stifled technology's potential as a learning tool (Office of Technology Assessment, 1995). NCATE points the finger at colleges of education:

Bluntly, a majority of teacher preparation programs are falling short of what needs to be done. Not using technology much in their own research and teaching, teacher education faculty have insufficient understanding of the demand on classroom teachers to incorporate technology into their teaching. (Trotter, 1999, para 85)

Although technology is readily available in most teacher education programs, a study by Persichitte, Tharp, and Caffarella (1997) found that only 45% of education program faculty members use technologies in their classes. Further, only 40% of students enrolled in teacher education programs are required to design and deliver instruction using technology. When asked the extent to which they exposed their pre-service teachers to technology in their classes, field experiences, and curriculum materials, the majority of faculty members at 416 teacher preparation institutions disclosed that they generally do not practice or model the use of technology:

There is inconsistency between what teacher-training faculty know about technology and what they are training teachers to do in their courses... We can be confident that there is more technology awareness and experience out there, but it

is not being used in teacher training to the extent nor manner we think necessary.

(Milken, 2001, para. 6)

Over 70% of teacher training programs require students to take three or more credit hours of courses that focus on technology, and pre-service teachers get an equivalent amount of exposure to technology in their other courses; still, most faculty members do not feel that the training is adequate (Milken, 1999). Further investigation reveals that despite having an adequate technology infrastructure, most colleges of education do not have technology enhanced-classrooms that would allow the use of the Internet and other technologies to be modeled routinely by faculty (Milken, 2001).

Hargrave and Hsu (2000) surveyed 88 institutions of higher education belonging to the Holmes Group, a national consortium of research institutions “committed to making programs of teacher preparation more rigorous and connected to liberal arts education, research on learning and teaching, and wise practice in schools” (p. 305). The intent of their survey was to derive information about instructional technology courses that teacher preparation colleges mandate for their pre-service teachers. Seventy-three percent of the colleges reported offering a specific introduction to instructional technology course. At 60% of these colleges, the course was three credit hours with three contact hours per week. Eighty-three percent of those colleges reported that the course was taught in a lecture and lab format, and no prerequisites were required for enrollment in the course. The primary focus of these courses was computer technology. While over 50% of the institutions reported addressing and using computer-based instruction (packaged software such as drill and practice, tutorials, educational games, problem-solving, and simulations), the majority of the institutions identified classroom design,

needs analysis, audience analysis, task analysis, and situated cognition as topics not covered in the courses. Yet, teachers are expected to use technology to provide meaningful student-centered curriculum-oriented learning activities for their students. The question of “how ” begs an answer.

What are the best practices for teaching technology? Evidence supports an approach that is integrated and provides students not only with a single instructional technology course, but also with methods and elective courses that integrate and model technology throughout the program (Todd 1993; Wetzel, 1993):

The use of technology in everyday classroom and practicum experiences seems to be more important than specific computer classrooms....Specific technology training has a role, but only up to a point. The institutions that reported the highest level of student technology skills and experience were not those with heavy computer course requirements, but those that made use of technology on a routine basis throughout the teacher training program. (Milken, 2001, para. 10)

Optimally, pre-service teachers should be exposed to and have experiences with computers prior both to their entering teacher education programs and to their teaching (Liu, Reed, & Phillips, 1992; Koohang, 1987). Their experiences with technology should be practical and immediately applicable in order to ensure practice, transfer of skills, and relevancy (McKenzie, 2001; Woodrow, 1990).

Technology needs to become a personal tool for pre-service teachers, one they use expressively, creatively, meaningfully and purposefully. Teachers who use computers personally and own personal computers are more likely to feel less anxious about integrating them into their practices (Laffey & Musser, 1998; Hochman, Maurer, &

Roebuck, 1993; Kearns, 1992). Critical to the use of technology is enjoyment. Fostering positive attitudes toward computers can improve performance, as a relationship has been found between computer anxiety, poor performance and a negative attitude toward computers (Honeyman & White, 1987). In a review of how technology can affect learning, one of the conclusions that Valdez, et al. (1999) drew is that technology can make learning more enjoyable. Rodriguez & McDonald (2001) noted that one of the outcomes of providing training and support for teacher- and student-use of online curriculum materials (eeZone), was that “students enjoyed using the materials and found the experience to be fun” (p. 17). From this, they extrapolated that because the students found it appealing and motivating to learn using interactive online curriculum materials, they would be more likely to find and use other interactive web-based science curriculum materials. Also crucial to the use of technology is self-efficacy. Teachers’ beliefs about their ability to use computers instructionally have been “repeatedly reported as a major factor in understanding the frequency and success with which individuals use computers” (Eachus & Cassidy, 1999, p. 2).

Drawing on adult learning theory, McKenzie (2001) emphasized the importance of making the learning experience self-directed, contextual, and relevant both to personal interests/needs and to daily practice. Learning to use technology not only involves the acquisition of computer skills, but also is a process whereby students try, fail, access, evaluate, analyze and apply skills as well as processes meaningfully (McKenzie, 2001; Scheffler & Logan, 1999). These skills and processes are best learned when they are not taught as isolated skills to be used at a later time, but are acquired within the context of accomplishing a meaningful task (Harel & Papert, 1991). Meaningful tasks for using

technology might include researching, analyzing data, applying and representing knowledge, communication, and collaborating (Scheffler & Logan, 1999). Pre-service teachers judge the potential or usefulness of computing by using a relevancy-irrelevancy dimension (Laffey & Musser, 1998). Pre-service teachers want to know how to apply the technology skills in the context of learning and teaching. Without the experience of applying technology skills, students have a limited vision of technology integration and “maintain a vision of a technology-rich class as one that has ‘lots of computers for students to spend lots of time on, playing games and tutorials’” (Beyerbach, Walsh, & Vannatta, 2001, p. 116). Further, they tend to view technology as an add-on and rely on external factors and facilitators to infuse technology into their classrooms (Beyerbach, Walsh, & Vannatta, 2001). When describing the single change that transformed San Carlos School in Monterey, California, Adams (2000) points to the application of technologies directly and relevantly to classrooms (job-embedded training): “Our technology center ceased to be viewed as a separate entity and has become an extension of each teachers’ classroom. What the technology is being used for comes directly from the classroom curriculum” (p. 116). Calls for job-embedded learning are echoed through the literature (Sparks & Hirsch, 1997).

In essence, focusing on technology skills alone does little to move teachers to a point where they can use technology meaningfully in their classrooms. Traditionally, both in-service and pre-service technology training programs have focused on software instead of curriculum, leaving teachers unable to create or implement small-group or whole-group learning activities that use technology meaningfully (Gilmore, 1995; Moersche, 1995; Moursand & Bielefeldt, 1999; Yildirim, 2000). These skills-based and

software-based approaches leave teachers without a clear vision of how technology can improve teaching and learning (Office of Educational Research and Improvement, 1993). Training that focuses on teaching specific technologies or the mechanics of using computer technology has little carry-over into the classroom (Beavers, 2001). What is needed is a change from a skills-based approach to an approach that incorporates technology seamlessly into subject matter in much the same way that the practical applications of technology have permeated society (Williams & Williams, 1997). Educational training in the use of technology should introduce teachers to a diverse range of technology and a variety of applications should focus on problem-solving or design, and should foster the development of creativity, adaptability and collaborative problem-solving skills (Williams & Williams, 1997). The integration of technology happens when tools are presented in the context of meaningful authentic learning situations, where users can see practical applications, engage in reflective teaching, and share their ideas with others (Spady, 1994; Warner, 1999).

Drawing on cognitive psychology, Collins, Brown, and Newman (1989) developed a cognitive apprenticeship model that teams novices and experts in a learning environment that focuses on: (a) methods that allow novices to “observe, engage in invent, or discover expert strategies in context” while experts coach, model, and encouraged exploration and independence, (b) content that focuses on concepts, facts, and procedures as well as problem-solving strategies used by experts, cognitive management strategies, and learning strategies, (c) sequencing skills from the basic to the more complex as well as conditions under which to apply the skills, (d) subject

matter/skills introduced in a context where what is being learned is used and students work together as they would in the real world.

Teaching Pedagogy and Technology Use

Perhaps the best predictor of how and whether teachers will use technology in their practice is their pedagogical beliefs (Cuban, 1990; Honey & Moeller, 1990; Dwyer et al., 1992; Ravitz, Becker, & Wong, 2000):

Constructivist-oriented teachers use computers professionally in more varied ways, have greater technical expertise in the use of computers, use computers frequently with students and apparently use them in more powerful ways. (Ravitz, Becker, & Wong, 2000, p. 55)

Further, teachers' beliefs about knowledge acquisition and about effective uses of technology are closely associated with the way they use technology in their classrooms (Niederhauser & Stoddard, 1994; Hannafin & Freeman, 1995). Technology has the potential to be a viable and valuable learning tool when put in the hands of students; however, it must be used in a meaningful, focused way, and not as busy work (Becker & Ravitz, 1999). Although traditionally technology has been used as a delivery tool, Jonassen (1994) contends that this use of technology constrains learners. Those who most benefit from the use of the technology are the designers, not the learners (Perkins, 1986). Teachers who use a more traditional teacher-centered approach may feel uncomfortable relinquishing control and allowing students to use computers meaningfully to design and create (Brooks & Brooks, 1993). For technology to be used optimally, teachers require training in pedagogy and "staff development focused on changing their pedagogical

beliefs and practices” (Trotter, 1999, p. 3). The process by which belief systems change is complex. Dwyer et al., describe a process whereby the beliefs and practices of teachers move from a traditional, text-based curriculum to a more constructivist approach (1992). They contend that the first stage, entry, is characterized by problems related to discipline, resource management, and personal frustration. During the entry stage, teachers’ traditional beliefs and practices are actually strengthened. However, as teachers progress through the next four stages-- adoption, adaption, appropriation, and invention-- there is a movement toward dynamic learning and constructivism. Honey and Moeller (1990) studied teachers’ perceptions of how and why they do or do not use technology in their teaching. They found that high-tech-using teachers engaged their students in collaboration, project-oriented work, hands-on activities, inquiry and discovery-based learning. From their study, Honey and Moeller drew the inference that changes from a traditional to more constructivist paradigm are called for in both the belief systems of teachers and in the educational system if technology is to live up to its potential. Becker (1999) surveyed 2,250 teachers to examine their use of the Internet and found that “teachers who regard education as primarily the distribution of facts and skills to students according to a fixed curriculum sequence are much less likely to exploit the Internet than more ‘constructivist’ teachers” (para. 53). What inhibits teachers from adopting technology as an instruction tool may not be a resistance to technology, per se, but instead a resistance to the change in pedagogy that accompanies the meaningful use of technology (Hannafin & Savenye, 1993).

Hooper and Rieber (1995), in seeking to understand the adoption of “idea” and “product” technologies in education, developed a model based on five progressive phases

that move teachers through a continuum from familiarization, utilization, integration, and reorientation to evolution. They assert that the “traditional perspective of educational technology focused on either the technology itself or a teacher’s instruction and is limited to the first three phases” (p. 2). Reorientation and evolution characterize the final two phases, during which educators reflect on and reconceptualize the purpose and function of the classroom and continue to evolve and adapt. To reach the final phase, learners must engage in active construction of knowledge. These researchers further contend that “the full potential of any educational technology can only be realized when educators progress through all five phases; otherwise, the technology will most likely be misused or discarded” (p. 2).

In an effort to explain why technology has not been applied more widely in education, some educators feel that the predominate value system in education is incompatible with technology’s use as a tool for meaningful learning (Cuban, 1997; Hannafin & Savenye, 1993). The traditional school organization emphasizing a teacher-centered, fact-and-skills approach to learning still predominates in many schools. The physical environments of schools are set up to arrange children in their individual seats, facing the teacher. Traditional assessment is often skills-driven and focuses on measurement of factual and discrete knowledge (Grabe & Grabe, 2001; Dwyer et al, 1992). Jaffee (2001) coined the term “pedagogical isomorphism” to describe institutional social practices and the pedagogical ecology (institutional social space). He contends that pedagogical practices in higher education are traditionally teacher-centered and lecture-based; however “reasons for isomorphism...have less to do with the proven effectiveness

of the particular practice than the desire to appear legitimate or conform to normative expectations” (p. 2).

Many researchers and leaders are calling for a pedagogical shift “from transmitting a body of knowledge that is largely memorized to one that is largely process oriented” (Conway, 1997, p. 1). There is wide spread agreement among researchers about the characteristics of an optimal learning environment. Ideally, students should have an active voice in determining learning goals and activities so that learning is personally relevant. Relevancy is a critical component of an optimal learning environment.

Discussions and collaborations allow students opportunities to talk about what they are learning as well as gain insight into multiple perspectives. Researchers suggest engaging students in learning activities that are sustained over a period of time, thus allowing for on-going revisions of their work. Hands-on activities allow students to manipulate, test, and construct assumptions and knowledge. Learners should be availed of multiple learning strategies. Students need to feel valued, acknowledged, and supported. (Ficek, 1998; Handler, Strudler, & Falba, 1998; Matthew, Parker, & Wilkinson, 1998). These constructivist learning environments are sharply contrasted to more conventional settings.

Table 1 contrasts characteristics of traditional and constructivist classrooms.

The contrasts between traditional and constructivist approaches to learning are dramatic. They are guided by differing philosophical foundations and each serves specific educational purposes. Objectivist or proponents of traditional/direct instructional methods “believe that knowledge has a separate, real existence of its own outside the human mind” (Roblyer & Edwards, 2000, p. 50). Objectivists believe that learning happens

Table 1

Characteristics of Traditional and Constructivist Learning Environments

(International Society for Technology in Education, 2000; Grabe & Grabe, 2001; Jonassen, Peck, & Wilson, 1999; Brooks & Brooks, 1999; Southwest Educational Development Laboratory, 1996; Jones, Valdez, Nowakowski, & Rasmussen, 1994, Baylor, Kitsantas, & Chung, 2001)

Characteristic	Traditional Setting	Constructivist Setting
Student Role	Passive and reactive. Learns information by absorbing from teacher or other source.	Actively constructs knowledge by exploring, manipulating, comparing, reflecting, articulating.
Curriculum Characteristics	Fragmented, simplified, disciplines taught in isolation, focus on breadth, emphasis on literacy and skills. Information delivery. Factual/literal thinking	Relevant, authentic, complex, multidisciplinary, knowledge integration, focus on depth, emphasis on depth and application, inquiry-based. Information exchange. Process driven.
Social Characteristics	Teacher centered, students work independently. Information delivery.	Collaborative and conversational. Teacher as facilitator. Student centered and driven. Information exchange.
Assessment	External to learner. Measurement of factual knowledge and discrete skills generally at the end of the learning sequence.	Reflective and self-regulatory. On-going. Performance and application driven.

mind” (Roblyer & Edwards, 2000, p. 50). Objectivists believe that learning happens when knowledge is imposed on the learner (Winn, 1991). Direct instructional models are rooted in behaviorism and information-processing theories (Roblyer & Edwards, 2000). Knowledge is external to the learner. The focus is on specially enumerated skills that are hierarchically arranged, sequenced, and transmitted to the learner generally by an expert (Roblyer & Edwards, 2000). Teaching is direct, structured, and easily assessable, as this ensures that learning is systematic and efficient giving all learners access to the same body of knowledge. Predetermined specific learning outcomes are generally assessed by tests. Technology, when used in a direct instructional approach, becomes another information delivery system, a transmitter of knowledge, or a way to practice specific skills. Technologies currently used as a direct instructional tools include two major software categories-- drill and practice software and tutorials (Conway, 1997) and in some cases simulation software (Roblyer & Edwards, 2000). “When used to deliver instructional messages, students generally learn no differently from technologies or teachers” (Jonassen, Peck, & Wilson, 1999, p. 218).

Constructivism is rooted in cognitive learning theories. Constructivists contend that learning is a personal interpretation of the world, colored by experiences, backgrounds, and aptitudes, and is an active process of making meaning (Roblyer & Edwards, 2000; Wilson, Teslow, & Osman-Jouchoux, 1999). Learning, as such, moves beyond skills that are externally imposed and irrelevant to the learners’ lives, to learning that is contextual, personally relevant, focused on exploration, manipulation of information, and the exploration of possibilities (Roblyer & Edwards, 2000; Wilson, Teslow, & Osman-Jouchoux, 1999; Jonassen, 1994). Under these assumptions,

meaningful learning occurs when the goal of education is to “help students learn how to recognize and solve problems, comprehend new phenomena, construct mental models of those phenomena, and given a new situation, set goals and regulate their own learning” (Jonassen, Peck, & Wilson, 1999, p. 3). Technology, when used in a constructivist manner, becomes a tool that students learn with. Learners use technologies to manipulate data, to explore relationships, to intentionally and actively process information, to construct personal and socially shared meaning, and to reflect on the learning process (Jonassen, Peck, & Wilson, 1999). Technologies currently used as tools within this paradigm include concept mapping software, databases, spreadsheets, multimedia software, web-editing software, simulation software, video tools, and conferencing/telecommunication tools. Jonassen, Peck, & Wilson (1999) comment on a “grocery store” analogy developed by Richard Clark to explain their constructivist critique of traditional methods. They write

Richard Clark has for many years argued that technologies that are mere vehicles that deliver instructional messages to learners, much the same as trucks deliver groceries to the supermarket. It doesn't matter which vehicle you use. We have claimed that instructional delivery is the wrong issue. We argue that technologies should not be used as conveyors and delivers of the designer's message to a passive learner. Rather, they should be used as tools that students learn with. Why? Because when learners are passive receptacles of technology-delivered messages to be consumed and regurgitated, they are not learning meaningfully. When students learn by using technologies as tools for growing and sharing their own groceries, they are learning meaningfully (p. 218).

Chapter 3

Methodology

The purpose of this study was to determine the effect of a constructivist pedagogical approach supported by technology on pre-service teachers' confidence in their own ability to plan and create constructivist learning activities supported by technology as well as to understand their perceptions of the experience. This chapter details the methodology used in the study, including the design, participants and setting, the methods, and the intervention activities.

Design

A quasi-experimental research design, using a pre- and post-intervention survey as well as journal entries, focus groups, and interviews, was selected to investigate the effect of a constructivist pedagogical approach supported by technology on the confidence of pre-service teachers in their own ability to develop constructivist learning activities supported by technology to enhance learning as well as their perceptions of the experience.

Description of Participants and Setting

Participants in this study were 23 pre-service teachers who had been accepted into the University of Tennessee Knoxville's (UTK) College of Education's teacher education program and were enrolled in *Instructional Technology, Curriculum, and Evaluation 486: Introduction to Instructional Computing (ITCE 486) Section 26986* for the Summer

2001 semester. ITCE 486 is a three credit course that is mandatory for all K-12 pre-service teachers enrolled in the graduate-level teacher licensure program in the College of Education. Students in the course had varied major areas of concentrations, including special education, art education, deaf education, elementary education, science, social studies, English, and Spanish. Although 23 students were enrolled in the course and all 23 agreed to be part of the study, only 15 returned both parts of the pre-and post survey. Nineteen returned the pre-survey; their information was included in the descriptive data. One student transferred into the class from another section and did not complete either survey. One student withdrew from the class in the middle of the semester.

To ascertain their experience with each of the instructional methods and supporting technology prior to the intervention, students were asked to assess their experience level in six areas using a five-point Likert Scale, where one is the lowest and five is the highest. **Table 2** provides a summary of participants' entry experience levels.

Surveys

A pre- and post-intervention survey with a 5-point Likert Scale was used to determine the extent to which participating in a course that used a constructivist pedagogical approach affected pre-service teachers' confidence in their ability to plan and create their own constructivist learning activities supported by technology (research question 1). The pre- and post-intervention surveys were developed by the researcher using technology standards set by the International Society for Technology in Education's (ISTE) National Educational Technology Standards (NETS): Professional Preparation Performance Profile (ISTE, 2000) and using the ITCE 486 course syllabus and outline of major projects that was developed during 486 team meetings during the

Table 2

Participants' Pre-Intervention Experience With Constructivist

Activities Supported by Technology

Experience	<u>n</u>	Minimum	Maximum	Mean	<u>SD</u>
EXP 1	19	1	5	2.21	1.32
EXP 2	19	1	5	2.05	1.35
EXP 3	19	1	4	1.47	.90
EXP 4	19	1	5	1.58	.96
EXP 5	19	1	5	1.74	1.05
EXP 6	19	1	5	2.21	1.16

Note: The experiences designated by each category were as follows:

EXP 1: Planning and creating a multidisciplinary unit with constructivist learning activity supported by technology.

EXP 2: Planning and creating a constructivist learning activity supported by a slideshow.

EXP 3: Planning and creating an inquiry-based learning activity supported by a WebQuest.

EXP 4: Planning and creating a constructivist learning activity that makes use of categorizing, sorting, and classifying supported by a database.

EXP 5: Planning and creating a constructivist learning activity that makes use of predicting, hypothesizing, and calculating supported by a spreadsheet.

EXP 6: Identifying and evaluating resources for constructivist learning activities.

Fall semester 2000 and Spring semester 2001 by instructors of ITCE 486 and the ITCE 486 coordinator.

Pre-survey. The pre-class survey (Appendix B) was comprised of twelve items that addressed, first, the students' confidence in their ability to plan and create learning activities related to each of the constructivist instructional strategies supported by technology to be taught in the class, and second, the students' prior experience with each constructivist instructional strategy supported by technology to be taught in the class. Six items related specifically the students' confidence in their ability to:

- Plan and create a multidisciplinary unit with constructivist learning activities supported by technology;
- Plan and create constructivist learning activities supported by slideshows;
- Plan and create inquiry-based learning activities supported by WebQuests;
- Plan and create constructivist learning activities involving categorization, sorting, and classification supported by databases;
- Plan and create constructivist learning activities involving prediction, hypothesizing, and calculation supported by spreadsheets;
- Identify and evaluate resources for constructivist learning activities.

The other six items addressed students' prior experiences with each of the six learning activities. The Cronbach alpha reliability of this instrument is .93 and was calculated using the six items on the pre-test that related to confidence in ability to plan and create constructivist learning activities supported by technology.

At the beginning of the first class session, students were oriented to the study and given the Study Information Sheet (Appendix A). Next, students participated in Activity

One (Appendix F). Because many of the students were new to education and may not have understood the term “constructivist,” Activity One was done to orient them conceptually to constructivism. Once Activity One was complete, students were asked to complete the twelve-item pre-class survey by reading each item and ranking themselves using a five-point Likert Scale, where 1= lowest confidence and 5=highest confidence. Verbal anchoring was used to convey to the participants that the intervals were evenly spaced (Uebersax, 2001). Information about students' prior experiences was used to help define the context of the experiences relative to each student or groups of students.

Post-Survey. Upon completion of the intervention which was a series of interrelated lessons within a thematic unit, participants completed a post-invention survey (Appendix B) on which included the same questions as the pre-survey related to the students' confidence in their abilities to plan and create learning activities using constructivist instructional strategies supported by technology.

Journals, Focus Groups, and Interviews

To gain insight into participants' perceptions of the experience of participating in the study, three data sources were used: journals, focus groups, and interviews. These multiple sources provided a method of triangulation (Merriam, 1998). Information derived from the journals was used initially to develop guides for the focus groups and interviews and then as a method of member-checking during interviews (Maxwell, 1996).

Journals. Participants were asked to keep a reflective journal during the course. The focus of the journal was general, but related to the course and topics covered the week prior to the journal entry. Students were instructed to reflect on the prior week's course activities and to write about their experience or anything else related to the course

that was on their minds. Journal entries were either e-mailed to the researcher or turned in as hardcopies during each Monday class meetings. Students were not required to put their names on their journal entries, but many of them did. The journals were analyzed each week and coded using analytic coding (Glesne & Peshkin, 1992). The themes identified by this method were used to create opening, nondirective questions and “planned prompts” (McCracken, 1988) which were then used in the focus groups and interviews.

Focus Groups. After themes were identified from journal entries each week, non-directive and planned prompts were developed (Appendix C). The focus groups were conducted to probe for more information as well as to solicit feedback about the data and conclusions from the participants via member checks (Maxwell, 1996). For the initial two weeks of the course, 30-45 minutes of class time toward the end of each Wednesday’s session was set aside for the focus group. All members of the class gathered in a circle to provide feedback regarding the themes derived from the week’s journal as well as to discuss any other topics that they found pertinent. For the first session, an audio-tape recorder with one microphone was used to record the focus group, but due to audio difficulties, the session was not recorded. Adaptations were made to the audio equipment and a mixer with five microphones was used for the second session; however, due to the acoustics in the room, the sound on the tape was still inaudible. Students made comments about the sound equipment intimidating them as well as feeling the focus groups were taking away from valuable class time. After discussing these issues with her advisor, Dr. E. Counts, the researcher made the decision to discontinue the focus groups.

Interviews. During the last week of classes, seven students were interviewed to determine their perceptions of the experience of participating in the intervention. An

Table 3

Representative Sampling for Interview Selection

Classification	Low Tech Skills	Average Tech Skills	High Tech Skills
Non-handicapped	1	2	1
Handicapped	1	1	1

n=7

impartial interviewer trained in interview techniques was used to conduct the interviews.

In an effort to achieve representiveness of individuals as well as the “entire range of variation” (Maxwell, 1996, 7) interviewees were selected based on purposeful, representative sampling (Reyes, 2000; Maxwell, 1996). For the purpose of representative sampling in survey selection, participants were sorted into two general categories:

handicapped or non-handicapped and then by their self-reported technology skill level (**Table 3**). Three students in the class identified themselves as handicapped and as having special needs. With this in mind, the class was divided into two major sections:

handicapped and non-handicapped. All handicapped persons were asked to participate in the interviews. On the first day of class, all students were asked to complete an information sheet that included general demographic information and asked them to make a general self-assessment of their technology skill. Non-handicapped participants were divided into the categories of low technology skills, average technology skills, or high technology skills based on general statements derived from their information sheet as well as from the researcher observation of their entry-level technology skills. At least one non-handicapped individual from each of the entry-level tech skills categories was interviewed. **Table 3** shows the skill level and category for the students interviewed.

During the second to the last week of class, participants were contacted via e-mail and asked if they would be willing to be interviewed regarding their experiences in the course. All agreed to be interviewed. Interviews were done during class time, and each interview was allotted an hour. The interviewer had the option of scheduling more time for another session as needed. Interviews were conducted in a private office and recorded using an audiocassette recorder and later transcribed by a professional transcriptionist. The interviewer used an interview guide (Appendix D) and began by asking the participants to provide general background information: age, education, and anything else the participant felt was important. Collecting simple descriptive details about an individual's life helps "cue the interviewer to the biographical realities that will inform the respondent's subsequent testimony" (McCracken, 1998, 34). Because the participants were part of an ongoing study and were known to the researcher, demographic information had already been gathered. However, because the interviewer was not the primary researcher, her knowledge of the participants was somewhat limited. Biographical data helped provide a context for the individuals' responses to the interviewer and allowed her to investigate how life experiences may have framed participants' perceptions of their experience in the course (Denzin, 1989). In several of the interviews, once participants had introduced prior educational or job related experiences, the interviewer extensively probed the backgrounds of the participants.

Several basic principles governed the development of the interview guide and the interviews. The central principle was to allow the participants the means to describe their perception of the experience in their own terms, so the interviewer was cautious not to be obtrusive (Maxwell, 1998). Questions were developed using participants' journal entries

and were general and nondirective (Maxwell, 1998), while at the same time providing a means of understanding specific phenomena that had been introduced by participants in journal entries (Glesne & Peshkin, 1992). The interviewer began the interview with a grand tour question, asking the participants to talk about their experiences in the class (Maxwell, 1998). Once participants began talking, the interviewer used the technique of floating prompts to delve and encourage participants to clarify or explicate (McCracken, 1988). To address specific data that emerged from the journal entries, the interviewer used a series of planned prompts. Once the interviews were completed, they were transcribed and analyzed.

Intervention

Section 26986 was one of three sections of ITCE 486 offered during the summer 2001 semester. Different instructors using different instructional methods taught the other two sections of ITCE 486. The overall course goals, objectives, and assignments were the same in all the classes. Goals and objectives for the course were determined by the ITCE 486 coordinator and aligned with the International Society for Technology in Education's National Educational Technology Standards (NETS): Professional Preparation Performance Profile (ISTE, 2000). Participants in this study either randomly chose to enroll in the class or were referred to this section by students previously enrolled in the instructor's course. The course met for 17 sessions twice a week for 3 hours and 15 minutes.

Drawing on constructivism and adult learning theory, the intervention was designed to situate participants in a course that would both model and teach constructivist

methods as well as how those methods could be supported by technology. The learning activities were developed with five attributes of constructivist learning in mind: they were active, constructive, intentional, authentic, and cooperative (Jonassen, Peck, and Wilson, 1999). Through their work on a series of activities, students produced an interdisciplinary thematic curriculum-based instructional unit that contained a series of constructivist lessons supported by technology (corresponding to pre- and post-survey item 1). ITCE 486 is taught each semester in multiple sections and certain technology skills have been targeted as critical. Rather than teaching the isolated skills using a direct instructional method, the instructor embedded the use of technology skills in the context of activities in which students both engaged in and developed the constructivist learning activities (Jonassen, 1999). Students used the technology to acquire knowledge and express what they had learned. Scaffolding for technology skills was provided with skill tasksheets that students could use as needed (Appendix E). Once students had completed the learning activities in the classroom, they were asked to plan and design constructivist learning activities that both were tied to the Tennessee State Curriculum Framework and to their thematic unit. For each lesson, the instructor developed a guide or rubric that students used to assess their own work.

Activity 1: Direct and Constructivist Instructional Methods

This activity was done before the pre-survey was distributed in an effort to ensure that participants understood the meaning of constructivist learning activities, a term used frequently on the survey. During this learning activity, students were randomly pre-assigned by the instructor to groups of four or five and given the Tasksheet for Direct and Constructivist Instructional Methods (Appendix F). Pre-service teachers were challenged

to investigate two major instructional approaches, direct instruction and constructivism, and then to share what they had learned by creating a concept map of each instructional approach on the computer and a visual representation of what a classroom might look like that embraces each method. The tasksheet set the context for learning, defined tasks/learning outcomes, and suggested processes. Some resources were identified (the textbook and relevant websites). Students were encouraged to identify other materials that pertained to instructional methods using the Web, books, and other resources. This activity took two class sessions to complete, including the presentations.

In the development of this activity, consideration was given to five attributes of constructivist learning in the following ways:

1. Active: The students were given the task of developing an understanding of how each instructional method might shape teaching and learning, the needs addressed by each method, characteristics of teaching and learning associated with each method, and any possible limitations of each method. They were asked to create a concept map and a graphic representation of each method. Once they were familiar with both methods, they were asked to think about the two methods in relationship to their own educational experiences and describe a time when they were situated in either a direct or constructivist learning experience, the elements of that experience, and their feelings about the experience. Some resources were identified to help the students accomplish the task, and they also received teacher coaching.
2. Constructive: Students were asked to use resources, each other, the instructor, and their own lived experiences to build a conceptual construct of both direct instruction and constructivist models and then to represent their construct visually (with concept

- maps and visual representations of classrooms representing direct and constructivist teaching methods) as well as to use their constructs to evaluate and relate to their own educational experiences.
3. Intentional: Once the groups had finished the tasks, groups presented to the entire class, articulating the goals of their learning, how they reached those goals, and the conclusions they drew. They also displayed and explained their graphic representations of direct and constructivist methods.
 4. Authentic: Pre-service teachers were challenged to reflect on their teaching practices and pedagogy as well as on their lived experiences as students. They were asked to evaluate a learning experience in terms of instructional methodology (direct or constructivist) and to post their reflections on a class forum electronic bulletin board. Students were encouraged to read each other's postings and react to them on the message board.
 5. Cooperative: Students worked in groups to accomplish the task as well as to evaluate the process and their progress.

Technology skills were embedded in the activity so that students would acquire those skills and knowledge as they needed them to complete the learning activity and express what they had learned. These skills were correlated with the ITCE Course Packet Critical Technology Skills List, but were not limited to that list:

- Word Processing: Enter and edit text, save and retrieve documents, check spelling, print documents and adjust page setup, format documents, insert and manipulate graphics, align text, manipulate font sizes, styles, and color
- Web Searching

- Online course delivery package (Course Info): Create an account, enroll in a course, post to an online forum
- Concept Mapping
- Operating System: Save, open, edit, and copy files

To assist with the technology skills, scaffolding was provided in the form of a word processing tasksheet and a graphic manipulation tasksheet (Appendix F) that students could refer to as needed. Students also were encouraged to use each other as a resource. The instructor was available as needed.

Once the students had completed the activity, the class met again as a group and shared their findings through concept maps and graphic representations of each instructional method. They printed copies of their concept maps for each member of the class and distributed them. They were also asked to discuss the process they had used to complete the activity. As a follow-up, students were asked to post to the class's online forum a description of one of their educational experiences, to evaluate the instructional methodology used in that experience, and to tell how they felt during the experience.

Activity 2: Constructivist Slide Show

Activity 2 corresponds to pre- and post-survey item 2: "I am confident in my ability to plan and create a constructivist learning activity supported by a slideshow" (Appendix B). During this activity, students were pre-assigned to groups of four or five based on their content area and grade level. This allowed the instructor to create meaningful tasks directly relevant to students' future teaching area and grade levels. For example, pre-service math teachers were grouped with other pre-service math teachers and received a tasksheet that modeled a constructivist math lesson on slopes that could be

supported by a slideshow geared toward high school students. In the development of the activity, consideration was given to the following five attributes of constructivist learning:

1. Active: Students were challenged to complete specific tasks that were curriculum-oriented and required them to gain some knowledge, analyze the knowledge, and represent what they had learned in a multimedia slideshow.
2. Constructive: Depending on their content area, students were asked to construct knowledge in one of the following ways:
 - a. Become familiar with insects that are native to East Tennessee by spending twenty minutes outside observing insects, taking digital pictures of the insects, documenting the behavior of the insects, researching the insects online or using a field guide, and then sharing their findings with the class via a slideshow presentation (Appendix G).
 - b. Investigate planning meals by reading the book “Potatoes on Tuesday,” planning a meal, listing all the foods needed for the meal, and creating a slideshow book based on the pattern used in the book “Potatoes on Tuesday” (Appendix G).
 - c. Identify qualities that would make someone a hero, select a hero, research that person, create a stamp to commemorate the hero, and create a “Stamp of Honor Album” using a slideshow (Appendix G).
 - d. Consider how the purpose of a building influences its design by walking around campus and investigating buildings, using a digital camera to document the design of the building, taking notes on the purpose of the

building, and creating a slideshow presentation to represent their conclusions (Appendix G).

- e. Investigate Haiku poetry by using the web to find out the definition, form, and source of inspiration for Haiku, meditating outside for about 20 minutes, and using a slideshow to create and illustrate a Haiku (Appendix G).
 - f. Learn about the four types of slopes and be able to identify them in the environment by researching slopes on the Web, identifying slopes in the environment, using a digital camera to document those slopes, and creating a slideshow presentation using the pictures taken to illustrate and explain each type of slope (Appendix G).
 - g. Recognize and use nouns and verbs by reading “The Wind Blew,” identifying nouns and verbs used in the story, brainstorming nouns and verbs as a group, and creating a digital storybook in a slideshow based on the pattern of “The Wind Blew” with original nouns and verbs (Appendix G).
- 3. Intentional: The students were engaged in specific tasks and were required to reflect, evaluate, and articulate their progress and the outcome of the activity as well as the process they used to complete the activity.
 - 4. Authentic- All activities were developed to be relevant to each participant’s content area and grade level.
 - 5. Cooperative- Participants engaged in collaborative activities during which they were required to dialog about the tasks and methods used to accomplish the tasks, make

group decisions, and seek out alternative ideas and opinions. They worked in groups both to accomplish the task and evaluate the process and their progress.

Technology skills were embedded in the activity so that the students would acquire the skills or practice them as needed to complete the learning activity, acquire knowledge, and express what they had learned. These skills were correlated with the ITCE Course Packet Critical Technology Skills List, but were not limited to that list:

- Digital Images: Create digital photographs, manipulate digital images, download images from the web, import images
- Slideshows: Use a template; choose appropriate layouts; enter and edit fields; format font, size, style, color; promote and demote bullets; add and resize graphics from clip art and files; add builds and transitions; use different views (slide, notes, outline, multiple per page); insert, delete, duplicate, and import slides; print slides in appropriate modes; use draw tools; import sounds and movies; apply custom animations
- Word Processing: Enter and edit text; save and retrieve documents; check spelling; print documents and adjust page setup; format documents; insert and manipulate graphics; align text; manipulate font sizes, styles, and color; number pages; create bulleted/numbered lists
- Web Searching
- Operating System: Save, open, edit, and copy files

To assist with the technology skills, scaffolding was provided in the form of relevant websites and PowerPoint web-based tutorials. Students were also encouraged to use each other as a resource. The instructor was available as needed.

Once the students had completed the activity, the class met as a group and shared their activities through their slideshows. They also were asked to discuss the process they used to complete the activities. This activity took two class sessions including the presentations.

Next, students were asked to develop a constructivist learning activity that could be supported by a slideshow that fit within their unit theme and was correlated to the Tennessee Curriculum Framework and to create a slideshow that their own students might create in this learning activity. Two class sessions of studio time were provided for students to develop their lessons and slideshows. During that time, they were encouraged to collaborate with each other as needed. They also had access to technology tasksheets (Appendix E) to which they could reference for skills such as word processing or using MS Draw within PowerPoint. Students were also referred to web-based PowerPoint tutorials. The instructor was available as needed.

Activity 3: Inquiry-Based Learning Activity

Activity 3 corresponds to pre- and post-survey item 3: "I am confident in my ability to plan and create an inquiry-based learning activity supported by a WebQuest" (Appendix B). During this activity, students were pre-assigned to groups of four or five based on their content area and grade level. This allowed the instructor to create meaningful tasks directly relevant to the students' teaching content area and grade level. For example, high school science pre-service teachers were grouped with other high-school pre-service teachers and received a tasksheet that embedded them in an investigation of the ethics of cloning. They were asked to gather data about cloning, decide if cloning is ethical, and support their decision. These tasks were inquiries, which

is the essence of a WebQuest. To begin, students were given their hypothetical teaching context and then told that a WebQuest might be one way to make use of inquiry methodology. They were directed to an online WebQuest (Appendix H) that situated them in an inquiry-based lesson about WebQuests so that they would experience WebQuests from the perspective of a learner. Specific tasks were identified within the WebQuest lesson. Students were challenged to come to an understanding of what WebQuest is, how WebQuests can focus students' learning using guided inquiry methods, and what inquiry methods are and why teachers might employ them. More specifically, they were asked to identify the five critical attributes of a Webquest and develop an understanding of the essence of each attribute as well as how each attribute might be employed in a WebQuest. Once they had completed the WebQuest about WebQuests, they were asked to use their hypothetical teaching situation to develop a WebQuest using PowerPoint and to focus on the process of a WebQuest, not on the software used to create an html document. At this point there was no mention of how to create a WebQuest using a web editor. The focus was on students' developing an understanding of the process of inquiry methods and the critical attributes of a WebQuest and how these could be used within a curriculum. In the development of the activity, consideration was given to the following five attributes of constructivist learning:

1. Active: Students were challenged to investigate inquiry-based instruction and WebQuest by completing an inquiry-based lesson that made use of a WebQuest. This required them to research, acquire knowledge, analyze knowledge, and represent what they had learned by creating an inquiry-based lesson using their group's hypothetical teaching situation.

2. Constructive: All students were asked to build a conceptual construct of both guided inquiry methods and WebQuests by completing a guided inquiry-based WebQuest that required them to research, compare, and evaluate. They were asked to identify five critical attributes of inquiry methods supported by a WebQuest (introduction, task, process and resources, evaluation, and conclusion). Depending on their content area, students were asked to construct knowledge in one of the following ways:
- a. Create a guided inquiry-based lesson that incorporated the five critical attributes, and addressed the question “Is cloning ethical?” and to create a slideshow to illustrate the process (Appendix H).
 - b. Create a guided inquiry-based lesson that incorporated the five critical attributes and addressed the question “Is there life on Mars?” and to create a slideshow to illustrate the process (Appendix H).
 - c. Create a guided inquiry-based lesson that incorporated the five critical attributes and addressed the question “Paper or plastic?” and to create a slideshow to illustrate the process (Appendix H).
 - d. Create a guided inquiry-based lesson that incorporated the five critical attributes and addressed the question “Where have all the dinosaurs gone?” and to create a slideshow to illustrate the process (Appendix H).
 - e. Create a guided inquiry-based lesson that incorporated the five critical attributes and addressed the question “Painted Lady butterflies: Okay in our ecosystem?” and to create a slideshow to illustrate the process (Appendix H).
 - f. Create a guided inquiry-based lesson that incorporates the five critical attributes and addresses the question “Were there German POW camps in the

U.S. during World War II?” and to create a slideshow to illustrate the process (Appendix H).

g. Create a guided inquiry-based lesson that incorporated the five critical attributes and addressed the question “Art or artifact?” and to create a slideshow to illustrate the process (Appendix H).

3. Intentional: Students were engaged in specific tasks and were asked to reflect on, evaluate, and articulate their progress and the outcomes of the activity as well as the process they used to complete the activity.
4. Authentic: All activities were developed to be relevant to each participant’s content area and grade level.
5. Cooperative: Students worked collaboratively to complete the activities, identify processes, make decisions, seek out ideas and opinions, and evaluate their progress.

Technology skills were embedded in the activity so that students would acquire the skills or practice them with in the context of completing the learning activity, acquiring knowledge, or expressing what they had learned. This allowed them to focus on the process, not on learning new software. Further, they had the opportunity to practice software that they had just used to create their slideshow lessons. These skills were correlated with the ITCE Course Packet Critical Technology Skills List (Appendix I), but were not limited to that list:

- Word Processing: Enter and edit text; save and retrieve documents; check spelling; print documents and adjust page setup; format documents; insert and manipulate graphics; align text; manipulate font sizes, styles, and color; number pages; create bulleted/numbered lists

- Slideshows: Use a template; choose appropriate layouts; enter and edit fields; format font, size, style, color; promote and demote bullets; add and resize graphics from clip art and files; add builds and transitions; use different views (slide, notes, outline, multiple per page); insert, delete, duplicate, and import slides; print slides in appropriate modes; use draw tools; import sounds and movies; apply custom animations
- Internet: Use URLs, navigate, search, use bookmarks, evaluate websites, download programs and plug-ins, troubleshoot
- Digital Images: Download images from the web, import images from clipart and other sources
- Web-editing and management (Composer): Create and edit font size, style, color; embed and resize graphics; incorporate hyperlinks; manipulate page properties; use FTP; manage website
- Operating System: Save, open, edit, and copy files

Once they had completed this activity and presented their work to the class, students were asked to develop an inquiry-based lesson using a WebQuest that fit within their unit theme and was correlated to the Tennessee Curriculum Framework using web-editing software. They were able to refer to technology tasksheets (Appendix E) for skills such as word processing, using MS Draw, using Composer, and using file transfer protocol (FTP). To address Internet skills, students had access to “Ten First Steps on the Internet: A Learning Journey for Teachers” (Roblyer & Edwards, 2000). Two classes of studio time were provided for students to work on these projects. Students were encouraged to use each other as a resource. The instructor was also available as needed.

Activity 4: Categorizing, Sorting, Classifying Supported by a Database

Activity 4 corresponds to pre- and post-survey item 4: "I am confident in my ability to plan and create a constructivist learning activity that makes use of categorizing, sorting, and classifying supported by a database" (Appendix B). During this activity, students were pre-assigned to groups of three or four based on the grade level they intend to teach. This allowed the instructor to create hypothetical constructivist activities that could be supported by a database, with tasks directly related to the pre-service teachers' grade level. For example, middle school pre-service teachers were given an activity that focused on endangered animals and classifying animals based on characteristics. These hypothetical situations required students to gather information using various sources, organize the information into a database, and use the information to draw some conclusions about their topic and support those conclusions. In the development of these activities, consideration was given to the following five attributes of constructivist learning:

1. Active: Students were challenged to investigate a topic related to their future teaching. The task required them to collect data, organize it with a database, analyze it and draw some conclusions based on their acquired knowledge. They were asked to present their findings to the class.
2. Constructive: Depending on their grade level, students were asked to construct knowledge in one of the following ways:
 - a. Participants who focused on elementary education were challenged to use a variety of materials to identify seasons by clues or signs that might be

associated with each season and organize those clues or signs into a database (Appendix I).

- b. Participants who focused on middle school teaching were given the task of using a variety of materials to determine if the giant panda belongs in the bear or the raccoon family (Appendix I).
 - c. Participants who focused on high school teaching were asked to read two selections, one from “The Diary of Anne Frank” and the other from Guy De Maupassant’s “Two Friends” and then watch a film in which 5th grade students describe friendships. They were asked to compare their own friendship experiences with the other three people or persons and to draw some conclusions about the needs of friends in relationship to setting and situations (Appendix I).
- 3. Intentional: Students were engaged in tasks that required them to gather information, negotiate its meaning, evaluate, and articulate the outcomes of the activity as well as reflect on their learning and the cognitive processes they used.
 - 4. Authentic: All activities were developed to be relevant in relationship to the pre-service teachers’ intended grade level.
 - 5. Cooperative: Students worked collaboratively to negotiate meaning, identify and organize information, make decisions, identify processes, and evaluate their progress.

Technology skills were embedded in the activity so that the students would acquire and practice the skills meaningfully within the context of the activity. The focus was on the activity and its intent rather than on the acquisition of technology skills.

These skills were correlated with the ITCE Course Packet Critical Technology Skills List, but were not limited to that list:

- Word Processing: Enter and edit text; save and retrieve documents; check spelling; print documents and adjust page setup; format documents; insert and manipulate graphics; align text; manipulate font sizes, styles, and color; number pages; create bulleted/numbered lists
- Digital Images: Download images from the web, import images from clipart and other sources
- Databases: Create fields, enter and edit data in fields, use various layout modes, sort data, search for specific data
- Operating System: Saving, opening, editing, copying, and transferring files

Skills specific to technology were handled with technology tasksheets to which students could refer as needed (Appendix E). Students used each other as well as the instructor as a resource. Once students completed this activity in groups, they were asked to present their information to the class and to discuss the learning process. This was done in one class session.

After completing the activity, students were asked to develop a constructivist activity that made use of categorizing, sorting, and classifying to reveal some information or draw some conclusions that could be supported by a database as well as to create a database that their own students might devise as the result of their learning activity.

Learning activities were correlated to the Tennessee Curriculum Frameworks and fit within the themes of students' multidisciplinary unit plans. One class of studio time was

provided for students to develop and work on their projects. They were encouraged to communicate with each other and to use each other and the instructor as a resource.

Activity 5: Predicting, Hypothesizing, and Calculating Supported by a Spreadsheet

This activity corresponds to pre- and post-survey item 5: “I am confident in my ability to plan and create a constructivist learning activity that makes use of predicting, hypothesizing, and calculating supported by a spreadsheet” (Appendix B). During this activity, students were pre-assigned to groups and asked to participate in an investigation into the average family’s production of garbage to reach some conclusions about the impact of recycling (Appendix J). In the development of this activity, consideration was given to the following five attributes of constructivist learning:

1. Active: Students were actively engaged in constructing a spreadsheet, inputting information, analyzing data and manipulating data to draw conclusions.
2. Constructive: Students were asked to construct knowledge by compiling data regarding average weekly trash per family, analyze the data, develop hypotheses, and test those hypotheses.
3. Intentional: The students were engaged in a process that required them to reflect on and articulate their progress as well as the outcome of the activity.
4. Authentic: The activity was relevant to students’ realization that they personally could have an impact on the environment by recycling trash. The technology skills were acquired and used within that context.
5. Cooperative: Participants engaged in ongoing dialog and negotiated both the processes required to complete the tasks and the outcomes.

Technology skills were embedded in the activity so that the students would acquire the skills within the context of completing the learning activity. These skills were correlated with the ITCE Course Packet Critical Technology Skills List (Appendix I), but were not limited to that list:

- Word Processing: Enter and edit text; save and retrieve documents; check spelling; print documents and adjust page setup; format documents; insert and manipulate graphics; align text; manipulate font sizes, styles, and color; number pages; create bulleted/numbered lists
- Digital Images: Download images from the web, import images from clipart and other sources
- Spreadsheets: Enter labels and values; edit and manipulate data; align text; change font size, style, color; change column width and functions; apply formulas; use the “fill down” and “fill across” command; insert and delete rows and columns; change number formats; print spreadsheets; change orientations; create charts and graphs
- Operating System: Save, open, edit, copy, and transfer files

Once students had completed the activity, the class met together, and groups shared their findings as well as their impressions of the process. This activity took one class session.

Next, students were asked to create a constructivist learning activity that made use of predicting, hypothesizing, or calculating that could be supported by a spreadsheet and was correlated to the Tennessee Curriculum Frameworks and fit within the theme of their multidisciplinary unit. Students created both the lesson and the supporting spreadsheet

during a class studio session where they were encouraged to collaborate with each other. The instructor was available as needed.

Activity 6: Identifying and Evaluating Resources for Constructivist Learning Activities

Activity 6 corresponds to pre- and post-survey item 6: “I am confident in my ability to identify and evaluate resources for constructivist learning activities” (Appendix B). During this activity, students were pre-assigned to groups of three or four and asked to become experts in a specific category of software: production software, Integrated Learning Systems, simulation software, problem-solving software, education games, tutorial software, or drill and practice software. A hypothetical situation was created, and students were asked to pretend to be part of a team of Knox County educators who had been approached by the superintendent to teach other educators about specific software. Students were arranged in their groups, given their tasksheets, resources such as websites or readings, and a copy of a piece of software that represented the category of software to which they were assigned (Appendix K). In the development of the activity, consideration was given to the following five attributes of constructivist learning:

1. Active: Students were challenged to actively investigate various categories of software by researching, acquiring knowledge, and using that knowledge as a basis for then evaluating a piece of software. Further they were required to share that knowledge with their peers as part of a team.
2. Constructive: All students were engaged in constructing knowledge about their specific category of software by identifying its characteristics and investigating issues such as its classroom implications and application and guidelines for its effective use. They used a concept map as a conceptual tool while working through the process.

3. Intentional: Students were engaged in a process of evaluating their own progress with regard to their assigned activity. They reflected on their progress throughout the project and then shared the process they had used and the outcomes of their learning with the class.
4. Authentic: The activity was authentic because students used the information they had learned to evaluate a piece of software.
5. Cooperative: Students worked in groups to negotiate the process as well as the outcome of the process. They then became part of a larger team in which they taught each other and demonstrated the software, evaluating it as they did so.

Technology skills were embedded in the activity so that students would acquire or practice the skills within the context of using them to complete the learning activity.

These skills were correlated with the ITCE Course Packet Critical Technology Skills List, but were not limited to that list:

- Word Processing: Enter and edit text; save and retrieve documents; check spelling; print documents and adjust page setup; format documents; insert and manipulate graphics; align text; manipulate font sizes, styles, and color; number pages; create bulleted/numbered lists
- Digital Images: Download images from the web, import images from clipart and other sources
- Operating System: Save, open, edit, copy, and transfer files
- Web Searching
- Concept mapping

- Software: Use, install, delete, navigate, evaluate problem-solving software, Integrated Learning Systems, tutorials, educational games, production software, and simulation software
- Operating System: Save, open, edit, copy, and transfer files

To address technology skills, students had access to tasksheets and were encouraged to collaborate even outside their groups. The instructor was available as needed. The activity took two full course sessions. One and one-half class sessions were used for groupwork and the other half-session was used to present the results of their research to the class as a whole as well as to demonstrate and critique their software. They were asked to have copies of their concept maps available for the entire class. Each team was allotted 15 minutes to present.

Thus, in the development of each of the intervention activities, care was taken to incorporate the five attributes of constructivist learning and to integrate the use of technological skills into meaningful learning tasks.

Chapter 4

Findings

The purpose of this study was to determine the effect of a constructivist teaching strategy supported by technology on pre-service teachers' confidence in their own ability to plan and create constructivist learning activities supported by technology as well as their perceptions of that experience. This chapter details the results and is divided into two main sections: Research Question 1 and Research Question 2.

Research Question 1

How does an instructional approach that focuses on a constructivist teaching strategies affect pre-service teachers' confidence in their ability to plan and create constructivist learning activities supported by technology?

A total of 23 students participated in the study, from which 15 are included in the final analysis of the survey, as 15 returned both the pre-and post-survey. The researcher gave the pre-survey instrument to the participants on the second day of class after they had participated in an activity during which they investigated direct and constructivist instructional paradigms. On the pre-survey, they were asked to rank both their experience and their confidence in their abilities to plan and create six specific constructivist learning activities supported by technology, using a five-point Likert where 1 is the lowest and 5 is the highest. Verbal anchoring was used to convey to the rater that the intervals were evenly spaced (Uebersax, 2001). After the intervention and data collection were complete, the results were collected and coded into a computer database. A paired-

samples t-test was used to compare the means of the pre-and post survey data for each of the six pairs of survey items (Haslam & McGarty, 1998). In regard to the use of a paired-samples t-test, which assumes interval data, Jaccard and Wan (1996) report, “for many statistical tests, rather severe departures (from intervalness) do not seem to effect Type I and Type II errors dramatically” (p. 4). **Table 4** presents the paired-samples means and standard deviation for the pre- and post surveys and the results of the paired-samples t-test for the pre- and post survey.

A t-test was used to compare the means for each of pre-and post-survey items (1-6) in relationship to the effect of an intervention that employs constructivist teaching strategies supported by technology on pre-service teachers’ confidence in their own ability to plan and create various constructivist learning activities supported by technology. The results indicate there was a significant difference, $p \leq .001$, in pre-service teachers’ pre- and post- intervention confidence in their ability to plan and create the six constructivist activities supported by technology.

Research Question 2

How do pre-service teachers perceive the experience of participating in an intervention that employs a constructivist pedagogical approach to develop constructivist learning activities supported by technology?

To answer Research Question 2, data from journals and interviews were analyzed and coded using analytic coding to identify patterns and themes. Data were triangulated by comparing journals and interviews. Themes identified in the journals were used to

Table 4**Summary of Paired-Samples T-Test for Pre- and Post Survey**

<u>Source</u>	<u>DF</u>	<u>m</u>	<u>SD</u>	<u>T</u>	<u>P</u>
Pair 1	14	1.53	.99	5.996	<.001
Pst 1		4.60	.51		
Pre 1		3.07	1.22		
Pair 2	14	1.80	1.37	5.077	<.001
Pst 2		4.80	.41		
Pre 2		3.00	1.41		
Pair 3	14	2.07	1.33	5.998	<.001
Pst 3		4.27	.59		
Pre 3		2.20	1.47		
Pair 4	14	2.13	1.51	5.488	<.001
Pst 4		4.60	.51		
Pre 4		2.47	1.64		
Pair 5	14	1.73	1.28	5.245	<.001
Pst 5		4.33	.82		
Pre 5		2.60	1.45		
Pair 6	14	1.20	1.08	4.294	.001
Pst 6		4.67	.62		
Pre 5		3.47	1.25		

Note. The following is an explanation of pre- and post-survey items:

- Pair 1, Pst 1, and Pre 1: Plan and create a multidisciplinary unit with constructivist learning activities supported by technology;
- Pair 2, Pst 2, and Pre 2: Plan and create a constructivist learning activity supported by a slideshow;
- Pair 3, Pst 3, and Pre 3: Plan and create an inquiry-based learning activity supported by a WebQuest;
- Pair 4, Pst 4, and Pre 4: Plan and create a constructivist learning activity that makes use of categorizing, sorting, and classifying supported by a database;
- Pair 5, Pst 5, and Pre 5: Plan and create a constructivist learning activity that makes use of predicting, hypothesizing, and calculating supported by a spreadsheet;
- Pair 6, Pst 6, and Pre 6: Identify and evaluate resources for constructivist learning activities.

generate questions and a guide for the focus groups and interviews. This strategy served as a method of member-checking and also allowed the researcher to explore topics introduced in the journals during the interviews. The journal entries and interviews revealed that participants engaged in a self-reflective process whereby they analyzed their ideas about teaching (teacher thinking), processes used while situated in a constructivist learning environment (process thinking), cooperative learning (group thinking), instruction (instruction thinking), and technology (technology thinking).

Prior Experiences

After completing Activity 1: Direct and Constructivist Methods (Appendix F), students were asked to think about the two methods (direct and constructivist) in

relationship to their own educational experiences and describe a time when they were involved in either a direct or constructivist learning experience, the elements of that experience, and their feelings about the experiences.

Constructivist. Of the seventeen students who responded to the assignment, sixteen reported that they had been exposed to at least one class that they perceived as employing a constructivist approach. Of those sixteen students, ten reported that only a few of their educational experiences employed what they believed to be a constructivist approach. A special education pre-service teacher expressed sentiments that were echoed by the ten participants who reported little exposure to constructivism: “I can think of many experiences in which direct instruction was the method of teaching, but only one experience when constructivism was employed.” Typically participants viewed those constructivist experiences as having stood out or being unique. Out of the sixteen who reported having been situated in a constructivist environment, all but two felt positive about those experiences. Those who felt positive about their experiences reported feeling more valued, challenged, and responsible for their own learning, and reported that the content was more interesting and important. They felt that the emphasis in constructivist courses was on exploring, asking questions, and self-guided learning. They also felt that those methods allowed them to explore content to a far greater depth, which aided in remembering more of what they had learned. One student reflected on her experiences in history courses that employed constructivist methodology:

In my experience, constructivist methods add a personal/real –life connection for the students. When I took history classes in Great Britain, the courses focused on doing outside reading about/from a certain period,

discussing findings with peers and instructors, and writing a paper about what was learned. I found that these classes really made history hit home for me-- I explored history to a far greater depth than I had before, and I remember more of what I learned than in any other history class I have taken. Yet the only parameters we were given outlined the historical period we were to research and the specific type of paper we were to write. There were no exams, and only one paper for each class, but I learned more than I ever have studying for an exam, and the information stuck.

Although fourteen of the sixteen students spoke positively about their experiences in a constructivist learning environments, they also noted at times feeling frustrated, intimidated by this classroom structure, or disturbed that the course provided vague guidelines. A pre-service science teacher explains her feelings in a botany class that employed a constructivist approach:

The class was learning/student-centered, the teachers often floated around the class, asking us WHY we were doing/thinking certain ways. We were given an unknown organism and told to “find out something about it.” It was frustrating, how the teacher gave us little structure, except when we were supposed to give our reports. We asked questions of the instructors, but they were usually answered with more questions by the instructors.

Of the two students who spoke negatively about their experiences in constructivist learning, one student felt as if a constructivist approach might be better suited to keeping elementary aged students interested and motivated, but he felt a direct instructional

approach was more appropriate for college-level students. The other student, who spoke negatively of his experience in a constructivist classroom in English classes in Sweden, felt the method was not especially pertinent because students often lacked a strong knowledge base that he saw as a critical prerequisite to being engaged in constructivist learning activities.

Direct Instruction. Ten of the sixteen participants reported that most of their prior educational experiences were lecture-based and employed a direct instructional model. The other six failed to state if their experiences had been predominately with direct instruction or a constructivist approach. They described their experiences with direct instruction as teacher-centered, with an emphasis on facts, and right or wrong. They felt the approach did not allow them to explore concepts in depth nor did it facilitate an understanding of the subject matter. Further, direct instruction failed to make learning important and relevant to participants and devalued their ideas and thoughts. One student comments about feeling devalued during a high school literature class:

Teachers can be very brutal when using the direct method. I think that every student will most likely have a different view of a particular work. But to tell a student that their interpretation is totally wrong is very hurtful. I think a teacher should try to really listen to the student and give suggestions. This was something that always bothered me, specifically in high school.

Reflective Processes

While situated in a constructivist intervention, pre-service teachers spent time reflecting, analyzing, evaluating and adapting their constructs of teaching and learning.

Many of the students had limited constructivist experiences. These unfamiliar experiences resulted in initial feelings of being confused, frustrated, intimidated, or overwhelmed. One participant spoke of those feelings after the first class session that situated them in Activity 1: Direct and Constructivist Instructional Methods: “The first week in class was very confusing to be quite honest. At this point I am not exactly sure of everything that is expected me during this course. However, I am motivated and interested.” Another participant spoke of feeling initially challenged and overwhelmed: “This has been a challenging week. It seemed over-whelming ...at first. But after the initial shock wore off and I just ‘did it,’ my confidence level began to rise.” By the third week of the course, none of the participants mentioned feeling confused, frustrated, intimidated, or overwhelmed in their journal entries

Teacher Thinking. “Teacher thinking” was a self-reflective process whereby participants analyzed their ideas about teaching and learning. They thought about their constructs of teaching, teaching methods, and their experiences during the courses. They compared those constructs, experiences, and methods with what they viewed as their own teaching styles. Further, they examined assumptions each method made about teaching and tried to judge how those assumptions fit into their constructs of teaching and learning. If the assumption seemed valid and did not fit into their construct, they adapted their model to include the new idea. One student, a pre-service kindergarten teacher who was the most computer-savvy participant in this study, was initially vehemently opposed to kindergarten students using computers. She discussed her assumptions about the abilities of kindergarten students when asked to create an assignment that focused on

students using a slideshow to demonstrate a concept they had learned or to express themselves in some way:

I found it challenging to create a way for students to use PowerPoint since it is unreasonable for them to actually use the computers. (A few may have that capability, but most will not have the coordination or skill level to use keyboards, etc.) However, I did come up with a project- modified from a paper project- that allows students to participate and use PowerPoint.

Participants thought about their experiences, worked through the process of adapting their ideas about teaching and learning and evaluated how their new experiences and ideas might work in their future classrooms and how they might affect their future students. A pre-service science teacher analyzed how a constructivist activity supported by a slideshow might work in a future class:

I am very excited about all of the technology and skill I am learning to bring to the classroom. My concern is will we have enough computers and technology to make this a viable learning process for the classroom? I would like to hear more about how we are going to accomplish these activities if we have limited computer time and availability. I'm thinking we may need to rotate projects and computer use. For example, in the science classroom, I might have students working on different projects at the same time. Some might be involved in hands-on inquiry while others are preparing their PowerPoint presentations. This would make sense, except it might be hard to keep everyone on track and be available to assist the students as they need help.

Group Thinking. Throughout the intervention, participants engaged in “group thinking,” self- reflection about and evaluation of their feelings when situated in cooperative groups in terms of their relationships with others and in terms of the application to their learning. In general, they were positive about working in a collaborative setting in terms of relationships with others, although there were times when students felt awkward or that the work in the group was not equally distributed. Participants valued getting to know each other and felt being a member of a group both gave them a place to be and colleagues with whom to share ideas. This sense of community facilitated the sharing of ideas both in groups and among groups. They valued peer and instructor feedback and being able to work through a learning process with others. The group process was seen as a way to capitalize on the strengths of each person. Working in teams improved the participants’ confidence in their ability to complete learning activities. One student with limited technology experience described his feelings when he completed a group assignment:

This was most productive for me because I got through this PowerPoint presentation, and in my opinion, did quite well. I am not a huge fan of computers, they intimidate me, but I was able to conquer this challenging task. I got finished with my presentation on Wednesday and it is due on Monday, so I feel very accomplished. My self-esteem benefits when I can do something that I previously thought would be nearly impossible for me. I appreciate the opportunity to work in groups on the PowerPoint (the insect assignment). That was a much better way to lead us into use of this technology than simply handing out a tasksheet, or instructions, and

leaving us to fend for ourselves. I knew the value of the group work, so I tried to absorb all that I could about using PowerPoint by watching (names group member) who understood it better than me.... The atmosphere is supportive not scary. We are not a class full of students all worried about our grades and being nervous about our abilities not being good enough to get us the grade we want. No, we are more relaxed (which in my opinion makes for a better learning environment).

Process Thinking. Participants engaged in metacognition by spending time reflecting on the learning processes they used while situated in a constructivist learning environment. They generally agreed that the constructivist learning environment challenged them to be self-reliant in evaluating and adjusting their learning and learning strategies. Participants evaluated their knowledge and skills and identified and developed processes by which to acquire new knowledge and skills. Further, they evaluated those processes and their new knowledge and skills. Participants felt the focus of the course was on processes. Because they felt that the focus of their efforts should be processes, self-directed learning, and self-evaluation rather than products, they moved beyond accomplishing the minimum to complete an assignment. As a special education major who worked for several years as a technology lab aide in an elementary public schools noted:

It is like an artists canvas. Okay, so you know what you have to come up with so now you have to actually come up with it. And people who don't have the opportunity to do it that way get stuck in a box and all they do is fill in templates and fill out forms and they don't see the ability to go

beyond and create beyond what's there. Because they don't know how to get there

A process-related theme that reoccurred throughout the journals and interviews was that of creativity. Students felt that constructivist methodology allowed and encouraged them to be more imaginative and creative. As one participant said, "It's like giving you the guidelines, being there to help you if you have difficulties. But it was a lot of self-motivation. It's a method that is going to leave us a lot more flexible and a lot more creative." Another pre-service science teacher discusses how constructivist methods influence creativity,

We are all going to be different, we're all going to have different styles, we are all going to enjoy doing different things and our students are going to enjoy doing different things. So it's a method that is going to leave us more flexibility and a lot more creativity and a lot more room to use things in the way that is going to suit our style. Whereas you know, the directive method is like you need to stamp out like a cookie-cutter.

Instruction Thinking. Participants spent time thinking about the instruction. They evaluated the instructor and her role in their learning. Students valued an instructional approach that allowed them to explore and to guide their own learning and acquisition of skills. They felt this method gave them the freedom to explore topics at a greater depth, but wanted to know that the instructor or peers would support them if needed. One student discusses his feelings about the instructional approach: "You are trying to let us figure out what to do after a little guidance from you. I appreciate that a lot and think that

is a great way of teaching. Do it for them and they will never learn. Show them and they will never learn. Let them do it hands on, they will learn.”

They valued a collegial approach where they felt their ideas were as valued as the instructor's, they were viewed as peers, and they were encouraged to take an active partnership in learning and then sharing their knowledge and teaching others. One student described this:

She's very open to, No, I don't know everything, I don't know every version of software, I'm not supposed to. That's what help is for. You know, let's create, let's do this, let's go in and figure out how to do it. And a lot of teachers are so scared that they don't know everything. They are afraid to let the kids on there because they don't want to be in a position to say I don't know. And that's a really scary position to be in if you look at a little kid who thinks you are this really awesome person and say I don't know, but there are lots of ways to say I don't know, well I am not sure, let's figure this out. I mean there is just so much to learn from each other. When one of us comes up with something that she does not know, oh that's cool, I hadn't seen that before! and really encourages us to explore and discover and go beyond what she's shown us.

Participants also thought about how they felt supported or valued by the instructor and their peers. They appreciated having access to the instructor via e-mail as well as via phone and office hours. It was very important to them to have their concerns, questions, or thoughts responded to promptly even when out of class. They appreciated being treated individually and having individual time with the instructor. Although they

generally felt the instructor was accessible to them in class, they did voice some frustration at having to wait for the instructor's help during class. They valued being able to share ideas and discuss ideas with peers. One participant reflects on the value of sharing with peers: "It is a really good environment. There seems to be a lot of peer support also. The young man who sits next to me, (name), is so very helpful. There seems to be that cooperative spirit in this classroom and that is encouraging."

Students evaluated the materials used in the course and how they could adapt those materials for their own use both during the course and after the course. The website proved challenging initially because of an unfamiliar interface, but once students became acclimated to it, it provided them with a central location to access information about the course, assignments, and grades, as well as alerted them to daily agendas. They supplied on-going feedback about the organization of the website and appreciated seeing their suggestions incorporated into the structure of the website. It was important that the website be kept current. In addition to the website, they spent time analyzing the other materials used in the class such as the course packet, the book, instructor-created handouts, and software demos. They felt that the course packet was unnecessary. While they believed the book had useful information, they felt its usefulness was not commensurate with its expense. They suggested using alternate resources that were not as costly, such as websites and handouts. Participants valued the instructor-made handouts that were specific to each assignment. Skill tasksheets that addressed the specifics of the technology were created for each of the technology components, and students commented on using them as needed to address their technology deficits. As one student put it, "She has a handout for every skill, every piece of software so that you could always kind of

teach yourself, walk yourself through, and learn the software.” While having access to reference material for specific technology skills was important, students did not want to be made to work through tasksheets. They wanted to use them as needed in the content of creating projects or practicing skills. Participants commented on how they might use the skill sheets with their future students or personally as they apply the skills they had acquired in their future teaching. Software demos were important to students because they felt the demos allowed and encouraged them to explore the software outside of class. In some instances, they were frustrated because some of the software demos were not fully functional and because they encountered some problems with the platforms they were using, but the general consensus was that demo software was valuable and important to their developing their projects.

Technology Thinking. Participants spent time thinking about technology in terms of its accessibility, their own skill levels using technology, and their hardware and software successes and problems. They also compared their new experiences with their prior knowledge and experiences. While a list of critical technology skills was identified for students in the course packet, students did not use the list to assess their technology skills. Instead they assessed their skills contextually within the scope of the tasks they were accomplishing. They identified their deficit technology skills and how those skills affected their use of the technology to accomplish tasks. One student relayed his self-assessment of his Internet searching skills and how his lack of Internet searching strategies affected his ability to find information related to his unit theme of geology:

One problem I am having using the Internet as a resource is that I end up finding lots of advertising material and less raw information. I need to

know how to get sites that simply have lots of information on the subject of geology (like an online encyclopedia resource). I don't want to end up using mediocre Internet resources because I don't know how to best search the web.

The students considered it important to have hands-on access to the technology while learning to use it. After participating in Activity 2: Constructivist Slideshow: Slopes which required learners to use a digital camera to document slopes in their environment, one student commented on how he felt when he was given a digital camera to use during the activity:

I also had a chance Wednesday to use a digital camera. I have always wanted to use one but no one has ever let me. It may have not meant much to you to let me use it but it meant a lot to me. Using it was so awesome and it is so neat to know you can now keep pictures you want and throw away the ones you don't before even developing them.

Participants gauged their technology proficiency in comparing their skills to those of their peers as well as by comparing them with their prior experiences. Although some of the students were proficient and experienced in using some of the technologies, they felt the constructivist environment allowed them to explore the technologies in greater depth. Working in groups allowed them to learn skills from each other. A participant with high technology skills acquired during her career in business, compared her skills to those of her classmates and also discussed challenging herself to learn an unfamiliar platform,

This week was exciting and frustrating. As I talk with some of the other students, I find that I am much slower in catching on to the technology. Some of the others are commenting on the slow pace of the class. I, however, do not find the class to be moving too slowly. It seems about right for me, so I hope the pace does not pick up. I think one other difference exists between me and the others too. Most of the other students selected a computer that they are already comfortable with and are working on what they usually use at home. I decided to work with a Mac, because I know a lot of schools have Macs and I want to be able to use one if need be. That may also account for my slow pace. The Mac is not all that different, but it does take a little more thought. (journal entry from week two of the intervention)

Having a choice of platforms was important to students. Generally students elected to use the platform that they were already most comfortable with or one that was compatible with the system they had access to outside of the class. Although students were free to sit wherever they wanted and use whichever platform they chose, three of the students in the class self-elected to use a platform that was unfamiliar to them because they saw the value in learning both Windows and Macintosh operating systems.

In terms of technology, participants discussed accessibility to computers, software, and other technologies. While there were some minor issues with accessibility, students felt as if technologies were generally accessible to them both in and out of the classroom. They used computer labs in College of Education and other campus labs and noted that the computer lab hours, software, and hardware met their needs. However,

there was concern about the lack of access to color printers and to other peripheral devices such as digital cameras and scanners. Students wanted to be able to use these technologies to complete their projects outside of class as well as having access to them in class.

When students encountered hardware or software problems, they tried to work through the problems themselves. Participants described this process as playing around or exploring the software and felt the environment in the classroom allowed them to work in this way:

I have realized my biggest problem is patience. I don't like "playing" around on the computer. But I have found that this is a good way to learn my way around. I am a very procedural type person and I like to do things right the first time. This is an excellent tool, though, because my students will not do things right the first time, and if I can't have the patience with myself, there is NO WAY I will have the patience with my students that I definitely must have. (I guess I'll be doing some "growing" in this class, won't I?!)

If they could not solve their own problems, they relied on peers or the instructor, but generally only as a last resort.

Summary

The data gathered via a pre- and post-intervention survey revealed a significant difference in participants' pre- and post-intervention confidence in their abilities to plan and create various constructivist learning activities supported by technology (**Table 4**). Data from journal entries and interviews, reveal participants' perceptions of participating

in a constructivist intervention as a process of analyzing, reflecting, evaluating, and adjusting their ideas about their own teaching and learning as well as the learning of their future students.

Chapter 5

Conclusions, Discussion, and Recommendations

Summary of Study

The purpose of this study was, first, to determine the effect of a constructivist intervention supported by technology on pre-service teachers' confidence in their own ability to plan and create constructivist learning activities supported by technology and, second, to understand their perceptions of the experience. Two research questions drove the study:

- What is the effect of an instructional approach that uses constructivist pedagogy supported by technology on pre-service teachers' confidence in their own ability to plan and develop constructivist learning activities supported by technology?
- How do pre-service teachers perceive the experience of participating in an instructional technology course that employs a constructivist pedagogical approach to develop constructivist learning activities that utilize technology to enhance learning?

A quasi-experimental research design using a pre- and post-intervention survey as well as journal entries, focus groups, and interviews was used to investigate the effects of the intervention.

Data were collected from 23 pre-service teachers over the course of a summer semester in an introduction to instructional technology class at the University of Tennessee Knoxville. Students were situated in a learning environment that employed a

constructivist pedagogical approach and focused on constructivist learning methods supported by various technologies. Prior to completing the pre-intervention survey, students explored the two predominate instructional methods, direct instruction and constructivism, so that they would be familiar with concepts and terms used on the pre-intervention survey. Students' pre-intervention experience and confidence in their ability to plan and create six constructivist learning activities were assessed via the pre-intervention survey. Students were then situated in an intervention designed both to model and to teach constructivist methods as well as how those methods could be supported by technology. The activities were intended to engage students actively and cooperatively in constructing relevant knowledge as well as to allow them to reflect on their learning and the cognitive processes used during the activities. Technology skills were embedded in the constructivist activities and were acquired within that context. Upon completion of the intervention, students were given a post-intervention survey to re-assess their ability to plan and create the same six constructivist learning activities that were assessed on the pre-intervention survey. Fifteen of the 23 participants returned both parts of the survey (n=15). A paired-samples t-test was used to compare the means for each of the pre-and post-intervention items (1-6) to determine the effect of the intervention.

To gain insight into how pre-service teachers perceived the experience of participating in the intervention, journals, focus groups, and interviews were used. Journals were kept throughout the intervention. Due to technical difficulties, focus groups were only conducted the first two weeks of the study. Seven of the participants were

interviewed at the end of the intervention. Data were gathered and analyzed using analytical coding to identify patterns and themes.

Summary of Findings

Research Question 1

To determine the effect of an intervention that employs constructivist methods on pre-service teachers' confidence in their ability to plan and create six constructivist learning activities, a paired-samples t-test was used to compare the means of a five-point Likert pre- and post-intervention surveys. The results indicated there was a significant difference, $p \leq .001$, in pre-service teachers' pre- and post- intervention confidence in their ability to plan and create the six constructivist activities supported by technology.

Research Question 2

To determine participants' perception of participating in an intervention that employs a constructivist pedagogical approach supported by technology to develop constructivist learning activities supported by technology, data from journals, focus groups, and interviews were coded, revealing that participants in the intervention reflected on, analyzed, and evaluated their group processes, their technology skills, the metacognitive skills they used, and the instructors methods. In sum, they felt the intervention engaged them in a reflective process that led them to challenge their constructs of teaching.

Conclusions

This study was conducted to determine if an educational intervention could effect change in pre-service teachers' confidence in their ability to design and create constructivist learning experiences support by technology. This study also was an attempt to understand their perspectives of the experience. From this study, it seems reasonable to conclude:

- Situating pre-service teachers in an educational intervention that employs a constructivist approach supported by technology can significantly improve their confidence in their ability to create and design constructivist learning activities supported by technology.
- Situating pre-service teachers in an educational intervention that employs a constructivist approach supported by technology engages them in a reflective process whereby they analyze, evaluate, adapt, and adjust their constructs of teaching, group processes, metacognition, instructional methods, and their own technology skills.

Discussion

A review of the literature indicates that a skills-based approach to teaching technology and its integration into the classroom has not had the desired outcome: teachers who facilitate their students' use of computers as a tool for data analysis, exploration, simulation, or other high order thinking-skills. Learning is a complex process. Cognitive psychology reveals that learning is grounded in active participation, that knowledge is constructed, and that the situation and context influence not only what

we learned, but how what is learned can be used. To short cut the learning process by offering learners bits of decontextualized information divorces learning from reality. Direct instruction may not allow the learner to go through the process of actively and intentionally constructing, adapting, and adjusting mental models. Situating pre-service teachers in an intervention that employs a constructivist methodology honors learning processes in several ways. First, it honors learning as a natural, adaptive process that allows students to act on and manipulate their environment and observe the results of their actions. (Jonassen, Peck, & Wilson, 1999). Many of the students in the study had either limited or no exposure to constructivist experiences or to planning and creating constructivist learning activities supported by technology. Thus their mental models of both were limited by their prior experiences. As evidenced in many of their journal entries, the students initially tried to fit their new experiences into their old teaching/learning paradigm. At times they admittedly clung to their pre-intervention mental models: "I found it challenging to create a way for students to use PowerPoint since it is unreasonable for them to actually use the computer." The difference between their intervention experiences and their prior experiences and mental models of teaching, learning, and the use of technology created cognitive dissonance that was evident from the initial confusion and frustration many of them reported. Those initial feelings of confusion and frustration, of being intimidated or overwhelmed, required learners to reflect upon, manipulate, self-regulate, and adjust their construct of teaching, learning, and the role of technology in their future teaching practices. For these pre-service teachers, being situated in a constructivist intervention evoked a reflective process: students analyzed their ideas about teaching and learning by comparing their new

experiences to what they had viewed as effective teaching and learning before the intervention. They examined their own assumptions and tried to judge how those assumptions fit into their construct of teaching and learning. They actively and collaboratively adjusted their constructs of teaching and learning, thereby creating new mental models. They tested their assumptions against their constructs of how they would teach, how their students would learn, and how their adjusted models might work in their future classrooms. As students actively worked through this process, their confidence significantly increased. They became self-directed, self-regulated, and motivated. They felt valued and important. And most importantly, they were encouraged to be creative and imaginative, to explore, discover, and “go beyond.” In short, they wanted to learn.

The question remains, “How can we best train teachers to use technology to facilitate student learning?” In this study, related literature has been reviewed, pre-service teachers have been asked to describe their own perceptions of an introduction to instructional technology class that used a constructivist approach and changes in the confidence levels of pre-service teachers in their ability to plan and create constructivist activities supported by technology have been observed. The relationship between the increase in confidence among pre-service teachers, pre-service teachers’ confidence, and the literature related to pre-service training and technology and teacher beliefs, practices, and technology use is clear. Focusing technology skills in isolation has not been effective in training teachers to use technology to support learning, nor has direct traditional instruction in technology integration. However, when teachers are situated in a learning environment where the constructivist instructional methods are modeled and implemented, pre-service teachers develop confidence in their abilities to produce

constructivist learning activities that are tied to curriculum and supported by technology. Both this study and others, (Milken, 2001; Todd, 1993; Wetzel, 1993) suggest that teacher education programs need to routinely model the use of technology as an integrated teaching tool. That cannot happen when the technology is isolated in computer labs. It may happen when computers, software, and materials are integrated, physically as well as in their use, into methods classes or other classes where pre-service teachers learn. By using computers as a vital tool to facilitate their own learning, using computers to express themselves creatively, and using computers for personal purposes, teachers are more likely to learn to like using computers and find value in technology as an instructional tool (Laffey & Musser, 1998; Hochman, Maurer, & Roebuck, 1993; Kearns, 1992). People want to see relevance in what they are learning. For pre-service teachers, relevance means not only how they are personally affected, but also how methods and tools might affect the learning of their future students (Valdez, et al, 1999, Rodriguez & McDonald, 2001). Pre-service teachers should engage in the constructive processes of analyzing, adapting, testing, negotiating, retrying, and reflecting in order to determine for themselves how to teach, how students learn, and how technology can support learning.

Recommendations for Further Research

This study was limited to a relatively short time frame. It was also limited in that pre-service teachers applied, tested, revised their ideas about teaching, learning, and the use of technology in a college class rather than in an actual teaching setting. The participants in this study were pre-service teachers who have not yet taught. Based on the

review of the literature and the major findings and conclusions of this study, the following recommendations for additional research can be made:

1. Investigate the effects of a constructivist intervention that focuses on constructivist methodology supported by technology on pre-service teachers' pedagogical beliefs.
2. Investigate the effects on practicing teachers' pedagogical beliefs, practices, and use of technology of a constructivist intervention supported by technology and requires these teachers to restructure and implement learning activities and concepts previously taught using more traditional approaches. Investigate the effects immediately after the intervention, and each year thereafter for three years. Investigate whether, after participating in such an intervention, practicing teachers can and do restructure learning experiences that were previously taught using direct instruction/tradition methods and provide their students with constructivist learning experiences supported by technology. Investigate the perceptions of the participants while they are situated in the intervention and after the intervention during over a period of three years. Explore the effects any changes in teachers' pedagogical beliefs, practices, and use of technology have on student learning processes and outcomes.
3. Investigate the effects of integrating constructivist pedagogical approaches into methods courses that are designed so that faculty members seamlessly model constructivist methods and technology and require students routinely to use technology personally and as a learning/teaching tool. Investigate the perceptions of the participants and the faculty members involved in the study.

4. Explore how teachers are affected when their own pedagogical beliefs, practices, and use of technology do not conform with the dominant pedagogical beliefs, practices, and use of technology at their institutions.

REFERENCES

- Adams, E. (2000). Transparent training and technology intuition. T.H.E. Journal, April, 115- 117.
- Anderson, R.E. & Ronnkvist, A. (1999). The Presence of Computers in American Schools. Teaching, Learning, and Computing: 1998 National Survey Report #2. Irvine, CA: Center for Research on Information Technology and Organizations.
- Baylor, A., Kitsantas, A., & Chung, H. (2001). Two Tools to facilitate per-service teacher's self-regulation during instructional planning. Manuscript in review.
- Beavers, D. (2001). Professional development outside the workshop box. Principal Leadership, May/June, 43-46.
- Becker, H. & Ravitz, J. (1999). The influence of computer and Internet use on teachers' pedagogical practices and perceptions. Journal of Research on Computing in Education, 31(4).
- Becker, H.J. (1999). Internet Use by Teachers. Retrieved April 24, 2001 from the World Wide Web: <http://www.crito.uci.edu/tlc/findings/internet-Use/report.htm>
- Berryman, S. (2001). Designing Effective Learning Environments: Cognitive Apprenticeship Models. Retrieved September 25, 2001 from the World Wide Web: <http://www.ilt.columbia.edu/k12/livetext/docs/berry1.html>
- Beyerbach, B., Walsh, C. & Vannatta, R. (2001). From teaching technology to using technology to enhance student learning: Preservice teachers' changing perceptions of technology infusion. Journal of Technology and Teacher Education, 9(1), 105-127.
- Brooks, J. & Brooks, M. (1999). In Search of Understanding: The Case for Constructivist Classrooms. Alexandria, VA: Assn for Supervision & Curriculum Development

- Collins, A., Brown, J., & Newman S. (1989). Cognitive apprenticeship: teaching the crafts of reading, writing, and mathematics. In Knowing, Learning, and Instruction: Essays in honor of Robert Glaser. Hillsdale, NJ: Lawrence Erlbaum Associates. 453-494.
- Conway, J. (1997). Educational Technology's Effect on Models of Instruction. Retrieved November 1, 2001 from the World Wide Web:
<http://udel.edu/~jconway/EDST666.htm>
- Cuban, L. (1990) Reforming again, again, and again. Educational Researcher, 19(1):3, 13.
- Cuban, L. (1997). High-tech schools and low-tech teaching. Journal of Computing in Teacher Education, 14(2), 6-7.
- Denzin, N. K. (1989). Interpretive Interactionism. Newberry Park, CA : Sage Publications, Inc.
- Dressel, P. (1958). The meaning and significance of integration. In N.B. Henry (Ed.), The Integration of Educational Experiences, 57th Yearbook of National Society for the Study of Education (pp. 3-25). Chicago, IL: University of Chicago Press.
- Dwyer, D., Ringstaff, C. & Sandholtz, J. (1992). Teacher beliefs and practices part 1: Patterns of change. The evolution of teachers' instructional beliefs and practices in high-access-to-technology classrooms first - fourth year findings. ACOT report #8. California: Apple Computer Inc.
- Eachus, P. & Cassidy, S. (1999). Developing the computer self-efficacy (CSE) scale:

- Investigating the relationships between CSE, gender, and experience with computers. Retrieved September 1, 2001 from the World Wide Web:
<http://www.salford.ac.uk/healthSci/selfeff/selfeff.htm>
- Education Week (1999). Technology Counts '99. Retrieved October 21, 2000 from the World Wide Web: <http://www.edweek.org/sreports/tc99/>
- Fisher, M.M. (1997). The voice of experience: Inservice teacher technology competency recommendations for preservice teacher preparation programs. Journal of Technology and Teacher Education, v5, 139-147.
- Fulton, K. & Torney-Purta, J. (1999). How Teachers Beliefs about Teaching and Learning are Reflected in Their Use of Technology: Case Studies from Urban Middle Schools. Retrieved August 1, 2001 from the World Wide Web:
<http://www.learn.umd.edu/futon-thesis.html>
- George, E. J. (1995). What should we be teaching preservice teachers about the "Information Superhighway?" Unpublished doctoral dissertation: Purdue University. Retrieved June 10, 1999 from the World Wide Web:
<http://edtech2000.net/george/dissertation>.
- Gerald, D. & Hussar, W. (1991). Projections of Educational Statistics to 2002. Washington, DC: National Center for Educational Statistics, U.S. Department of Education.
- Gilmore, A.M.. (1995). Turning teachers on to computers: Evaluation of a teacher development program, Journal of Research on Computing in Education, 27, 251-269.
- Glennan, T. & Melmed, A. (1999). Fostering the Use of Educational Technology:

- Elements of a National Strategy. Washington, D.C.: RAND.
- Glesne, C. & Peshkin, A. (1992). Becoming Qualitative Researchers: An introduction. White Plains, NY: Longman.
- Goldman, S., Cole, K., & Syer, C. (1999). The Technology/Content Dilemma. Retrieved March 18, 2001 from the World Wide Web:
<http://www.ed.gov/TechConf/1999/whitepapers/paper4.html>
- Hannafin, R. & Freeman, D. (1995). An exploratory study of teachers' views of knowledge acquisition. Educational Technology, 49-56.
- Hannafin, R.D., & Savenye, S. (1993). Technology in the classroom: The teacher's new role and resistance to it. Educational Technology, 33, (6), 26-31.
- Harel, I. & Papert, S. (1991). Software as a learning environment. In I. Harel and S. Papert (Eds.) Constructivism, 41-84. Norwood, NJ: Ablex.
- Hargrave, C. & His, Ying-Shao (2000). Survey of instructional technology courses for preservice teachers, Journal of Technology and Teacher Education Irvine, CA: Center for Research on Information Technology and Organizations, 8(4), 303-314.
- Harris, M.B. (1998). Basic Statistics for Behavioral Science Research. Needham Heights, MA: Allyn & Bacon.
- Haslam, S.A. & McGarty, C. (1998). Doing Psychology. Thousand Oaks, CA: Sage Publications.
- Hochman, A., Maurer, M., & Roebuck, D. (1993). Buttons and cards and fields, oh my! Tech Trends, 38(2), 25-28.
- Honey, M., Culp, K., & Carrigg, F. (1999). Perspectives on Technology and Educational

- Research: Lessons from the Past and Present. Retrieved March 18, 2001 from the World Wide Web: <http://www.ed.gov/TechConf/1999/whitepapers.html>.
- Honey, M. & Moeller, B. (1990). Teacher's beliefs and technology integration: Different values, different understandings. CTE Technical Report Issue, No. 6. Education Development Center, Inc. Center for Children and Technology.
- Honeyman, D. & White, W. (1987). Computer anxiety in educators learning to use the computer: A preliminary report. Journal of Research on Computing in Education, 20(2), 129-138.
- Hooper, S. & Rieber, L. (1995). Teaching with technology. In A.C. Orstein (Ed.), Teaching: Theory into practice, 154-170. Needlham Heights, MA: Allyn and Bacon.
- International Society for Technology in Education (2000). National Educational Technology Standards for Students: Connecting Curriculum and Technology. Eugene, OR: International Society for Technology in Education
- International Society for Technology in Education (2000). National Educational Standards (NETS) for Teachers Project. Retrieved March 1, 2001 from the World Wide Web: http://cnets.iste.org/intro_splash3.htm
- Jaccard, J. & Wan, C.K. (1996). Approaches to Interaction Effects in Multiple Regression. Thousand Oaks, CA: Sage Publications, Inc.
- Jacobs, H. (1989). Interdisciplinary Curriculum: Design and Implementation. Alexandria, VA: Association for Supervision and Curriculum Development.
- Jaffee, D. (2001). Virtual Transformation: Web-Based Technology and Pedagogical Change. Manuscript in review.

- Jonassen, D. (1994). Technology as Cognitive Tools: Learners as Designers. Retrieved February 1, 2000 from the World Wide Web:
<http://it.coe.uga.edu/itforum/paper1/paper1.html>
- Jonassen, D. (1994). Thinking technology: Toward a constructivist model. Educational Technology, 34(4), 45-53.
- Jonassen, D., Peck, K., & Wilson, B. (1999). Learning with Technology: A constructivist perspective. Upper Saddle River, NJ: Prentice-Hall, Inc.
- Johnson, M., Schwab, R., Foa, L. (1999). Technology as a change agent for the teaching process: How technology integration can change teaching. Journal of Theory into Practice, Ohio State University, February, 1999.
- Kearns, J. (1992). Does computer coursework transfer into teaching practice? Journal of Computing in Teacher Education, 8(4), 29-34.
- Koohang, A. A. (1987). A study of the attitudes of preservice teachers toward the use of computers. Educational Communication and Technology Journal, 35(3), 145-149.
- Laffey, K. & Musser, D. (1998). Attitudes of preservice teachers about using technology in teaching. Journal of Technology and Teacher Education, 6(4), 223-241.
- Lake, K. (2001). Integrated Curriculum. Retrieved February 16, 2001 from the World Wide Web: <http://www.nwrel.org/scpd/sirs/8/c016.html>.
- Liu, M., Reed, W. & Phillips, P. (1992). Teacher education, students, and computers: Gender, major, prior computer experience, occurrence, and anxiety. Journal of Research on Computing in Education, 24(4), 457-467.
- Market Data Retrieval (2001). K-12 Schools Make Major Changes in Technology. Retrieved March 19, 2001 from the World Wide Web

<http://www.schooldata.com/pr22.html>

Maxwell, J. A. (1996). Qualitative Research Design: An interactive approach. Thousand Oaks, CA: Sage Publications.

McCracken, G. (1988). The Long Interview. Newberry Park, CA: Sage Publications, Inc.

McKenzie, J. (2001). How Teachers Learn Technology Best. Retrieved March 19, 2001 from the World Wide Web: <http://fno.org/mar01/howlearn.html>

Merriam, S. B. (1998). Qualitative Research and Case Study Applications in Education. San Francisco: Jossey-Bass Publishers.

Milken Family Foundation (2002). Information Technology Underused in Teacher Education. Retrieved November 8, 1999 from the World Wide Web:
http://www.mff.org/edtech/article.taf?_function=detail&Content_vid1=131

Moersch, C. (1995). Levels of technology implementation (LoTi): A framework for measuring classroom technology use. Learning and Leading with Technology, 23(3), 40-41.

Moursand, D. & Bielefeldt, T. (1999). Information Technology in Teacher Education. Eugene, OR: International Society for Technology in Education.

Norris, C., Smolka, J., & Soloway, E. (1999). Convergent Analysis: A Method for Extracting the Value from Research Studies on Technology in Education. Retrieved October 2, 2001 from the World Wide Web:
<http://www.ed.gov/Technology/TechConf/1999/whitepapers/papers2.html>

National Center for Educational Statistics. (1993). Edsearch: Educational statistics on disk. [Computer Software]. U.S. Department of Education.

Niederhauser, D. & Stoddart, T. (1994). Teachers' perspectives on computer-assisted

- instruction: Transmission versus construction of knowledge. Paper presented at the Annual meeting of the American Educational Research Association (New Orleans, L.A.) (ERIC Document Reproduction Services No. ED 374 116).
- North Central Regional Educational Laboratory (1994). Policy Briefs, Special Policy Report 1. Retrieved October 4, 2001 from the World Wide Web:
<http://www.ncrel.org/sdrs/pbriefs/94/94-1ovr2.htm>.
- Office of Educational Research and Improvement (1993). Using technology to support educational reform. Washington, DC: U.S. Government Printing Office.
- Office of Technology Assessment. (1988). Power on! New tools for teaching and learning. (OTA-SET-379). Washington, D.C: United States Government Printing Office.
- Office of Technology Assessment. (1995). Teachers and technology: Making the connection. (OTA-SET-616). Washington, D.C: United States Government Printing Office.
- Penuel, W. & Means, B. (1999). Observing Classroom Processes in Project-Based Learning Using Multimedia: A Tool for Evaluation. Retrieved March 18, 2001 from the World Wide Web:
<http://www.ed.gov/Technology/TechConf/1999/whitepapers/paper3.html>.
- Perkins, D. (1986). Knowledge as Design. Hillsdale, NJ: Lawrence Erlbaum.
- Persichitte, K., Tharp, D. & Caffarella, E. (1997). The Use of Technology by Schools, Colleges, and Departments of Education 1996. Washington, DC: American Association of Colleges for Teacher Education.
- President's Committee of Advisors on Science and Technology: Panel on Educational

- Technology. (1997). Report to the President on the use of technology to Strengthen K-12 education in the United States. Retrieved June 10, 1999 from the World Wide Web:
<http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/PCAST/k-12ed.html>.
- Ravitz, J., Becker, H., & Wong, Y. (2000). Constructivist-Compatible Beliefs and Practices among U.S. Teachers. Teaching, Learning, and Computing: 1998 National Survey, Report #4. Irvine, CA: Center for Research on Information Technology and Organizations.
- Reyes, P. (2001). Qualitative Research Design. Retrieved June 29, 2001 from the World Wide Web: <http://www.edb.utexas.edu/reyes/appendixb.html> .
- Roblyer, M., & Edwards, J. (2000). Integrating Educational Technology into Teaching. Upper Saddle River, NJ: Prentice Hall.
- Rodriguez, S. & McDonald, J. (2001). Implementing a web-based middle school science curriculum: An Evaluation Report. Presented at SITE 2001, Orlando, FL.
- Ronnkvist, A., Dexter, S., & Anderson, R. (2000). Technology Support: Its Depth, Breadth and Impact in America's Schools. Teaching, Learning, and Computing: 1998 National Survey, Report #5. Irvine, CA: Center for Research on Information Technology and Organizations.
- Scheffler, F. & Logan, J. (1999). Computer technology in schools: What teachers should know and be able to do. Journal of Research on Computing in Education, 31, 305-325. Retrieved June 10, 2000 from EBSCO database on the World Wide Web:
<http://www.ebsco.com>
- Spady, w. (1994). Choosing outcomes of significance. Educational Leadership, 51(6), 18-

22.

Sparks, D. & Hirsh, S. (1997). A New Vision for Staff Development. Oxford, OH:

National Staff Development Council.

The National Commission on Excellence in Education (1983). *A Nation at Risk: An*

imperative for educational reform. Washington, D.C.: U.S. Government Printing Office.

Todd, N. (1993). A curriculum model for integrating technology in teacher education

courses. Journal of Computing in Teacher Education, 9(3), 5-11.

Trondle, P., Mandl, H., Fischer, F., Koch, J., Schlichter, J., & Teege, G. (2001). Use of

Multimedia for Problem Based Learning in Computer Science: The Munics

learning environment. Retrieved September 20, 2001 from the World Wide Web:

<http://e3.uci.edu/programs/ificonf/papers/koch>

Trotter, A. (1999). Preparing Teachers for the Digital Age. Retrieved June 19, 2000 from

the World Wide Web: <http://www.edweek.org/sreports/tc99/articles/teach.htm>

Uebersax, J. (jsubdersax@yahoo.com). (2001, October 15). Your website on stats.

E-mail to Kathryn DiPietro (kdipietr@utk.edu).

United States Congress (1994). Technology Act for Education of 1994.

Retrieved June 10, 1999 from the World Wide Web

<http://www.ed.gov/legislation/ESEA.sec3111.html>.

United States Department of Education (2001). Clinton Announces Grants to Prepare

Tomorrow's Teachers to Use Technology. Retrieved March 18, 1999

from the World Wide Web: <http://www.ed.gov/PressReleases/06-2000/0603.html>.

United States Department of Education, Office of Educational Technology (1998).

- Teachers will be ready to use and teach with technology. Retrieved June 10, 1999 from the World Wide Web: <http://www.ed.gov/Technology/pillar4.html>.
- United States Department of Education (1996). Getting America's students ready for the 21st century: Meeting the technology literacy challenge. . Retrieved June 10, 1999 from the World Wide Web: <http://www.edu.gov>.
- United States Department of Education. National Center for Educational Statistics. (2000). Teachers' Tools for the 21st Century: A Report on Teachers' Use of Technology. Washington, D.C.
- United States Department of Education, Office of Educational Technology (2001). ED Office of Educational Technology. Retrieved March 1, 2001 from the World Wide Web: www.ed.gov/Technology.
- United States Department of Education, Office of Educational Technology (2001). ED Technology Budget and Legislation. Retrieved March 1, 2001 from the World Wide Web: <http://www.ed.gov/Technology/budget.html>.
- Valdez, G., McNabb, M., Foertsche, M., Anderson, M., Hawkes, M., & Raack, L. (1999). Computer based technology and learning. Retrieved November 10, 2001 from the World Wide Web: <http://www.ncrel.org/tplan/cbtl/toc.htm>
- Warner, M. (1999). Training today's teachers for tomorrow's classrooms. T.H.E. Journal, October.
- Wetzel, K. (1993). Models for achieving computer competencies in preservice education. Journal of Computing in Teacher Education, 9(4), 4-6.
- Williams, A. & Williams, P. J. (1997). Problem-based learning: An appropriate method

- for technology education. Research in Science & Technological Education, vol. 15, No. 1.
- Wilson, B., Teslow, J., & Osman-Jouchoux R. (1995). The impact of constructivism (and postmodernism) on instructional design fundamentals. In B. Seels (Ed.) Instructional Design Fundamentals” A review and reconsideration, (p. 137-157). Englewood Cliffs, NJ: Educational Technology Publications.
- Winn, W.D. (1991). The assumptions of constructivism and instructional design. Educational Technology, 31(9), 38-40.
- Wise, A. (1997). A message to NCATE institutions, board members, constituent organizations, and friends about Technology and the New Professional Teacher: Preparing for 21st Century Classrooms. Washington, DC: NCATE.
- Woodrow, J. E. (1990). Locus of control and student teacher computer attitudes. Computers in Education, 14(5), 421-432.
- Yildirim, S. (2000). Effects of an educational computing course on pre-service and inservice teachers: A discussion and analysis of attitudes and use. Journal of Research on Computing in Education, 32, 479-497.

APPENDICES

APPENDIX A
STUDY INFORMATION SHEET

Study Information Sheet

The Experience of a Constructivist Pedagogical Approach in an Introduction to Instructional Computing Course

Introduction:

As part of ITCE 486 Section 26986 you are invited to participate in a research study. The purpose of this study is to examine the effects of constructivist teaching methods on the confidence of study participants to develop constructivist-learning activities that utilize technology to enhance learning as well as the participants' perceptions of the experience.

Information about Participant's Involvement in the Study:

During the course of the study, you will be asked to:

- Complete a pre and post class survey to determine your experience with a variety of constructivist activities supported by technology and your perception of your confidence in your ability to plan and develop a variety of constructivist activities supported by technology.
- Keep a weekly journal in which you will reflect on class activities or any thing else related to the class that you feel you'd like to write about.
- After each activity, participate in a focus group to share your thoughts about class activities or anything else related to the class. These focus groups may also be used to discuss, clarify, or verify themes identified in class journals or interviews.
- In addition, you may be asked to participate in an interview. The interviewer will be a trained interviewer other than the course instructor/researcher. The interview will allow you to discuss anything you like related to the course.

This study will begin June 4, 2001 and will end August 4, 2001. All data will be collected during normal course times and no additional course sessions will be required.

Risks:

There are no foreseeable risks associated with this study.

Benefits:

Benefits from your participation in this study are as follows:

Personal Benefits:

- An understanding of constructivist teaching pedagogy and technology integration

Other Benefits:

- Add to the literature regarding methods for training pre-service teachers in the use of pedagogy and technology support

Confidentiality:

All information in the study records will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study unless you specifically give permission in writing to do otherwise. No reference will be made in oral or written reports that could link you to the study.

Compensation:

There is no monetary compensation for your participation in this study

Contact:

If you have any questions at any time about this study, you may contact Kathryn DiPietro, at A404 Claxton, University of Tennessee Knoxville, Knoxville, Tennessee, or 865-974-8140 or Dr. Edward Counts, 442 Claxton, University of Tennessee Knoxville, Knoxville, Tennessee or 865-974-4246. If you have any questions about your rights as a participant, contact the Compliance Section at 865-974-3466.

Participation:

Your participation in this study is voluntary; you may decline to participate without penalty. Declining to participate in the study will not affect your grade in the course. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is complete, your data will be returned to you or destroyed. . If you so choose, you may enroll in another section of ITCE 486. Return of the completed survey or journal entries constitutes your consent to participate.

Thank you very much for you help!

--Kathryn DiPietro

APPENDIX B
ITCE 486 SECTION 26986 SUMMER 2001
SURVEYS

ITCE 486 Section 26986 Pre-Class Survey

Please read and respond to each of the following statements. Circle the number that reflects your self- rating in each of the areas.

	Lowest				Highest
I have experience planning and creating a multidisciplinary unit with constructivist learning activities supported by technology.	1	2	3	4	5
I am confident in my ability to plan and create a multidisciplinary unit with constructivist learning activities supported by technology.	1	2	3	4	5
I have experience planning and creating a constructivist learning experience supported by a slideshow.	1	2	3	4	5
I am confident in my ability to plan and create a constructivist learning activities supported by a slideshow.	1	2	3	4	5
I have experience planning and creating an inquiry-based learning activity supported by a WebQuest	1	2	3	4	5
I am confident in my ability to plan and create an inquiry-based learning activity supported by a WebQuest	1	2	3	4	5
I have experience planning and creating a constructivist learning activity that makes use of categorizing, sorting, and classifying supported by a database	1	2	3	4	5
I am confident in my ability to plan and create a constructivist learning activity that makes use of categorizing, sorting, and classifying supported by a database	1	2	3	4	5
I have experience planning and creating a constructivist learning activity that makes use of predicting, hypothesizing, and calculating supported by a spreadsheet.	1	2	3	4	5
I am confident in my ability to plan and create a constructivist learning activity that makes use of predicting, hypothesizing, and calculating supported by a spreadsheet.	1	2	3	4	5
I have experience identifying and evaluating resources for constructivist learning activities.	1	2	3	4	5
I am confident in my ability to identify and evaluate resources for constructivist learning activities.	1	2	3	4	5

ITCE 486 Section 26986 Post-Class Survey

Please read and respond to each of the following statements. Circle the number that reflects your self- rating in each of the areas.

	Lowest				Highest
I am confident in my ability to plan and create a multidisciplinary unit with constructivist learning activities supported by technology.	1	2	3	4	5
I am confident in my ability to plan and create a constructivist learning activities supported by a slideshow.	1	2	3	4	5
I am confident in my ability to plan and create an inquiry-based learning activity supported by a WebQuest	1	2	3	4	5
I am confident in my ability to plan and create a constructivist learning activity that makes use of categorizing, sorting, and classifying supported by a database	1	2	3	4	5
I am confident in my ability to plan and create a constructivist learning activity that makes use of predicting, hypothesizing, and calculating supported by a spreadsheet.	1	2	3	4	5
I am confident in my ability to identify and evaluate resources for constructivist learning activities.	1	2	3	4	5

APPENDIX C
FOCUS GROUP GUIDES

Week One Focus Group Questions:

- Some people used the word challenging in their entries, will you help me understand what you mean by challenging in relationship to the activities we did during week one or anything else related to the class thus far?
- Was there a time when anyone felt overwhelmed? Talk to me about that experience.
- In thinking over this last week, what did you find confusing?
- A theme that I picked up over and over was that many of you felt this course would benefit you in the future when you are teaching or benefit your students. Talk a little about that please.
- Many of you commented on the group activity we did the first day. I'd like to focus on the group activity and get your feedback on that activity.
- Many of you commented on the examples, books, materials and the website. I'd like to know more about your feelings about these.
- Some people mentioned that the technology is a bit intimidating. I'd like to understand more about that.
- In regards to the structure of the class, how do you feel about the way class time is used? Do you have any suggestions? Are there benefits to how it is used or drawbacks?
- Any other comments or feedback?

Week Two Focus Group Questions

1. Many of you talked about group work in your journal entries this week. I'd like to hear your thoughts on the group work.
2. In your journals, some people commented on getting feedback from each other and from other groups. Can you talk a bit about that?
3. How do you think the things we are doing related to your future teaching or many be relevant to you and your teaching practice?
4. In some of your journals you talked about the services that are offered in the COE such as the Curriculum Lab and the ISC, will you talk a little more about those services and your exposure to them..the way you use them or haven't used them in the past.
5. What about accessibility to equipment such as digital cameras.
6. How do you all feel about the "studio time?" How do you feel about the way the class time is used? How is the pace of the class?
7. Some people talked about "learning to experiment" in this class. What does that mean?

APPENDIX D
INTERVIEW GUIDE

Interview Guide

Sharon,

Here is a guide for interviews. Don't worry about addressing each of these areas. I mainly want to hear what they say and allow them to talk about the things that they find important. I want to keep it very open-ended and let them talk about what is important to them. Thanks for all your help!

1. Background information- Previous education, major, any other background information they feel is important like other education courses they've taken or technology courses. I have all this, but it will give you a chance to get to know them and give them something to talk about while they get comfortable with you.
2. Tell me about your experience in 486.
3. Relevancy to teaching-Ask them how they see what they've done in the class as relating to their future teaching. The idea of relevancy of the 486 to what they perceive as their future teaching.
4. Methods- What do they think about the instructional methods used in the classroom. How have those methods helped/hindered them? How are they the same/different from prior experiences?
5. Group work- Many people in their journals have focused on the group work. I want to investigate their feelings about the group work.

6. Materials- Some of the journals have focused on the materials we have used in class room. Ask them about the materials.
7. Frustration, confusion- Ask them if there was a time they felt confused or frustrated and to explain those feelings, what precipitated them, how they resolved them

APPENDIX E
TECHNOLOGY TASKSHEETS

Word Processing Task/Core Skill Sheet

The main objective of this task sheet is to give you some practice using a word processor as a productivity writing tool for both you and your students. The activities are Level 1 core skills and are found on page 11 of your course packet.

Word Processing Level 1

Creating a New Blank Word Processing Document

Open a new blank word processing document by clicking on **File** on the menu bar and then selecting **New**. Click on the **General** tab in the **New** window and then click on **Blank Document** to select it. While you are in the **New** window look around at the other options. Return to the **General** tab, reselect **Blank Document** and click **OK**. You have created a new word processing document.

Entering and Editing Text

Place your insertion point (flashing line) on the blank word processing document and **click**. Type your name. **Highlight** (select) your name by placing your insertion point before the first letter of your name, click your mouse and holding down the mouse key, and dragging until you have highlighted the last letter in your name. You have now highlighted or selected your name.

Font Type, Style, and Size

Now that your name is highlighted, move your mouse to the menu bar, click on **Format** then click on **Font**. A font dialog box will open after you click font. The dialog box contains three tabs. Click the font tab if it is not at the front of the box. Go to the box titled font, **Select** a different font type and then click **OK**. This will change your font to another type. Note that it only changes the type that you have highlighted.

Now go to the box labeled **Font Style**. This box is where you can choose to use regular, bold, italic, or bold italic style. Select the style you want and click **OK**.

Be certain your name is highlighted and try each style to see how the appearance of your name is changed.

Now go to the pull down menu labeled **Size**, select a different size font and click **OK**. This changes the size of the font that was highlighted.

Font Color and Underlining

Leave your name highlighted and go to the **Font Color** box. Use the drop down menu to open and view the color selection. Select a color other than black and click **OK**. Now you will move to the **Underlined Text** box. Keep your name highlighted and select the type of underline effect you want to apply and click **OK**. You have been working in the dialog box for font. Look at the dialog box and you will see two other tabs.

Text Effects

You will be exploring the **Text Effects** next. Click the text effects tab and you can view the six options. Be certain your text is highlighted, choose one effect and click **OK**. This effect is called sparkle. Try each effect on your highlighted name. Once you have explored these effects go to the selection box and select **None** and click **OK**. Next you will learn about text spacing

Character Spacing

Click on the **Character Spacing** tab. Use the pull down menu and view the options. Make certain your text is highlighted and select one option. Observe the effect on the text spacing. Go to the drop down menu named **Position**. Use the drop down menu to see the selections. Make certain your text is highlighted select an option and click

Cutting Text

Type one or two sentences. Highlight the text that you want to delete. There are several ways to delete the text:

- On the menu go to **Edit** and click **Cut** on the drop down menu.
- Hold down the **Control** key and type "X".
- Hit the **Back Space** key or **Delete** key. On a Macintosh, you will need to move your insertion point to the right of the text you want to delete.

Copying Text

Type one or two sentences. Highlight the text that you want to copy. There are several ways to copy the text:

- On the menu go to **Edit** and click **Copy** on the drop down menu.
- Hold down the **Control** key and type "C".
- On the tool bar the icon that shows a duplicate image is the shortcut copy key.

Pasting Text

Left click on the location within the document that you want to paste the text to. This text should have been copied using the copy text instructions.

- On the menu go to **Edit** and click **Paste** on the drop down menu.
- Hold down the **Control** key and type "V".
- On the tool bar the icon that shows a clipboard image is the shortcut paste key.

Now that you have learned some text editing features you will learn how to save and retrieve a document.



Insert a 3.5 floppy disk into the A drive making certain that the name on the floppy disk is face up.,

Saving a Document on a PC:

Save a document. In the document you have already opened please type three or four sentences. Go to **File**. Click on File. Go to **Save As** and a "Save As dialog box " will

open. Go to the **Save In** box and use the **pull down arrow** to choose the **3 1/2 floppy (A:)** Go to the **File Name** box and type the name you want to give the document file. Look at the **Save As Type** box and be certain it says word document. Click **Save**. You have now saved the file to the disk in the A drive.

Saving a Document on a Mac:

Save a document. In the document you have already opened please type three or four sentences. Go to **File**. Click on File. Go to **Save As** and a “Save As dialog box “ will open. Go to the **Save In** box and click on **Desktop**. Find the icon of your disk or zip, click twice on it to open it. You will notice that the name of your disk or zip now appears at the top of your **Save As** dialog box. Go to the **Save Current Document As** box and type the name you want to give the document file. Look at the **Save File As Type** box and be certain it says word document. Click **Save**. You have now saved the file to your disk or zip.

Retrieving a Document on a PC

Go to **Start**, move up to programs and then over to Microsoft Word, **Click** once to open the **Microsoft Word Program**. Go to **File**. Scroll down and click **Open**. An “Open dialog box” will appear. Go to The **Look In** box and use the pull down menu and select **3 _ floppy (A:)**. Select the file that you wish to open and **Click** the **Open** button in the lower right corner. The document that you see has been retrieved.

Retrieving a Document on a Mac

On the harddrive, locate Microsoft Word, **Click** twice to open the **Microsoft Word Program**. Go to **File**. Scroll down and click **Open**. A **Select a Document** dialog box will appear. Find the icon of your disk or zip, click twice on it to open it. You will notice that the name of your disk or zip now appears at the top of your **Select a Document** dialog box. Doubleclick on the document you wish to open. The document that you see has been retrieved.

Check Spelling

Leave your word document open. Move your insertion point to the top of your document. Go to the Menu Bar click **Tools**. Locate Mouse Arrow on **Spelling and Grammar** and **Click** to activate Spell Check. The “Spell Checker dialog box” will open.

The program will automatically begin to check for spelling and grammar errors. If the Spell Checker finds a possible spelling error the word or phrase will be in red. If there is a possible error in grammar the word or phrase will be green. Possible errors are located in the box titled “Not in Dictionary.” Below the “Not in Dictionary Box” is the “Suggestions Box”. The “Suggestion Box” provides a list of alternative spellings.

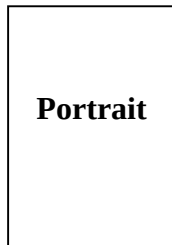
If an identified word is spelled incorrectly, you need to select the suggested spelling which is correct and click the **Change Button**. If the spelling is correct click the **Ignore Button**. When the spelling tool has completed the Spell Check click **Done**.

 **Remember spelling errors can and do occur even with spell check.**

If you write “to” for “two” or “son” for “sun” the Spell Checker will not identify the error. Proofreading of a document is essential in order to produce quality work.

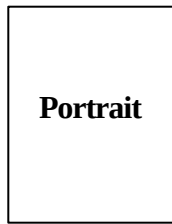
Print Document Adjust Page Setup on a PC

When your document is ready to print you go to File. Click **File**, go to **Print**, and **Click**. A “Print dialog Box” will open. The “**Name Box**” indicates the name of the printer that the computer is set up to. If there is more than one printer, be certain the correct printer is selected. If you need to change printers, click the pull down arrow and select the appropriate printer. **Click the Properties Button** in the top right hand corner. The Properties Dialog Box will open. However, the setup will vary from one computer to another. Within the dialog box the **Orientation** setting needs to be found. One document will be in “Portrait”. The other will be “Landscape”.



Print Document Adjust Page Setup on a Mac

When your document is ready to print you go to File. Click **File**, go to **Page Setup**, and **Click**. A **Page Setup** dialog box will open. You will see the name of the printer that the computer is set up to. If there is more than one printer and you want to change printers, you will do this under the **Apple**. If you need to change printers, click on the **Apple**, select **Chooser**. In the labs at UTK, you will need to click on **LaserWriter 8** to get a list of all available printers on the network. Click on the printer you wish to use to select it. Close out **Chooser**. Back in the **Page Setup** dialog box, you will notice that the printer you have selected has changed. The **Page Size** button lets you select the size of your paper. **Scaling** allows you to scale your entire document to a different size. **Orientation** refers to the orientation of your document on the paper. To select your orientation, click on the one you wish to use. **Portrait** is the standard traditional layout. The other orientation is **Landscape**. Some other options that you have are **Two Sided Safe Margin** which puts a default equal margin around your total document, **Flip Text Vertically** which flips your entire document vertically, and **Flip Text Horizontally** which flips your entire document horizontally. Click on each to see a preview.



To print your document, from the **Menubar** select **File** and then **Print**. This will open a **Print** dialog box. Within the **Print** dialog box you have the following options:

- **General, Papertype/Quality, Layout, Color, Microsoft Word**

We are going to focus on the **General** tab, however, you may want to explore the other options especially if you are working with color printing. Toggle back to **General** and you will note you have the following options:

1. **Copies**- This is the number of copies you want to make. You may have the option to collate those copies. This varied from printer to printer.
2. **Pages**- This allows you to print an entire document by clicking on all or selecting a page range to print by typing in the specific numbers of the pages you wish to print.
3. **Print Order**- You can print your pages from the first to the last or from the last to the first by altering the print order.
4. **Preview**- This allows you to preview your document before printing,;
5. **OK**- Clicking **OK** sends your print job to the printer

Format Documents

Although there are several features of formatting your document, for the purpose this class, we will limit that to setting your margins. From the **Menubar** select **Format** and then **Document**. Note that you can adjust the margins on the top, bottom, right, and left of your document. Also note that you can apply the margin changes to the entire document or from this point forward. This point forward would apply the changes from the point your insertion beam to the rest of the document.

Graphic Image From ClipArt

With the document open position the insertion point where you want the graphic image to be located. Go to menu click **Insert**. A drop down menu will open and you will move down to the word **"Picture"**. A sub menu will open. Move to **"ClipArt"** and **Click**. The **"Insert Image Dialog Box"** will open. If you know the name of the image that you want you can go to the "Search for Clips Box" and type in the name. Next, hit **Enter** and the images will appear in the pictures box. **Left Click** on the image you want to access, and a menu with four icons will appear. **Click** the **First Icon** to acquire the image and send it to the document. **Click** the **Second Icon** to view the image.

Graphic Image From File

Position the insertion point where you want the graphic image to be located. Go to the menu and click on **Insert**. A drop down menu will open, go to the word **"Picture"** and a sub menu will open. Go to the **"From File"** and **Click**. An Insert "Picture Dialog Box" will open. Go to the "Look In Box". On the pull down menu **select the drive** that the file is in. **Select the image** that you want to insert. Click **Insert Button** in the lower right hand corner.

Graphic Image Size

The image is now inserted in the document. It may not be the size you desire. To adjust the image you need to move the mouse cursor to the corner of the image. **When you see a line with arrows at either end, left click your mouse and drag the corner outward for a larger graphic image or inward for a smaller image.**

Cutting Graphic Image

Insert an image. Click on the image to make it active. You will see a box around the image when it is active.

There are several ways to delete the graphic:

1. On the menu go to **Edit** and click **Cut** on the drop down menu.
2. Hold down the **Control** key and type "X".
3. Hit the **Back Space** key or **Delete** key.

Copying Graphic Image

Insert an image. Click on the image to make it active. You will see a box around the image when it is active.

There are several ways to copy the graphic:

- On the menu go to **Edit** and click **Copy** on the drop down menu.
- Hold down the **Control** key and type "C".
- On the tool bar the icon the shows a duplicate image is the shortcut copy key.

Pasting Graphic Image

Click on the location within the document that you want to paste the graphic to. This graphic should have been copied using the copy graphic instructions.

- On the menu go to **Edit** and click **Paste** on the drop down menu.
- Hold down the **Control** key and type "V".
- On the tool bar the icon the shows a clipboard image is the shortcut paste key.

Text Alignment (Left, Center, Right, and Justified)

Go to the menu and click **Format**. The drop down menu will open. Go down to the word "**Paragraph**" and **Click**. The paragraph dialog box opens. **Click the indents and spacing tab**. Next, go to the **Alignment** box. Click on the pull down arrow to open the box and set alignment.

- Left alignment-Aligns text flush to left margin.
- Center alignment-Aligns text horizontally in the center of the document.
- Right-aligns text flush to the right margin.
- Justify-aligns text equally between left and right margin.

Once you have set the text alignment click **OK**. The Toolbar also has "short cut buttons" that access the four types of alignment.

Numbered and or Bulleted Lists

To select bullets or numbers for lists go to the menu bar and **Click Format**. A drop down list will then open. Go to and **Click on Bullets and Numbering**. A bullets and numbering dialog box will open. There are three tabs on the dialog box and each tab takes you to a different type of list. The bullets tab allows you to access a variety of different style bullets. There are seven selections of bullets. To see the selection **Click on One set of bullets** and then **Click on the Customize Button**. A customized bulleted list will open. **Click on the Bullet button** and view the symbols in the symbols box that appears. **Click on a Symbol** and click **OK**. Then in the customized list box choose a bullet and click **OK**. Type a list to view the results.

Picture Bullets

Click **Format** and click **Bullets and Numbering**. Go to the bullets and numbering box **Click Pictures**. A picture bullet box will open and colored bullets are available for use. **Click on a Colored Bullet** and then click **OK**. Begin typing and see the effects.

Numbered Lists-

Go to the menu bar and click **Format**. A drop down menu will open. Choose **Bullet and Numbering** and **Click**. The bullet and numbering dialog box will open and **Click the Numbered** tab. The numbered tab contains seven types of numbers for lists. **Click Customized** and a customized number list box will open. This box allows you to align the numbers and format text. Font type, size, color, and underlining can be changed. Once changes are made click **OK** and view the results.

Outline Numbered Lists

Go to the menu bar and click **Format**. Choose and click on **Bullets and Numbering**. The bullets and numbering box will open. **Click on the Outline Numbered** tab. Click on the format that you want and then click **Customize**. The customize outline numbered list box will open. This box allows you to position the numbers, change number format, and alignment. **Click the Font button** and the font format Box will open. Once the font format box is open you can change the font type, style, color, underlining, size, text affects, and spacing. Just as you have done before. Once you have made changes click **OK**. Next, **Click OK** on the customized outline numbered list box. Now you can view the changes that were made. The bullet and numbered lists can also be accessed on the tool bar.

Remember to save any changes you have made to the document. To save changes to a document

- Go to File and click on Save. **OR**
- Click the icon of the floppy disk on the tool bar. **OR**
- Hold down the shift key and while holding the shift key type "S".



On a PC eject disk by pressing the button below or beside the A drive. Your disk will then come out of the drive. If you are working on a Macintosh, drag your disk over the trash can. When the trash can turns black, release the mouse button and your disk will eject.

MS Word Draw Tasksheet

The main objective of this tasksheet is to give you some practice using Microsoft Word Draw. Although this activity was designed for MS Word Draw, the concepts you will learn are used in most other software packages. By the time you complete this tasksheet, you should understand the following concepts:

- Turning on Draw
- Creating, moving, resizing, coloring, changing, combining, grouping, layering, and editing shapes
- Using WordArt

Drawing applications are powerful teaching and learning tools. For ideas how teachers and students can use drawing applications or desktop publishing, see page 30 in your course packet. These activities are Level 1 Core Skills and all students must demonstrate mastery of these skills.

Level 1:

- Open a new or existing document Microsoft Document
- From the menubar click on **View** and then select **Toolbars>Drawing**. This turns on a toolbar for draw so you can access it. You should see a **Draw** toolbar at the bottom of your screen.
- Click on the **icon of the square** on the **Draw** toolbar, move your cursor back to your document, click and drag to draw a square. You will notice that your screen changes. Using Draw sends you into the **Page Layout** mode of **View**. To switch back to the **Normal** mode, click on **View** from the menubar and select **Normal**. In the **Normal** mode, you will not see your shapes and **WordArt**, but they are still there. To see them, switch back to the **Page Layout** mode. Once you have drawn the square, you can resize it or move it around. To resize it, move your cursor over the square until you have **Two-way arrows**, click, hold down, and drag to

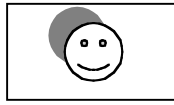
the desired size. If you drag the “handlebars” from the corners, your shape will resize proportionally. If you drag from the middle “handlebars,” your shape will resize stretched out or become narrow. To move your square, move your cursor over the square until you have **Four-way arrows**, click, hold down, and drag your square where you want to place it. Note that you have some choices of shapes on your **Draw** toolbar. You have **Autoshapes**, a **Line**, an **Arrowed line**, a **Square**, and a **Circle** (as well as a few others). The same principals you learn for a square can and do apply to all of them. Once you have finished this assignment, explore all of them! You can add as many of the shapes you want to your document.

- Let’s color your square. Select your square by clicking on it. You will notice that “handlebars” appear around the square. This means it is selected. Click on the **Paintbucket** icon on the **Draw** toolbar and select a color. The fill of your square will change colors! To change the color of the line around your square, click on the square to select it, and then click on the **Paintbrush** icon from the **Draw** toolbar, and select the color you want. To change the thickness of the line around your square, click on the square to select it, and then click on the **Lines** icon from the **Draw** toolbar, and select the thickness of line you want.
- Let’s copy your square. Click on your square to select it. From the menu bar at the top of the document, select **File**, and **Copy**. Now reselect **File** and then paste. You should have two squares.
- Let’s explore some more options for modifying a shape. Click on one of your squares to select it. Now click on **Draw** toolbar and select **Draw**. You will notice that you have some options i.e. you can turn off and on a grid, you can rotate, flip, align, nudge, and a variety of other things to your square. Try them all and see what happens. Let’s change your square to a smiley face! Select one of your squares, click on draw from the **Draw** toolbar, select change **Autoshape**, then **Basic shapes**, and pick the **Smiley face** . Let’s give your smiley guy some dimension. Click on your smiley guy to select him, and then select the **Shadow** icon from the **Draw** toolbar (second from the last and looks like a square with shadowing), select one of the shadowings and see what happens If you



don't like the choice you made, go to the menubar at the top, click **Edit**, and select **Undo**.

- Let's put your smiley guy inside the square. Click on the smiley guy and move him into the square. If he is not visible, you need to **Order** your shapes so that he is in the front of the square. Do this by selecting the square, clicking **Draw** on the **Draw** toolbar and then select **Order**. Select the effect that moves your square behind your smiley guy. Also note that you can move more than one shape around at a time by selecting the first shape by clicking on it, hold down the **Shift key** and select the second shape by clicking on it. You've grouped your shapes and can move them together.



- Let's make some word art! From the **Draw** toolbar, click on the **WordArt** icon that looks like a tilted letter A and is to the left of the paint bucket. A **WordArt Gallery** will open and you will be able to select the style of **WordArt** you like. Once you select a **WordArt** shape from the **WordArt Gallery**, you will be prompted to enter your text. Note you can change the font, the size, bold, and italics your **WordArt**. The same principals for coloring, resizing, moving, and manipulating that you used with your square apply to your **WordArt**. To edit your **WordArt**, double click on it.



APPENDIX F

ACTIVITY 1

Tasksheet:

Direct and Constructivist Instructional Methods

Context:

As a pre-service teacher, you will need an understanding of two major instructional methods: direct and constructivist. Each of these approaches are philosophically different and, as such, the way they view learning, the needs they address, and the way they shape teaching practices and the use of technology are different. Your job is to investigate each of these major instructional practices.

Task:

- After completing this project you will have an initial understanding of direct and constructivist instructional methods. You will be able to discuss the needs addressed by each method as well as the benefits of each method. You will be able to describe the characteristics of teaching and learning associated with each method and any criticisms related to them.
- You will use chart paper and markers/crayons to create a graphic representation of each method.
- You will think about the two methods in relationship to your own experiences and describe a time when you were involved in either a direct or constructivist learning experience, the elements of that experience, and your feelings about the experience. Go to the course website <http://online.utk.edu/courses/26986> and post your writing.

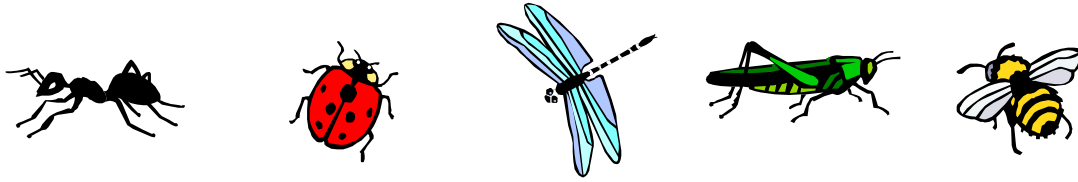
Process:

- Get in groups of 4
- Use the Roblyer/Edwards book and other resources to create a concept map that describes each instructional method. On that concept map be sure to answer the following questions:
- Describe concepts associated with direct instruction.
- Describe concepts associated with constructivism.
- Describe the needs addressed by/benefits of direct instruction.
- Describe the needs addressed by/benefits of constructivism.
- Describe the characteristics of teaching/learning associated with direct instruction
- Describe the characteristics of teaching/learning associated with constructivism.
- Describe criticisms of direct instructional methods.
- Describe criticisms of constructivist methods.
- Using chart paper and markers/crayons to create a visual representation of what classrooms that exemplify a direct instructional approach and a constructivist approach might look like. Be as creative as you like. Be sure to show the role of students and teachers in each of your drawings.
- Present your findings to the group. Be sure to describe the process your group used to complete the activity.

- Follow up (Homework): In thinking about the two instructional methods (directed and constructivist) your personal experiences as a student, describe a learning situation and the instructional approach used in that situation. Then tell why you believe the learning situation exemplifies either a constructivist or directed instructional method (or a combination of the two). What elements did that activity have that would make it either directed or constructivist? How did you (as a student) feel about the learning situation? Post your answer to the forum/discussion board before class Wednesday June 6.

APPENDIX G

ACTIVITY 2



Bugs

Group Members:

Context:

Your class is in the middle of a unit on insects. Your teacher wants you to become familiar with the insects that are native to East Tennessee. Once you become a "bug expert," you will share your findings with the class by creating a book using a slideshow.

Task:

When you are done with this activity, you will:

4. Have an idea of some of the insects that are native to East Tennessee.
5. Have created a slideshow book that documents your findings and provides information about each of the insects you have identified.

Process:

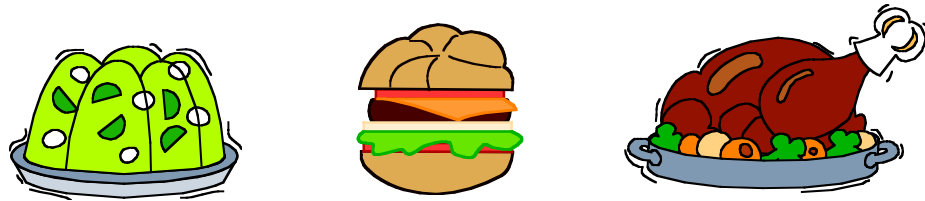
- Get in your group and read the poem "Neighbors" by Marchette Chute. In that poem Marchette Chute lists several types of insects that she saw while watching.
- Make a list of the type of insects you think you might see outside the classroom in East Tennessee.
- Take the digital camera and some paper, go outside, find a nice quiet place in the grass, and spend about 20 minutes observing a patch of grass. Take pictures of any insects you see. Make field notes about where and when you saw the insect and its behavior. After about 20 minutes, come back in the classroom.
- Sort your pictures. Use field guides or the Internet to try to identify each insect that you observed.
- Use a slideshow to create a book about the insects you observed. Make an introduction page and a page for each insect that you observed. On the page about each insect include your picture of the insect, your field notes, and any other information that you found about the insects that you'd like to include. If you use any outside sources, be sure to cite them (tell the source).

Evaluation:

You will be evaluated according to the following:

- Did all members of your team participate and work as a team?

- Did you spend 20 minutes outside observing an area for insects? Did you take field notes about the insects you observed? Did you take pictures of the insects you observed?
- Did you identify the insects you observed or make a reasonable effort to identify them?
- Did you create a book that includes a title page and a page for each insect with your field notes, the photographs, and any other information you found about the insects?
- Describe the process your group used to complete the activity.



"Potatoes on Tuesday"

Group Members:

Context:

You are a student whose class is in the middle of a thematic unit on food. You have been talking about the need for a balanced diet. Your teacher has asked you to plan a meal and think of all the foods that are in that meal. Once you have completed the following, you will share your book with the class.

Task:

After finishing this activity, you will:

- Be able to plan a meal and list all of the foods that are needed to make the meal.
- Have created a recipe book for your group's meal in PowerPoint.

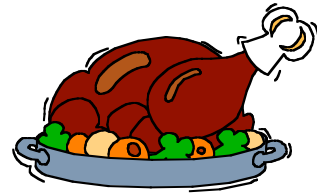
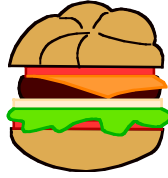
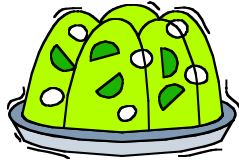
Process:

6. In a group, talk about what your favorite meal is. Members should share what their favorite meal is. Who cooks this meal for you? What type of food is in the meal?
7. Read "Potatoes on Tuesday" by Dee Lillegard.
8. Now as a group come up with a meal you'd like to eat. Think of all of the foods that are needed to make that meal. Use the attached planning sheet to plan your meal.
9. Use the template titled **potatoes** make a recipe book using the same pattern that Dee Lillegard did in the book "Potatoes on Tuesday." Use the draw tools to create pictures to go along with your book. Make sure your book has a title page and list all the authors on the first screen.

Evaluation:

- Did your group work well together? Did all members participate?
- Did you plan a meal and list all of the foods needed to make that meal using the planning sheet?
- Did you create a book with a title page and pages that follow the same pattern as "Potatoes on Tuesday" using the template.

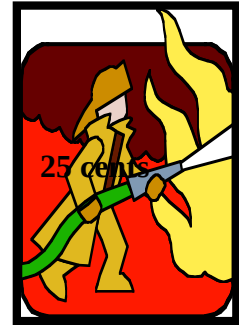
- Describe the process your group used to complete the activity.



The people in my group are:

My group's favorite meal is:

To make this meal we need these foods:



Stamp of Honor

Group Members:

Context:

You are in the middle of a unit studying heroes. One of the ways that we commemorate heroes is by creating a stamp to honor them.

Task:

In this lesson you will:

- List qualities that make someone a hero
- Research heroes
- Design a stamp to commemorate your hero
- Create a Stamp of Honor Album.

Process:

- In your group, brainstorm at least ten qualities that make someone heroic.
- Make a list of people who fit your groups "hero standards."
- Each person in your group should select one of the heroes on your list to research. Use the Internet or library resources to find out information about your heroes. Focus on facts accomplishments or what they did that makes them a hero. Write down the information and be sure to tell where you found the information.
- Use a slideshow to create a Stamp of Honor Album. Create a title page. Then create a table of contents. Each person in your group should create a page in your slideshow about their hero that includes information about their hero, explains why that person

choose their hero to commemorate, and should design a stamp to commemorate their hero. Share your album with the class.

Evaluation:

- Did your group work well together? Did all members participate?
- Did your group discuss and list 10 qualities that make someone heroic?
- Did your group make a list of people who fit those "hero standards?"
- Did each member of your group select on hero and research that person getting facts about their lives and accomplishments? Did each person document where they found that information?
- Did your group create a Stamp of Honor Album in a slideshow and does that album have the following:
 - A title page
 - A table of contents
 - Pages for each hero that contain information about the person's accomplishments and why they were selected as a hero to be honored in your book. A stamp designed to commemorate them.
- Describe the process your group used to complete the activity.

Forms and Purpose in Buildings



Group Members:

Context:

You are in a high school art class. Your class is in the middle of a unit on architecture. Your teacher has asked you to look at forms that are found in buildings and how those forms serve a purpose.

Task:

When you have finished this assignment, you will have:

- Investigated the relationship between form and function in architecture.
- Create a slideshow presentation that illustrates the relationship between form and function in building on the UTK campus.

Process:

- In your group gather the following resources:
- A digital camera with a few disks
- Paper and Pencil
- Go outside and walk around the campus take 4 pictures of 4 different buildings. Select buildings that have unique designs. Now find out what the building is used for and what happens inside that building. You may need to walk inside the buildings to investigate. Make notes about the buildings as you are taking
- Come back to the classroom and in your group, discuss the form of the buildings and they way the building is used. Are there any conclusions that you can draw about the way the architect designed the building and its use? Do you think the architect used had the purpose of the building in mind when he designed it? What makes you think he/she did or did not?
- Use a slideshow to create a presentation that uses your pictures to illustrate your conclusions about the relationship between the form and the function of the buildings. Be sure to have a title slide and then content slides for each building. Add any other slides that you feel are necessary.

Evaluation:

You will be evaluated according to the following criteria:

- Did your team work as a group and each member participate?
- Did you spend about 30 minutes walking around campus taking pictures of at least 4 buildings and investigate the purpose or use of the building?
- Did your group create a slideshow presentation that includes a title page and content pages that uses your pictures to illustrate your conclusions about the relationship between the form and the function of the buildings?
- Describe the process your group used to complete the activity.

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Haiku

Context:

You are in the middle of a unit on poetry. As part of the unit your class is comparing the poetry forms from several different cultures and how they represent that culture. Your teacher has asked to explore Haiku, which is a very old form of Japanese verse.

Task:

After completing this assignment, you will:

- Know what a Haiku is.
- Know the form of a Haiku.
- Know the source of inspiration of a Haiku.
- Write and illustrate a Haiku in a slideshow and combine each member of your groups Haiku to create a Haiku poetry book.

Process:

- As a group go to <http://www.lsi.usp.br/usp/rod/poet/haiku.html> and find out what a Haiku is. What is the form of a Haiku? What is the source of inspiration of a Haiku?
- Read some Haiku and reviews of them <http://www.haikuworld.org/fall99.judge2.html>
<http://www.haikuworld.org/fall99.judge1.html>
- Go outside and find a quiet place to meditate and observe nature for about 20 minutes. You may want to take a pencil and paper to jot some notes about what you observe.
- In the lab, use a slideshow create a Haiku book. As a group create a title page. Now have each member of your group write and illustrate a Haiku. Combine all of the Haiku together in one slideshow presentation.

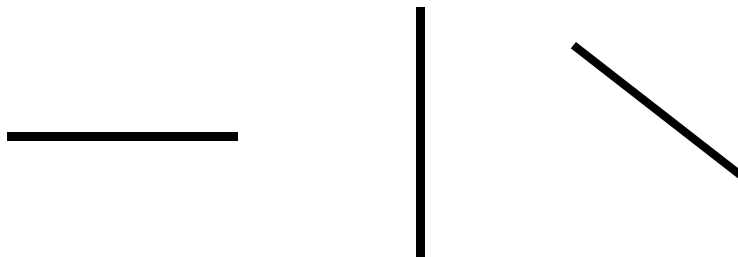
Evaluation:

You will be evaluated according to the following criteria:

- Did your team work as a group and each member participate?
- Did your group go to the websites and find out the form of a Haiku? What is the source of inspiration of a Haiku? Did you read some Haiku and the reviews of those Haiku?
- Did your group find a quiet place outside and observe nature for about 20 minutes?

- Did your group use a slideshow to create a Haiku book? Did each member of your group write and illustrate a Haiku?
- Describe the process your group used to complete the activity.

Slopes



Context:

You are in a beginning algebra class and have started looking at slopes. Your teacher wants you to be able to identify the 4 different slopes in your environment.

Task:

When you are done with this activity, you will:

- Know what positive, negative, zero, and undefined slopes are.
- Know how to read slopes.
- Be able to identify slopes in your surroundings.
- Create a slide show with pictures you have taken of slopes, name those slopes, and draw the line of the slope.

Process:

- In your group, open the HyperStudio stack titled "Slopes" that is on your desktop.
- Use the program Slopes to learn about the 4 different types of slopes. Be sure to go through the entire program.
- Take the digital camera and go for about a 10 minute walk. Look for slopes. Take pictures of all the slopes that you find.
- Come back to the classroom. Make a folder on your desktop and title it slopes. In that folder, create 4 other folders and title them: positive, negative, zero, and undefined. Sort your pictures by slope type into those folders.
- Create a slideshow/book of slopes. Use the pictures that you took, identify the slope type and use the line tool to draw the slope either beside or on your picture.

Evaluation:

You will be evaluated according to the following:

- Did your team work well together and everyone participate?
- Do you know the 4 types of slopes? Can you recognize slopes in your environment?
- Do you know how to read slopes?
- Did you take pictures of slopes with the digital camera and create a slideshow/book of slopes. In that book/slideshow did you identify the slope type and use the line tool to draw the slope you see in your picture?
- Describe the process your group used to complete the activity.



The Wind Blew

Context:

Your class is in the middle of a unit on weather. You are going to write a story about the wind based on the book "The Wind Blew" by Pat Hutchins.

Task:

After finishing this activity you will:

- Recognize action words (verbs) and naming words (nouns) in a story.
- Plan a story using a storyboard.
- Create an illustrated wind story in a slideshow that uses action words and naming words to describe the actions of the wind.

Process:

- In your group read "The Wind Blew" by Pat Hutchins. As you read the story pay close attention to what the wind did (action words or verbs) and the things the wind did something to (naming words or nouns).
- After you read the book, use the attached planning sheet and the book to list action words and naming words from the story you just read. Once you have listed the words from the book, make a list of new action words and naming words that your group members know.
- Use the planning sheet to plan your wind story as a group. Insert an action word and a naming word on each of the pages of storyboard and some details to make a sentence telling what the wind did to something.
- Open a slideshow and write your story and use the draw tools to illustrate your story. Be sure to have a title page that has the title: "The Wind Blew, Again" and the names of your group members.

Evaluation:

- Did your everyone in your group participate?
- Did you make a list of all the action and naming words in the story? Did your group brainstorm new words and add them to the planning page?
- Did you use the storyboard to plan your wind story?
- Did your group create and illustrate a wind story in a slideshow?
- Describe the process your group used to complete the activity.

Wind Story Planning Sheet

Action words from the story (verbs):

Naming words from the story (nouns):

Our group's action words (verbs):

Our group's naming words (nouns):

Title Page Story Name: The Wind Blew, Again (Adapted from "The Wind Blew" by Pat Hutchins) By:	Page 1 The wind blew
Page 2 It _____ the _____ _____ _____ _____	Page 3 It _____ the _____ _____ _____ _____
Page 4 And not content, it _____ a _____ _____ _____ _____	Page 5 It _____ the _____ _____ _____ _____
Page 6 It _____ a _____ _____ _____ _____	Page 7 It _____ a _____ _____ _____ _____
Page 8 It _____ the _____ _____ _____ _____	Page 9 And then the wind _____ _____ _____ _____

APPENDIX H

ACTIVITY 3

A WebQuest About **WEBQUESTS**

A WebQuest for ITCE 486

Designed by

[Kathryn DiPietro](#)

[Introduction](#) | [Task](#) | [Process](#) | [Evaluation](#) | [Conclusion](#) | [Credits](#)

Introduction

You are a teacher in a classroom with access to the Internet. Your principal is encouraging all teachers to use the Internet as an instructional tool. You really want to use the Internet because you feel it is a valuable tool, but you are hesitant about turning students loose on the Web with no focus. In the teachers' lounge you heard someone mention "Webquests" as a way to use the internet as an instructional resource while focusing students on the concepts you are learning about in class. The big question is: **What are Webquests and how can you use them in your classroom to support your teaching?**

The Task

After completing this Webquest about Webquests you will:

- Know what a Webquest is.
- Know how you can use a Webquest to focus students using inquiry based methods. Know what inquiry based methods are and why should teachers use them.
- Know the 5 critical attributes of a Webquest. What is unique to each of the critical attributes? What would you expect to see in each of the critical attributes? As you look at the targeted websites, be sure to answer the guide questions. You may want to print out this web site so you are sure to answer them. Use either a word processor or a piece of paper to jot down your ideas.
- As a group, use the tasksheet you are given to guide your development of an outline of a WebQuest. Create

a PowerPoint presentation of the Webquest outline focusing on the 5 critical attributes for the tasksheet you are given.

The Process

To accomplish the tasks, you will need to:

1. First, you will be assigned to a team of other teachers who are exploring Webquests with you so get in your groups.
2. Second, you will need to use Netscape and your computer to complete this Webquest. As you work through this Webquest About Webquests, be sure to focus on the tasks above.
3. Next in your group, go to [Some Thoughts About WebQuests](#) and read Bernie Dodge's description of WebQuests. Find out what a Webquest is and the critical attributes that should be addressed in WebQuests. You may want to look at Tom March's [WebQuests and More](#) to find out why you might use a Webquest. Also go to [Building Blocks of a WebQuest](#) and look at the building blocks to creating WebQuests and an in-depth look at each of the critical attributes. Why are these attributes critical in WebQuests?
4. Now let's focus more on each of those attributes:
 - Introduction:
 - Go to [Save The Whales](#) and read the introduction. What was the author trying to do in this introduction?
 - Go to [Watch Out For That Volcano](#) and read the introduction. How did the author try to get students hooked on learning more about volcanos?
 - Task:
 - Go to [Creepy Crawlies](#) and look at the task. What were the students to do? What was

their final product?

Go to [Where Have All the Frogs Gone](#). Is the task clearly specified under the heading of task? Can the students tell exactly what they are to do?

- Process:

- Go to [THE TITANIC: What Can Numbers Tell Us About Her Fatal Voyage](#)? Is the process clear? Would a student know exactly what they need to do and the order in which they should do it? Are there orienting questions or checklists used so that they will know what information they should look for on each of the resource web sites?

- Evaluation:

- Go to [World Hunger](#). Can students tell exactly how they will be evaluated? Does the evaluation help the student know specifically what is expected of them and how their accomplishment of the WebQuest and related projects will be evaluated?
- Go to [Apples](#). Is the evaluation appropriate for the task and for the students for whom the WebQuest was created?
- Another forum of evaluation for WebQuests is a rubric. Go to [Rubrics for Weblessons](#). What is a rubric? When would it be appropriate to use a rubric? What is the advantage of using a rubric.
- How can you tell if a WebQuest is well done? Go to [WebQuest Rubric](#) for more details.

- Conclusion:

- The conclusion should do two things: summarize the activity and challenge the learner to learn more about either the topic of the WebQuest or related topics. Go to [Wonderful Web Weather](#). Look at the conclusion. Did the teacher summarize what the students had done and as well as challenge the students to learn more about the topic or expand their knowledge in related fields?

Evaluation

Your work will be evaluated as a group in the following areas:

1. Did you complete the WebQuest About WebQuests as a team?
 2. Did you answer the key guiding questions as you completed the WebQuest About WebQuests? Are your answers well thought through and did you focus on the key elements? Do you have your notes about the sites you visited on either notebook paper or in a word processing document?
 3. Did you complete the assignment on your tasksheet ?
-

Conclusion

After completing this WebQuest about WebQuests you should understand inquiry based teaching, know how you can use the Internet in a focused way to help students learn content. Are there other ways you can integrate the Internet in teaching and learning? What are some topics that make for good Webquests? You may want to visit the sites below to extend your knowledge of WebQuests!

- [The WebQuest Page](#)
 - [Ozland](#)
-

Credits & References

- All graphics used are from the Microsoft Office 98

Clipart Gallery.

- WebQuest ideas and formats are adapted from work done by [Bernie Dodge](#) and [Tom March](#)
- The format template used for this WebQuest is from [The WebQuest Page](#)

Tasksheet

To Clone or Not to Clone...That is THE Question?

Context:

You are in the middle of a unit on genetics. A student comes in with a magazine article about the cloning of sheep. A section of the article focuses on cloning humans. You want to show students the complexity of the ethical issues surrounding cloning. You want to make use of inquiry based methods to let them draw their own conclusions. Someone mentioned WebQuests and you are interested in learning more as you have two computers in the classroom with Internet Access.

What to do:

- Go to The WebQuest About WebQuests (<http://web.utk.edu/~kdipietr/Webquestlesson/WebQuest.html>) and complete the activities
- Know what a Webquest is.
- Know how you can use a Webquest to focus students using inquiry based methods.
- Know what inquiry based methods are and how teachers can use them to facilitate high level thinking processes.
- Know the 5 critical attributes of a Webquest. What is unique to each of the critical attributes? What would you expect to see in each of the critical attributes? Why do you think each of those attributes are critical?
- As you look at the targeted websites, be sure to answer the guide questions. You may want to print out the web site so you are sure to answer them. Use either a word processor, concept map, or a piece of paper to jot down your ideas.
- As a group, use the scenario described above to guide your development of an outline of an inquiry based lesson that uses a WebQuest. Create a PowerPoint presentation of your inquiry based lesson outline focusing on the 5 critical attributes for a WebQuest that deals with the question "**is cloning ethical.**" You probably will not have time to identify more than just a few websites . Focus on the process.

Group Members:

Tasksheet

Is There Life On Mars?

Context:

You are in the middle of a thematic unit on the Solar System. As part of that unit, students are investigating man's exploration of each planet. A student brings in an article about the Mars Pathfinder and a piece of rock recovered on Mars. The article says that there may be life on Mars because there was some evidence of bacteria-like colonies. A discussions follows. Some students think that there is no life on Mars. Others think that the bacteria-like colonies are evidence of life. They ask you what you think. You want to make use of inquiry based methods to let them draw their own conclusions. Someone mentioned WebQuests and you are interested in learning more as you have two computers in the classroom with Internet Access.

What to do:

- Go to The WebQuest About WebQuests (<http://web.utk.edu/~kdipietr/Webquestlesson/WebQuest.html>) and complete the activities
- Know what a Webquest is.
- Know what inquiry based methods are and how teachers can use them to facilitate high level thinking processes.
- Know the 5 critical attributes of a Webquest. What is unique to each of the critical attributes? What would you expect to see in each of the critical attributes? Why do you think each of those attributes are critical?
- As you look at the targeted websites, be sure to answer the guide questions. You may want to print out the web site so you are sure to answer them. Use either a word processor, concept map, or a piece of paper to jot down your ideas.
 - As a group, use the scenario described above to guide your development of an outline of an inquiry based lesson that uses a WebQuest. Create a PowerPoint presentation of the inquiry based lesson outline focusing on the 5 critical attributes for a WebQuest that deals with the question “**is there life on Mar**” You probably will not have time to identify more than just a few websites . Focus on the process.

Team Members:

Tasksheet

Paper or Plastic?

Context:

You are in the middle of a unit that looks at man's impact on the environment. You ask students to make a list of ways that they can help reduce the amount of trash that is sent to landfills. As you are brainstorming ideas, one student says it is helpful to use paper bags because they quickly deteriorate in landfills. Another student argues that plastic bags are better because we can reuse them. Students ask you which is better? You want to make use of inquiry based methods to let them draw their own conclusions. Someone mentioned WebQuests and you are interested in learning more as you have two computers in the classroom with Internet Access.

What to do:

- Go to The WebQuest About WebQuests (<http://web.utk.edu/~kdipietr/Webquestlesson/WebQuest.html>) and complete the activities
- Know what a Webquest is.
- Know how you can use a Webquest to focus students using inquiry based methods.
- Know what inquiry based methods are and how teachers can use them to facilitate high level thinking processes.
- Know the 5 critical attributes of a Webquest. What is unique to each of the critical attributes? What would you expect to see in each of the critical attributes? Why do you think each of those attributes are critical? As you look at the targeted websites, be sure to answer the guide questions. You may want to print out the web site so you are sure to answer them. Use either a word processor, a concept map, or a piece of paper to jot down your ideas.
- As a group, use the scenario described above to guide your development of an outline of an inquiry based lesson that uses a WebQuest. Create a PowerPoint presentation of the inquiry based lesson outline focusing on the 5 critical attributes for a WebQuest that deals with the question of "**paper or plastic.**" You probably will not have time to identify more than just a few websites. Focus on the process.

Team members:

Tasksheet

Where Have All the Dinosaurs Gone?

Context:

You are a teacher who is doing an integrated unit with the theme of dinosaurs. On the playground one day you hear students discussing dinosaurs. One student tells the other that there was no such thing as dinosaurs because if dinosaurs were real, they would still be around. Some students say they are make believe and others say they were real. Students come to you to solve the discussion and ask you what happen to all the dinosaurs. You want to make use of inquiry based methods to let them draw their own conclusions. Someone mentioned WebQuests and you are interested in learning more as you have two computers in the classroom with Internet Access.

What to do:

- Go to The WebQuest About WebQuests (<http://web.utk.edu/~kdipietr/Webquestlesson/WebQuest.html>) and complete the activities
- Know what a Webquest is.
- Know how you can use a Webquest to focus students using inquiry based methods.
- Know what inquiry based methods are and how teachers can use them to facilitate high level thinking processes.
- Know the 5 critical attributes of a Webquest. What is unique to each of the critical attributes? What would you expect to see in each of the critical attributes? Why do you think each of those attributes are critical?
- As you look at the targeted websites, be sure to answer the guide questions. You may want to print out the web site so you are sure to answer them. Use either a word processor, a concept map, or a piece of paper to jot down your ideas.
- As a group, use the context described above to guide your development of an outline of a WebQuest. Create a PowerPoint presentation of the WebQuest outline focusing on the 5 critical attributes for a WebQuest that focuses on exploring the question “**where have all the dinosaurs gone**” You probably will not have time to identify more than just a few websites . Focus on the process.

Team members:

Task sheet

Painted Lady Butterflies: Okay in Our Ecosystem?

Context:

You are in the middle of a thematic unit on insects. As part of the unit you are looking at the life cycle of butterflies. You have ordered 12 painted lady butterfly larva from Carolina Biological Supply Co. You have considered what to do with the butterflies once they have emerged from their cocoons and want to release them into surrounding area. You've previously determined that they are native to the environment, but you want students to determine 1). If they are native to your environment; 2). What might be the effect on the ecosystem if you released your 10 painted lady butterflies into an ecosystem where they are not native. You want to make use of inquiry based methods to let them draw their own conclusions. Someone mentioned WebQuests and you are interested in learning more as you have two computers in the classroom with Internet Access.

What to do:

- Go to The WebQuest About WebQuests (<http://web.utk.edu/~kdipietr/Webquestlesson/WebQuest.html>) and complete the activities
- Know what a Webquest is.
- Know how you can use a Webquest to focus students using inquiry based methods.
- Know what inquiry based methods are and how teachers can use them to facilitate high level thinking processes.
- Know the 5 critical attributes of a Webquest. What is unique to each of the critical attributes? What would you expect to see in each of the critical attributes? Why do you think each of those attributes are critical?
- As you look at the targeted websites, be sure to answer the guide questions. You may want to print out the web site so you are sure to answer them. Use either a word processor, concept map, or a piece of paper to jot down your ideas.
- As a group, use the scenario described above to guide your development of an outline of an inquiry based lesson that uses a WebQuest. Create a PowerPoint presentation of your inquiry based lesson outline focusing on the 5 critical attributes for a WebQuest that deals with the questions 1.) **Are painted lady butterflies native to Knoxville;** 2). **What effect would releasing painted lady butterflies have on an ecosystem in which they were not native?** You probably will not have time to identify more than just a few websites . Focus on the process.
- **Group Members:**

Summer of My German Soldier...

POW Camps in the USA?

Context:

You are in the middle of reading “Summer of My German Soldier” by Bette Greene. You over hear students talking about POW camps in the US. Some of the students feel that there were POW camps in the US and others think the idea of POWs in the US is pure hogwash. Students come to you and ask you if there were German POWs held in the US during WWII. You want to make use of inquiry based methods to let them draw their own conclusions. Someone mentioned WebQuests and you are interested in learning more as you have two computers in the classroom with Internet Access.

What to do:

10. Go to The WebQuest About WebQuests

(<http://web.utk.edu/~kdipietr/Webquestlesson/WebQuest.html>) and complete the activities

- Know what a Webquest is.
 - Know how you can use a Webquest to focus students using inquiry based methods.
 - Know what inquiry based methods are and how teachers can use them to facilitate high level thinking processes.
 - Know the 5 critical attributes of a Webquest. What is unique to each of the critical attributes? What would you expect to see in each of the critical attributes? Why do you think each of those attributes are critical?
 - As you look at the targeted websites, be sure to answer the guide questions. You may want to print out the web site so you are sure to answer them. Use either a word processor, a concept map, or a piece of paper to jot down your ideas.
11. As a group, use the scenerio described above to guide your development of an outline of an inquiry based lesson that uses a WebQuest. Create a PowerPoint presentation of the inquiry based lesson outline focusing on the 5 critical attributes for a WebQuest that deals with the question were there POW Camps in the USA during WWII. You probably will not have time to identify more than just a few websites. Focus on the process.

Team members:

Art or Artifact?

Context:

Students in your high school students are researching the influence of cultures on art. One student has selected to study art from Egypt. She has brought in pictures of “things” that have been excavated during archeological digs. Among these things are bowls, jewelry, knives, hieroglyphics, and sculptures done on tombs. One student in the class tells the student studying Egyptian art that the pieces she has identified are not art, they are artifacts. Students come to you and ask the question what is the difference in art and an artifact. You want to make use of inquiry based methods to let them draw their own conclusions. Someone mentioned WebQuests and you are interested in learning more as you have two computers in the classroom with Internet Access.

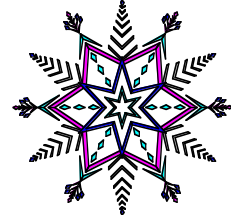
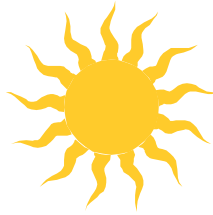
What to do:

- Go to The WebQuest About WebQuests (<http://web.utk.edu/~kdipietr/Webquestlesson/WebQuest.html>) and complete the activities
- Know what a Webquest is.
- Know how you can use a Webquest to focus students using inquiry based methods.
- Know what inquiry based methods are and how teachers can use them to facilitate high level thinking processes.
- Know the 5 critical attributes of a Webquest. What is unique to each of the critical attributes? What would you expect to see in each of the critical attributes? Why do you think each of those attributes are critical?
- As you look at the targeted websites, be sure to answer the guide questions. You may want to print out the web site so you are sure to answer them. Use either a word processor, a concept map, or a piece of paper to jot down your ideas.
- As a group, use the scenario described above to guide your development of an outline of an inquiry based lesson that uses WebQuest. Create a PowerPoint presentation of the inquiry based lesson outline focusing on the 5 critical attributes for a WebQuest that explores the question “art or artifact”. You probably will not have time to identify more than just a few websites. Focus on the process.

Team members:

APPENDIX I

ACTIVITY 4



The Seasons

Group Members:

Context:

You are a student in a second grade class. The class is in the middle of a unit on seasons. You are going to learn how to tell what season it is by looking for signs of the seasons.

Task/Process:

- In your group read the book: The Four Seasons. Take turns reading. As your group is reading the book, notice things that you might see in during each season. These are clues or signs of the season. Talk in your group about things you see and things people might do in each of the seasons: Spring, Summer, Fall (also called Autumn), Winter
- Some other books and resources you may want to use are:
 - Books:
 - Around the Oak
 - A Tree in the Forest
 - Spring (big book)
 - Spring
 - Summer
 - Autumn
 - Winter
- Now lets create a database. Open up AppleWorks and select database
- Field 1: name= **Spring**, type=**text** then click **create**
- Field 2: name= **Summer**; type=**text** then click **create**
- Field 2: name= **Fall**; type=**text** then click **create**
- Field 3: name=**Winter**; type=**text** then click **create**
- Now click **done**

- Select **Layout** and then **list** from the menubar.
- Then from the menubar, select **edit>new record**
- Then from the menubar, select **edit>new record**
- Then from the menubar, select **edit>new record**
- Then from the menubar, select **edit>new record**
- Then from the menubar, select **format>insert header** and type **Signs of Spring** in your header.

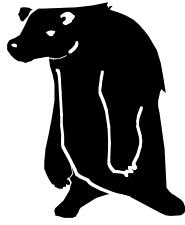
Be sure to discuss why you put each picture in the season you put it in.

- Print your season database and be ready to tell the class what you learned about the “signs of the seasons.”

Evaluation:

You will be evaluated using the following criteria:

- Did your group work together?
- Did you read The Four Seasons?
- Did you use the chart and sort the pictures, putting them in each season?
- Can you tell why you put each picture in each season?



Project Panda Watch

Group Members:

Context:

You are a student in a 7th grade class that is in the middle of a unit on ecosystems and changes that occur in ecosystems. As part of that unit, you are learning about different endangered animals. One of the books your class has been reading is “Project Panda Watch” by Miriam Schlein.

Task/Process:

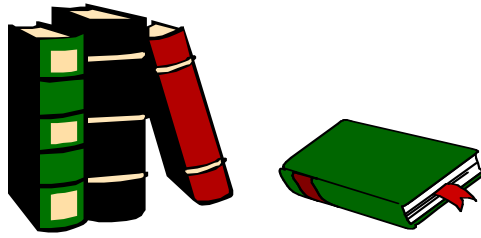
- Read Chapter 8: “You be the Scientist” in “Project Panda Watch.”
- In the chapter, you learned about the different opinions concerning to which family the giant panda belongs. It is time for you to be the scientist and decide what you think. Do you think the panda belongs in the bear family or in the raccoon family? Or do you think the giant panda is an animal special enough to be in a family of its own? Try to come to your own conclusions and support those conclusions.
- You may also want to use some of the following resources:
- Books:
 - Simon & Schuster’s Guide to Mammals
 - The Audubon Society Field Guide to North American Mammals
 - A Golden Guide: Pond Life
 - Bears, Bears, Bears
 - Bears: A Global Look at Bears in the Wild
 - The Big Bears
 - Where is Panda?
 - The Panda
 - Animal Footnotes
- Computer Software:
 - Microsoft: Dangerous Animals
 - The Magic School Bus: Animals
- Create a database to categorize specific characteristics of the giant panda. (See attached sample)
 - Open up AppleWorks and select database

- Field 1: name= **characteristics**, type=**text** then click **create**
- Field 2: name= **bear**; type=**text** then click **create**
- Field 2: name=**raccoon**; type=**text** then click **create**
- Field 3: name=**own family**; type=**text** then click **create**
- Field 4: name=**support**; type= **text** then click **create**
- Now click **done**
- Select **Layout** and then **list** from the menubar.
- In column 1 row 2 type **shape**
- Then from the menubar, select **edit>new record**
- In column 1 row 3 type **size**
- Then from the menubar, select **edit>new record**
- In column 1 row 4 type **behavior**
- Then from the menubar, select **edit>new record**
- In column 1 row 5 type **skull, jaws, teeth**
- Then from the menubar, select **edit>new record**
- In column 1 row 6 type **other characteristics**
- Then from the menubar, select **format>insert header** and type **Panda** in your header.
- Now use the information from your reading and your resources to complete the database. In the support row you should document where you found your information that caused you to draw the conclusion.
 - Print your database.

Evaluation:

You will be evaluated using the following criteria:

- Did your group work together?
- Did you read the chapter in Project Panda Watch?
- Did you create a chart that has the following:
 - Title
 - Specific characteristics of the giant panda
 - Classifies the specific characteristics as either belonging to the bear family, the raccoon family, or other family.
 - Gives support for your choices of family
 - From the information you gathered, decide to which family the giant panda belongs. Reach consensus as a group.
- Print a copy of your chart for each member of the class and be prepared to discuss this activity and your project.



Comparing Friendships

Group Members:

Context:

You are a student in a 10th grade literature class. Your class is in the middle of a unit about friendship. Your teacher has given you the following assignment.

Task/Process:

1. As a group, discuss what you look for in friendships (what you need from friends). Jot down your groups thoughts. You have 10 minutes to do this.
2. With the rest of the class, watch the first video tape Friends. As you watch the video tape, jot down some of the ways that the students in the class describe what they need in a friendship.
3. Read the the June 20, 1942 writing from "The Diary of Anne Frank." As you read, jot down Anne's thoughts about friendship.
4. As a group let's create a database to compare some elements of friendships and situations. (See attached sample)
 - Open up AppleWorks and select database
 - Field 1: name= **people**, type=**text** then click **create**
 - Field 2: name= **friendship needs**; type=**text** then click **create**
 - Field 2: name=**setting/situation**; type=**text** then click **create**
 - Field 3: name= **age**; type=**text** then click **create**
 - Field 4: name= **why those needs**; type= **text** then click **create**
 - Now click **done**
 - Select **Layout** and then **list** from the menubar.
 - In column 1 row 2 type **us**
 - Then from the menubar, select **edit>new record**
In column 1 row 3 type **kids**

- Then from the menubar, select **edit>new record**
In column 1 row 4 type **Anne**
 - Then from the menubar, select **format>insert header** and type **Friendship** in your header.
 - Insert a graphic in your header by placing your mouse in the header and clicking, from the menubar select **edit>show clippings**. Select the clipping you want to insert and double click (note that you can resize it).
5. As a group, fill in the information in each of the cells as you discuss the stories or your personal experiences.
 6. From the group discussion and the chart, draw some conclusions about the needs of friends' needs and situations. Print your database and be ready to share them with the group. Be sure to tell how you drew those conclusions. Support your conclusions.

Evaluation:

You will be evaluated using the following criteria:

1. Did your group work together?
2. Did you complete the chart and did all members of your group give their input?
3. Did you draw some conclusion about friends' needs and situations/settings? Did you support those conclusions?

APPENDIX J

ACTIVITY 5



Stash your Trash

Group 1:

Group 2:

Group 3:

Group 4:

Group 5:

Group 6:

Group 7:

Context:

You are students in a 9th grade class that is involved in an integrated unit titled: Ecosystems. As part of the unit you are looking at man's impact on his environment. You have just finished learning about landfills and their impact on the environment. Your teacher has asked you to be engaged in some research that to document the amount of trash your family generates.

Task/Process:

1. Weigh your family's trash each night at 9 o'clock for two weeks (March 1 – March 14) and bring that information to class. (for the purpose of this class, your teacher has gathered that information for you...see attached sheets).
2. Open the spreadsheet application in Apple Works.
3. Create a table with 25 columns and 30 rows. To format your spreadsheet select **format>document** and set your columns and rows.
4. Label the columns with the dates March 1 Sunday, March 2 Monday, March 3 Tuesday, etc. starting in **column B**. Click in the cell you want to label and then type your information in the text entry area next to the check mark.
5. Label column P weekly total
6. Label column Q weekly average
7. Label the rows starting in column A row 2 with the name of each member of your group. Let each member of your group input their daily family trash amounts. Use tab to move quickly across the columns.
8. Label the row right after the last person in your group's name, daily total
9. Label the next row daily average

10. Place your cursor in the weekly total cell and let's insert a formula in that cell.
- With your cursor placed in the weekly total cell, click on **fx** and scroll until you see **sum**. Select **sum** and click insert. Now click in the cells you want to sum. One you click off the cell where you are inserting the formula, the spreadsheet will calculate you daily garbage totals.
 - To apply this formula to all the other weekly total cells, click in the cell where you placed the formula, select all the other cells you wish to total and from the menu bar select **calculate>fill down**.
 - Do this same thing to figure out the daily totals, the weekly average [hint you will need to use a different fx ($\text{average} = \text{sum}/n$)], and the daily average.
 - Insert any other formulas you may need to answer the following questions.
11. Use your spreadsheet to answer the following questions. Discuss your answers as a group and be prepared to discuss your answers as well as defend those answers.
- What was the weekly total for each family?
 - What was the weekly average for each family?
 - What was the weekly total for all families?
 - What was the weekly average for all families?
 - Was there a pattern of more or less garbage on certain days? If so, why do you think these patterns existed?
 - Was there a pattern of more or less garbage for certain families? What are some reasons a family may use more or less trash?
 - If the population in your town was 1000 more families, approximately how much trash would be generated in 2 weeks. In a month? In a year?
 - If the population in your town was 100,000 more families, approximately how much trash would be generated in 2 weeks? In a month? In a year?
 - How much less trash would each family have to produce over a 2 week period to make the total trash produced less than 1/2 of what it is now?
 - From the information above, do you think that the amount trash produced by a family can have a significant impact on the environment over a 1 year period? Why or why not?
12. Generate a bar graph that shows the average weekly family usage of trash for the past 2 weeks per day. Print your graph.
- To do this select all of the cells under weekly average by highlighting them, select **options** from the menu bar and then **make chart**. You will see the bar graph which you can label and generate.
13. Print out your spreadsheet with your bar graph.
14. Make a list of things that your group can do to reduce the amount of trash that your family sends to the landfill.

Evaluation:

You will be evaluated using the following criteria:

1. Did your group work together?
2. Did you create the spreadsheet according to the criteria? Did you print your spreadsheet?
3. Did you create and print your graph?

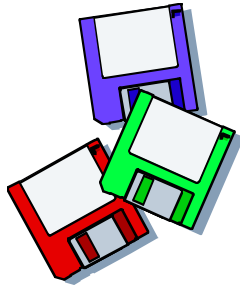
4. Did you answer all the questions and defend your answers where required?
5. Did your group make a list of things each group member can do to reduce the amount of trash sent by his/her family to the landfill?

Name:	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa
	3.2	3.0	2.7	1.2	2.5	1.0	3.0	3.4	2.0	2.1	1.0	2.3	.9	2.9
	2.6	2.4	2.0	.9	2.2	.5	2.8	2.7	2.3	1.9	.7	2.0	.2	3.0
	4.5	3.2	2.9	1.5	2.7	1.3	3.6	4.0	3.0	2.6	1.6	3.1	1.5	4.1

Measured in pounds

APPENDIX K

ACTIVITY 6



Drill and Practice Software Evaluation Tasksheet

Context:

You are part of a group of teachers in Knox County who has been approached by the superintendent to be part of a team that travels throughout the district teaching other educators about instructional software. Your job is to use the resources provided below to put together a presentation about one aspect of educational software. Your group has been asked to focus on Drill and Practice Software. Your group members are:

Task:

- After reading Chapter 4 in the Roblyer Book, you will create a concept map of drill and practice software which includes the following elements. Once you have created your concept map, print enough copies for each member of the class (25 copies).
 - definition and characteristics of drill and practice software
 - issues related to drill and practice software
 - how to effectively use drill and practice software in teaching
 - classroom applications of drill and practice software
 - guidelines for using drill and practice software.
- As a group review and evaluate Millie's Mathhouse (listed in resources) according to recommended courseware evaluation criteria listed on pages 106-108 in your Roblyer book. Use the form on page 108 as a guide. In your review, you will also want to make note of the cost of the software.
- Be prepared to teach your section on July 11. Your presentation should cover the content presented on your concept map as well as a demonstration of your drill and

practice software discussing your evaluation of it as you demonstrate it. Your group will present 4th. You will have 15 minutes.

Materials:

- Roblyer Book: Chapter 4
- You may use the Internet to find sites that supplement the information provided in the Roblyer Book if you feel the need
- Millie's Math House Software
- Inspiration Concept Mapping Software



Tutorial Software Evaluation Tasksheet

Context:

You are part of a group of teachers in Knox County who has been approached by the superintendent to be part of a team that travels throughout the district teaching other educators about instructional software. Your job is to use the resources provided below to put together a presentation about one aspect of educational software. Your group has been asked to focus on Tutorial Software. Your group members are:

Task:

- After reading Chapter 4 in the Roblyer Book, you will create a concept map of tutorial software which includes the following elements. Once you have created your concept map, print enough copies for each member of the class (25 copies).
 - definition and characteristics of tutorial software
 - issues related to tutorial software
 - how to effectively use tutorial software in teaching
 - classroom applications of tutorial software
 - guidelines for using tutorial software.
- As a group review and evaluate Language Workshop Interactive Multimedia Software Grade 9 (listed in resources) according to recommended courseware evaluation criteria listed on pages 106-108 in your Roblyer book. Use the form on

page 108 as a guide. In your review, you will also want to make note of the cost of the software.

- Be prepared to teach your section on July 11. Your presentation should cover the content presented on your concept map as well as a demonstration of your tutorial software discussing your evaluation of it as you demonstrate it. Your group will present 3rd. You will have 15 minutes.

Materials:

- Roblyer Book: Chapter 4
- You may use the Internet to find sites that supplement the information provided in the Roblyer Book if you feel the need
- Language Workshop Interactive Multimedia Software Grade 9
- Inspiration Concept Mapping



Educational Games Software Evaluation Tasksheet

Context:

You are part of a group of teachers in Knox County who has been approached by the superintendent to be part of a team that travels throughout the district teaching other educators about instructional software. Your job is to use the resources provided below to put together a presentation about one aspect of educational software. Your group has been asked to focus on Educational Games Software. Your group members are:

Task:

- After reading Chapter 4 in the Roblyer Book, you will create a concept map of educational games software which includes the following elements. Once you have created your concept map, print enough copies for each member of the class (25 copies).
 - definition and characteristics of educational games software
 - issues related to educational games software
 - how to effectively use educational games software in teaching
 - classroom applications of educational games software
 - guidelines for using educational games software.
- As a group review and evaluate MathBlaster (listed in resources) according to recommended courseware evaluation criteria listed on pages 106-108 in your Roblyer book. Use the form on page 108 as a guide. In your review, you will also want to make note of the cost of the software.

- Be prepared to teach your section on July 11. Your presentation should cover the content presented on your concept map as well as a demonstration of your educational games software discussing your evaluation of it as you demonstrate it. Your group will present 2nd. You will have 15 minutes.

Materials:

- Roblyer Book: Chapter 4
- You may use the Internet to find sites that supplement the information provided in the Roblyer Book if you feel the need
- Math Blaster Software
- Inspiration Concept Mapping



Problem Solving Software Evaluation Tasksheet

Context:

You are part of a group of teachers in Knox County who has been approached by the superintendent to be part of a team that travels throughout the district teaching other educators about instructional software. Your job is to use the resources provided below to put together a presentation about one aspect of educational software. Your group has been asked to focus on Problem Solving Software. Your group members are:

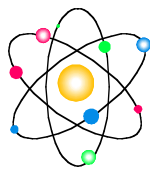
Task:

1. After reading Chapter 4 in the Roblyer Book, you will create a concept map of problem solving software which includes the following elements. Once you have created your concept map, print enough copies for each member of the class (25 copies).
 - definition and characteristics of problem solving software
 - issues related to problem solving software
 - how to effectively use problem solving software in teaching
 - classroom applications of problem solving software
 - guidelines for using problem solving software.
2. As a group review and evaluate Carmen SanDiego (listed in resources) according to recommended courseware evaluation criteria listed on pages 106-108 in your Roblyer book. Use the form on page 108 as a guide. In your review, you will also want to make note of the cost of the software.
3. Be prepared to teach your section on July 11. Your presentation should cover the content presented on your concept map as well as a demonstration of your problem

solving software discussing your evaluation of it as you demonstrate it. Your group will present 5th. You will have 15 minutes.

Materials:

- Roblyer Book: Chapter 4
- You may use the Internet to find sites that supplement the information provided in the Roblyer Book if you feel the need
- Carmen San Diego Software
- Inspiration Concept Mapping



Simulation Software Evaluation Tasksheet

Context:

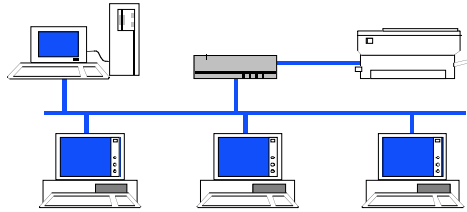
You are part of a group of teachers in Knox County who has been approached by the superintendent to be part of a team that travels throughout the district teaching other educators about instructional software. Your job is to use the resources provided below to put together a presentation about one aspect of educational software. Your group has been asked to focus on Simulation Software. Your group members are

Task:

1. After reading Chapter 4 in the Roblyer Book, you will create a concept map of simulation software which includes the following elements. Once you have created your concept map, print enough copies for each member of the class (25 copies).
 - definition and characteristics of simulation software
 - issues related to simulation software
 - how to effectively use simulation software in teaching
 - classroom applications of simulation software
 - guidelines for using simulation software.
2. As a group review and evaluate Crocodile Physics 1.5 Demo (listed in resources) according to recommended courseware evaluation criteria listed on pages 106-108 in your Roblyer book. Use the form on page 108 as a guide. In your review, you will also want to make note of the cost of the software.
3. Be prepared to teach your section on July 11th. Your presentation should cover the content presented on your concept map as well as a demonstration of your simulation software discussing your evaluation of it as you demonstrate it. Your group will present 6th. You will have 15 minutes.

Materials:

- Roblyer Book: Chapter 4
- You may use the Internet to find sites that supplement the information provided in the Roblyer Book if you feel the need
- http://www.crocodile-clips.com/crocphys/m5_1.htm
- Inspiration Concept Mapping



Integrated Learning Systems (ILSs) Tasksheet

Context:

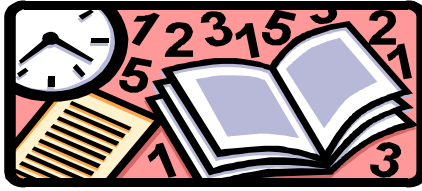
You are part of a group of teachers in Knox County who has been approached by the superintendent to be part of a team that travels throughout the district teaching other educators about instructional software. Your job is to use the resources provided below to put together a presentation about one aspect of educational software. Your group has been asked to focus on Integrated Learning Systems. Your group members are

Task:

1. After reading Chapter 4 in the Robyler Book, you will create a concept map of integrated learning systems and which includes the following elements. Once you have created your concept map, print enough copies for each member of the class (25 copies).
 - Definition and characteristics of ILSs
 - Issues related to ILSs
 - How to effectively use an ILS in teaching
 - Directed applications for ILSs
 - Constructivist applications for ILSs
2. Prepare an oral presentation and demonstration of CCC guided by the following:
 - Computer Curriculum Corporation (CCC) is one of the major players in the ILS field in education. Go to <http://www.ccclearn.com/> to learn the following:
 - What age level does CCC create ILSs for?
 - Describe Successmaker (the K-8 CCC ILS) in terms of activities it provides (hint: click on one of the titles once you are in Successmaker and scroll to the bottom) In Successmaker what content areas are covered? Is Successmaker correlated to a specific curriculum? If so, which one(s)? Pickout one of the

titles in reading for SuccessMaker K-8 and tell the content, what considerations are given to the students and what considerations are given to teaching. Can you find a product pricelist for any of the components? If so, what is the cost?

- Using the Dell Laptop with CCC loaded on it and the Management System Guide set up your class (the password is CCC) and add a student to that class (use student number 202 and the password of 486) Add the student to RAP (Reading Adventures Primary).
 - Login as the student and work through Reading Adventures Unit 1 Animals Everywhere. Use the Reading Adventures Primary Teacher's Handbook pages 11- 27 as a guide. When you login you will be asked to insert the Reading Adventures Primary CD 1.
 - Once you've completed your work as a student, log back into the management system as a teacher and generate reports in the student you created. See pages 69 -97 in the Management System Guide.
3. Be prepared to teach your section on July 11. Your group will present 7th. You will have 15 minutes.



Production Software Evaluation Tasksheet

Context:

You are part of a group of teachers in Knox County who has been approached by the superintendent to be part of a team that travels throughout the district teaching other educators about instructional software. Your job is to use the resources provided below to put together a presentation about one aspect of educational software. Your group has been asked to focus on Production Software. Your group members are

Task:

1. After reading Chapter 5 pages 113-114 and 149-152 (stop before Charting and Graphing Software) in the Robyler Book, you will review and evaluate Kid Pix. Use the manual included with your software so that you can demonstrate Kid Pix to the class. Be sure to cover the tools in Kid Pix. In your review, you will also want to make note of the cost of the software.
2. Be prepared to teach your section on July 11th. Your presentation should cover briefly the information gained from your reading in the Robyler book as well as a demonstration of your production software discussing your evaluation of it as you demonstrate it. Your group will present 7th. You will have 15 minutes.

Materials:

- Roblyer Book: Chapter 5
- You may use the Internet to find sites that supplement the information provided in the Roblyer Book if you feel the need
- Kid Pix

Vita

Kathryn Ann DiPietro was born in San Antonio, Texas on June 29, 1956. As her father was an officer in the Air Force, she moved extensively throughout her childhood. When she was in sixth grade she moved to Jacksonville, Florida with her parents, brother, and sister. At the age of twenty-eight and after having two children, Kathryn returned to school, first receiving her Associates of Arts degree at Florida Community College and then transferring to the University of North Florida where she received a Bachelor of Arts in Education with an emphasis in special education. Her masters of education with an emphasis in learning disabilities was obtained from the University of North Florida.

Kathryn taught in the public school system in Duval County, Florida for 9 years beginning in 1989. She taught at Long Branch Sixth Grade Center for two years, working with self-contained learning-disabled students. During her first year teaching, she was honored as Long Branch Sixth Grade Center's Teach of the Year and the Council of Exceptional Children's Rookie of the Year, a recognition that speaks more of what her students taught her than what she taught them. When Long Branch Sixth Grade Center made the transition from a sixth grade center to a neighborhood elementary school, Kathryn continued on at Long Branch Elementary school and taught in a varying exceptionalities resource classroom, working with learning disabled, emotionally handicapped, and educable mentally handicapped children. After two years, she moved to Arlington Elementary School and continued working in a varying exceptionalities resource program. While at Arlington Elementary, Kathryn was again honored as Arlington Elementary's Teach of the Year. In 1996-1997, Kathryn was the Title 1 Technology Coordinator for Arlington Elementary School. In the summer 1997, Kathryn

moved to Orange California and was employed by the district of Orange to work at McPherson Science, Math, and Technology Magnet School to work as a resource specialist in their learning disabilities program. Driven by her own less than stellar K-12 public education experiences, Kathryn has worked passionately to provide meaningful, challenging, and relevant learning experiences for children and to help those children find joy in learning. She has written grants, served on boards of advisors for grants as well as led school improvement and technology committees in an effort to provide the best educational experiences for children. It was this mission that lead her to technology as a tool for expressing, creating, manipulating, and making meaning. She is currently a Ph.D. candidate at the University of Tennessee Knoxville and is concentrating her studies on instructional technology and will graduate in May of 2002. At the University of Tennessee Knoxville, she has been privileged to work with many innovative and enriching people and projects. For three years she has taught graduate and undergraduate courses that focus on instructional methodology and technology and worked to support the creative educational endeavors of Ed Counts, Dale Doak, and Claudia Melear. She was the recipient of The University of Tennessee's Citation for Extraordinary Professional Promise.