TOWSON UNIVERSITY

COLLEGE OF GRADUATE STUDIES AND RESEARCH

A STUDY OF A LEARNER-CENTERED TECHNOLOGY PROFESSIONAL DEVELOPMENT SERIES WITH CLASSROOM TEACHERS

By

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THESIS APPROVAL PAGE

This is to certify that the thesis prepared by, CarolAnn Stevens, entitled, A study of a learner-centered technology professional development series with classroom teachers, has been approved by this committee as satisfactory completion of the thesis requirement for the degree of Doctor of Education in Instructional Technology

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ABSTRACT

A STUDY OF A LEARNER-CENTERED TECHNOLOGY PROFESSIONAL DEVELOPMENT SERIES WITH CLASSROOM TEACHERS.

CarolAnn Stevens

Using learner-centered teaching practices can change the state of technology integration in Elementary Schools (ES). A quasi-experimental, pretest/posttest survey was used to identify changes in the use of technology by ES students, ES teachers' technology skill, the use of computer technology to meet curricular objectives, and a learner-centered learning environment during technology professional development to change ES teacher's pedagogy. In the setting of an elementary school in the Baltimore / Washington corridor, twenty-five classroom ES teachers participated in research that measured: the time that ES teachers' used technology with their ES students, ES teachers' technology skill level, direct instruction with technology, and change of pedagogical practices. Additional computer lab usage data was collected for two years. Results from both data sources indicated that a learner-centered professional development series was related to significant changes in time that ES teachers' used technology with their ES students, ES teachers' technology skill level, and direct instruction with technology. This study points to the conclusion that job-embedded, learner-centered professional development is an effective way to provide technology professional development in an elementary setting.

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CHAPTER I. INTRODUCTION

This chapter provides information on the setting, the technology employed, and purpose of a study on a professional development program that used a learner-centered pedagogy for delivering instruction on computer technology and computer technology integration for teachers at ABC Elementary. This chapter also provides definitions of key terms (additional terms can be found in Appendix A) that are found within the survey and reviews the newly implemented professional development program. A quasi-experimental, pretest/posttest survey was used to identify changes in the use of technology by Elementary School (ES) students, ES teachers' technology skill, the use of computer technology to meet curricular objectives, and a learner-centered learning environment during technology professional development to change ES teacher's pedagogy. The survey data and detailed computer lab usage data were used in collaboration to determine if computer technology use increased from the 2005 - 2006 to 2006 - 2007 school year at ABC Elementary. For this study, computer technology (the combined use of computer hardware and software) for learning of content will be referred to as technology. How technology was used by ES teachers and ES students to meet curricular objectives will be referred to as technology integration. A detailed discussion of how technology use and integration were measured for this survey follows in this chapter.

Setting

ABC, a public elementary school, is located in a suburban area within the Baltimore/Washington corridor. ABC Elementary is a neighborhood school with many characteristics of urban schools (more details about the schools are found in the methodology chapter). At the time of the study, ABC Elementary had 627 students and 93 staff members. The mean years of teaching experience at ABC Elementary was 9.81 years while the mean within XYZ County was 11.7 years. Fifty-eight percent (37) of teachers at ABC Elementary hold a masters degree while 71% of teachers in XYZ County hold a masters degree or higher. The mean age of the study group was 37.24 and the median age was 37.

The researcher has been employed by XYZ County for sixteen years (all of those years at ABC Elementary). During the past seven years, the researcher has been providing job embedded professional development with computers and related technologies for all of the staff. A narrative summary of teacher's skills prior to the 2006 - 2007 school year can be found in Appendix B. During the 2001-2006 school years, the staff have had extensive training in software use such as: Microsoft® Word, Excel, PowerPoint, e-mail, and in hardware that supports computer use. Observation of how teachers were using computer technology at ABC Elementary has been part of the researcher's job responsibility. Prior to the study year, the researcher had observed that while teacher productivity using computer technology had increased, student use had not increased at a similar rate.

Background of Problem

After review of the student uses of technology at ABC Elementary, the researcher determined that teachers were proficient in using technology as a productivity tool, and that the use of technology as a productivity tool has been directly passed on to their ES students (see Appendix B). Teachers were proficient at creating attractive worksheets in Microsoft Word ® for their ES students and ES students, were able to create a Word® document using different fonts and text sizes to share their original poetry and stories. As another example, staff were able to effectively create PowerPoint® presentations to use as a tool to present information to their ES students with multi-media items embedded within the presentation. These presentations were often used as lecture tools and included audio and video clips. While the teachers have been improving their use of PowerPoint®, student use of this same software program was not apparent. ES Students in the intermediate grades (3-5) of ABC Elementary were not able to use PowerPoint® to share ideas and research with their peers. ES students in intermediate grades were also able to create attractive documents using Microsoft Word®. This information was based on a review of student skills with classroom teachers.

Terms

As technology is used and defined in many ways, identifying the key terms used in this research is essential for understanding this study. Noteworthy terms for this research are: technology, integration, Computer Lab Use (CLU), Learner-Centered Learning (LCL), Technology Hardware and Software Skills (THSS), Teacher Usage for Instruction (TUI), direct instruction, indirect instruction, and teacher technology skill level. Additional terms are also found in Appendix A.

Technology. For this study, computer technology was defined as the combined use of computer hardware and software, and their related peripherals, such as: scanners, digital cameras, printers, projectors, Smart Boards® and digital video cameras for learning of content. Technology also included educational software that allows the associated peripherals to create multi-media projects. These software programs include Microsoft® Office products. Technology use includes working with technology using the Internet, Kidspiration®, Inspiration®, Timeliner®, and other applications.

Technology Integration. For this research, technology integration was considered the combined use of technology delivered or facilitated by the teacher to the ES students in either a direct instructional method or an indirect instructional method. How technology was used by teachers and ES students to meet curricular objectives will be referred to as technology integration. Technology integration was measured using the pretest/posttest survey that allowed teachers to self-report their technology use. For an example of use, teachers self-reported the number of hours that they used the program Inspiration® to help ES students organize their writing. Technology integration, as a secondary measure, was also reported in time using laptop or desktop computers in ABC Elementary's computer lab or using the mobile computer lab.

Computer Lab Usage. Computer Lab Usage (CLU) data was used to measure technology integration time with ES students. Entries within sign-in sheets gave details of what grade level, teacher, time of day, duration of use, and curricular areas that were intended to use technology (see Appendix C for more information). Entries within sign-in sheets provided supporting data to the survey data. CLU data that was used in this research was entered directly by classroom teachers. The CLU sign-in sheets were kept in two separate locations. CLU data for the computer lab was kept in the computer lab. CLU data for the mobile computer lab was kept in the media center where the mobile lab was stored while not in use. Teachers were responsible for signing out either of the computer labs as needed within their teaching practices. All teachers were allowed equal access to the computer labs without regard to grade level, curricular areas, or previous use. A first-come, first-served basis was used when reserving the computer lab. When two teachers requested the computer lab at the same time, the researcher was able to mediate conflicts. The CLU data allowed the researcher to see the use of computers at ABC Elementary.

Learner-Centered Learning. In the current study, Learner-Centered Learning (LCL) refers to the pedagogy associated with the environment used to deliver professional development instruction to the teachers at ABC Elementary. A learner-centered environment promotes a focus of instruction: the planning, the delivery, and the assessment with a deliberate focus on the ES student's: learning needs, the learning styles of the ES student, the ES student's abilities, and the ES student's background knowledge in a particular curricular area. An example of the LCL used in this research was facilitating the designing of activities that let the ES teachers (in their role as learners) take initiatives to design ES student lessons using technology that involved the interest of their ES students. LCL was chosen as the term to reflect the researcher's approach to teaching the classroom teachers at ABC Elementary. The researcher used a LCL instructional approach to teaching the adults (ES teachers) to determine if this approach increased the use of learner-centered teaching practices in their classrooms.

Within the current study, ES teachers were given the opportunity to express which areas of learning they were interested in pursuing. During the pretest, ES teachers were given fourteen choices of professional development areas. These results were used to begin the development of the professional development plan for this research. As the professional development progressed, the direction of the instruction/facilitation was changed as the ES teachers' needs changed.

In order for the researcher, as the professional developer, to facilitate the use of different types of software for LCL for the ES teachers, the ES teachers' skill levels in the use of technology hardware, software, and use with their ES students was measured using several questions in the survey. Measuring ES teachers' skills resulted in the researcher creating two categories of ES teacher technology levels. The first group of ES teacher skills was the Technology Hardware and Software Skills (THSS) group while the second was Teacher Usage for Instruction (TUI) and these definitions follow.

Technology Hardware and Software Skills. Technology Hardware and Software Skills (THSS) are skills such as using a word processor, a digital camera, or peripherals. This term relates an understanding of the ES teacher's ability to manipulate computers and related technologies, and combines five survey questions in the pretest and posttest that are combined to create a composite. THSS are self-reported items that create a portion of the technology skill level that is assigned to each individual participant.

Teacher Usage for Instruction. ES Teacher Usage of technology Instruction (TUI) was the term used to identify how a ES teacher used technology for instruction with their ES students. Eleven survey questions were used to create a composite score (see Appendix D for more information). The instruction that the ES teachers were providing their ES students were classified into two types: direct and indirect instruction with technology.

Direct Instruction. Direct instruction was a term used in the current study to describe teaching or facilitating instruction with technology that meets curricular objectives. Direct instruction refers to student computer uses and/or the ES teacher using technology to instruct the ES students in reading/language arts, mathematics, science, and social studies. Examples within this study include ES students using the Internet to research topics, such as allowing the second grade students to self-select states to research and report on. Another example was ES students participating in a WebQuest®. Categories of direct instruction include: Internet research, cooperative group projects, performance based projects or assessments, and problem solving activities. Direct instruction was measured in the survey by ES teacher reported average use per week in the curricular areas above. Six survey questions were used in identifying direct instruction.

Indirect Instruction. Indirect instruction, also known as drill and practice, uses technology to deliver repetitive practice to ES students a particular educational skill. The ES teacher's role in indirect instruction is limited to physically setting up the ES students; and the ES teacher then relinquishes teaching. During indirect instruction, objectives have been previously introduced and are reviewed before the use of technology. For example, common uses of indirect instruction include: mathematics fact skill review, identifying rhyming patterns, and spelling practice. Indirect instruction was measured in the survey by self-reported average minutes per week by the ES teachers. Indirect instruction was measured in the survey by ES teacher reported average use per week in the curricular areas of: reading/LA, mathematics, social studies, science, and other. Six survey questions were used in identifying indirect instruction

Job Embedded Professional Development. Professional development at ABC Elementary has taken place during the planning period of ES teachers since 2001. While ES students are attending classes such as physical education, art, media, and music, ES teachers were participating in small-group instruction, or planning for modeling and co-teaching sessions. The researcher provided job-embedded professional development for the teachers at ABC Elementary. The most common job-embedded professional activities were: small group sessions, co-teaching, and modeling. For more information, see the section on professional development within the methods chapter of this study.

Teacher-centered instruction. Teacher-centered instruction in the current study refers to the researcher modeling learner-centered instruction during professional development to the ES teachers at ABC Elementary. The modeling of this pedagogy reflected the researcher's approach to teaching based on the researcher's knowledge and technology skills. In teacher-centered instruction, most instructional decisions about the professional development process and content were made by the researcher.

Purpose of Study

This study seeks to determine if a learner-centered professional development series focused on technology is associated with changes in ES teacher pedagogical practice, direct instruction using technology with ES students, ES teacher technology skills, and increased student technology use. Over the past five years at ABC Elementary, professional development has been used with a ES teacher-centered instruction. ES teachers were asked at the beginning of each school year which skills they wanted to improve. Planning for professional development activities was then guided by these requests combined with the researcher's judgment. Past professional development efforts consisted of software instruction that was designed to increase ES teacher skills. An example of teacher-centered instruction was the technical use of Kidspiration® software, such as how to open, save, and print. For the study year (2006 - 2007), professional development efforts were guided by the pretest survey and were facilitated by the researcher using a learner-centered pedagogy. An example of learner-centered instruction from the 2006 - 2007 school year was the small group collaboration to learn Kidspiration® to facilitate student writing and create differentiated student activities.

During the months prior to this study, careful review of CLU and the researcher's previous planning sheets indicated that the ES student use of technology did not change after teacher-centered professional development sessions. After considerable reflection, the researcher formed four central questions that are within the domain of learner-centered pedagogical practices. From the formation of these central questions, sub-questions were formed that investigate ES student technology integration, demographic data, and ES teacher skill level.

The central questions and sub-questions to be answered in this study are: to what extent -

1. Does a learner-centered series of technology professional development sessions for ES teachers increase technology integration with their ES students?
    a. Are there differences based on grade level taught?
    b. Are there differences based on years of teaching?
    c. Are there differences based on ES teacher technology skill level?
2. Does a learner-centered series of technology professional development sessions for ES teachers increase their technology skill level?
3. Does a learner-centered series of technology professional development sessions for ES teachers increase direct instruction with technology?
    a. Are there differences based on grade level taught?
    b. Are there differences based on years of teaching?
    c. Are there differences based on ES teacher technology skill level?
4. Does a learner-centered series of technology professional development sessions for ES teachers increase student-centered pedagogical practices of ES teachers?

Professional Development Plan

The professional development plan for ABC Elementary School has changed during the past five years. In the past, classroom ES teachers from the same grade level (approximately four to six ES teachers) met each month during common planning time with the researcher and listened to a teacher-centered small-group lesson on a specific topic. If ES teachers specifically requested a topic, that topic would be presented. If no topic was requested, the researcher picked a topic that could be integrated with curriculum in the upcoming month. Approximately twice a year, a mandatory professional development session would be delivered on a large-group scale to all staff members at the direction of the principal. In prior years, ES teachers met with the researcher for at least eight hours of training during the school year. During the 2005 - 2006 school year, professional development activities were site-based and embedded in grade-level sessions during common planning time. ES teachers were also encouraged to meet with the researcher for clarification, follow-up, or an extension of the monthly topic on an as-needed basis. These follow-up sessions totaled approximately sixteen hours in length, for a total of twenty-four hours of professional development per ES teacher. Professional development topics included productivity and instructional software review of: Microsoft Office®, Kidspiration/Inspiration®, Timeliner®, JumpStart®, and Type to Learn®. Session descriptions for the 2001-2005 school years can be found in Appendix B.

During the 2006 - 2007 school year, ES teachers participated in a learner-centered environment. Professional development activities were site-based and embedded in grade-level sessions during common planning time. In small group sessions lead by the researcher, ES teachers met and reviewed current study on learner-centered pedagogy and technology integration, completed a self-paced tutorial on specific software, collaboratively worked on curricular integration, and shared results of integrated lesson plans. Follow-up sessions with the ES teachers included collaborative planning sessions including: co-teaching and modeling of technology-integrated lessons. These lessons contained elements from the Maryland Teacher Technology Standards (Appendix E) and could be directly linked to the Maryland voluntary curriculum.

A learner-centered environment contains many aspects of a constructivist environment. The similarities between a learner-centered learning environment and constructivist epistemology rely on the underlying foundations and assumptions of both pedagogies (Land & Hannafin, 2000). The researcher's epistemological beliefs contain elements from both constructivist and learner-centered pedagogies.

Summary

This study examined the results of a professional development plan that was steeped in the framework of a learner-centered pedagogy. Using a survey as a measure of growth, all classroom ES teachers participated in a multi-session professional development program. The 25 classroom teachers at ABC Elementary were exposed to the tenants of learner-centered pedagogy while integrating technology into essential curriculum. A learner-centered environment promotes a focus on instruction: planning, delivery, and assessment. There is a deliberate focus on the student's learning needs. Within a learner-centered environment, the goal is to improve the quality and effectiveness of learning and teaching (Motsching-Pitrik &

Holtzinger, 2002). A pretest was administered before the technology professional development began. After eight months of professional development activities, a posttest was administered to measure changes in: the time that ES teachers used technology with their ES students, ES teacher's technology skill level, direct instruction with technology, and pedagogical practices.

CHAPTER II. LITERATURE REVIEW

Introduction

In this chapter the researcher will discuss: technology integration and learner-centered learning; relevant history of technology integration as related to this study; research on technology integration and learner-centered learning; current professional development in technology, including ES teacher technology skills; student technology skills; background of technology professional development at ABC Elementary; and learner-centered learning as a pedagogical practice.

The current study aims to investigate technology use through a learner-centered professional development program with ES teachers. The literature review will focus on technology use by students, teacher's technology skill, the use of computer technology to meet curricular objectives, and a learner-centered learning environment during technology professional development to change teacher's pedagogy. A summary then connects the central research questions to the review of literature.

Technology Integration and Learner-Centered Learning

Many researchers have defined technology integration over the past decades through different lenses. Recent research describes technology integration as technology that enhances and supports the achievement of teaching and learning. Other current research, (Ertmer, 1999, Yepes-Baraya, 2002), describes technology integration as meeting content objectives through the 3 C's (Ertmer, 1999). The 3 C's are creative problem solving, communication, and collaboration. Using the 3 C's from Ertmer's research directly links to the direct instructional method of teaching with technology and the current study. In addition, Jonassen (2000a) believes that technology integration occurs "when computers support knowledge construction, explorations, learning by doing and conversing" (p. 4). For this research, technology integration was considered as the combined use of technology delivered or facilitated by the ES teacher to the ES students in either a direct instructional method or an indirect instructional method.

Glazer, Hannafin, and Song (2005) suggest that technology professional development that is embedded "within the context of their teaching" (p. 57) can transfer professional learning to instructional practices. Glazer, Hannafin, and Song also suggested that modeling, collaboration, and coaching are effective ways to integrate technology. The Glazer, Hannafin, and Song research is important to the current study because their professional development model is based on small group instruction that includes collaboration, co-teaching, and modeling.

History of Technology Integration

Technology integration has been in place for decades, beginning with the integration of television and video into the use of computers to enrich education. For the current study, technology integration will be considered from the time of mainstream use of the personal computer to the present. Three examples that are key to technology integration are discussed in the current study. Logo®, Jasper Woodbury®, and WebQuests® were chosen by the researcher to depict early exemplar technology integration projects due to their lasting impression on best practices of technology integration.

In the 1960's, Papert and others at Massachusetts Institute of Technology (MIT) created Logo®, an object-oriented program that allows ES students to master geometry and problem solving curriculum while learning programming strategies (Papert, 1993). This program, extremely popular in the 1990s, is a model of student-centered learning (Clements & Meredith, 1992) with mathematics, science and technology integration. Some common characteristics of Logo® use include: collaborative learning, the teacher as the facilitator of learning, and student selected projects. Logo®, as well as the subsequent versions of this program, are an effective way for children to experiment and find alternative means of designing and solving problems while learning programming and/or geometry.

In many ways, Papert reconceptualizes Dewey, Montessori, Vygotsky, Piaget, A.S. Neil, and other progressive educators in a contemporary computer-rich world. His ideas are built on the shoulders of the great educators who came before. Moreover, Papert helps us see the tactical errors of our predecessors and the new opportunities that emerge with the widespread availability of personal computing devices. We are encouraged to use our imagination, to dream, to play (Stager, 2002, p. 3).

In 1982, members from the Learning Technology Center of Vanderbilt University developed an interactive tool that integrated technology into mathematics, science, and other curricular areas. This problem solving series, known as The Adventures of Jasper Woodbury, allows students to work on authentic problems that also require communication and reasoning skills. This instructional approach is referred to as anchored instruction. The twelve sets of videodisks, now moved to CD format, have been in use with students for the past twenty years. This seminal work contains technology embedded problem-solving activities that have embedded real life questions and sub-problems.

> In 1995, Dodge from San Diego State University developed the WebQuest®. A WebQuest® is an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet, optionally supplemented with videoconferencing. There are at least two levels of WebQuests® that should be distinguished from one another (Dodge, 1997, p. 1).

These levels are described as long-term and short term WebQuests®. A short-term WebQuest® can be completed in as little as one class period, while a long-term WebQuest® can last for an entire semester. This technology rich activity allows the teacher/designer to thoughtfully integrate technology to provide direct instruction to the students.

The exemplars of Logo®, Jasper Woodbury®, and WebQuest® integration projects were chosen because they relate to the current study on using technology to meet curricular objectives in a direct instructional method. These software programs are at the heart of LCL. While using these programs, the emphasis is on the student, focusing instruction on the learning styles of the student, the student's abilities, and the student's background knowledge in a particular curricular area.

Research on Technology Integration and Learner-Centered Learning

In 2004, Bebell, Russell, and O'Dwyer reported on measuring technology integration with over 1,278 teachers located in Massachusetts. The authors stated, "defining and measuring teachers' use of technology has increased in complexity as technology has become more advanced, varied, and pervasive in the educational system" (Bebell, Russell, & O'Dwyer, 2004, p. 45). Using multiple measures the research was found to: Provide a valid measure of technology use, interpret findings about the extent to which technology was used, and understand how to increase the use of technology.

Many large-scale investigations were reviewed for this study including: information from the 1986 Federal Office of Technology Assessment and subsequent reports, Becker's (1994) investigations on How Exemplary Computer-Using Teachers Differ From Other Teachers from the National Center for Educational Statistics from 1994 through 2002, and the Teaching, Learning, and Computing (1998) reports. These were used to identify a composite measure to calculate a teacher level of general technology use, and a categorical type of technology use for teachers (Bebell, Russell, & O'Dwyer, 2004). The findings in the Bebell, Russell, and O'Dwyer investigation compared student use of computers, student products, and delivery of instruction using technology in different subjects (reading / language arts, mathematics, social studies, and science). The Bebell, Russell, and O'Dwyer investigation was instrumental in creating categories within the current study survey (Appendix F). The categories listed in Appendix D were grouped by the researcher's four guiding questions of technology integration, ES teacher skill level, the use of direct instruction, and pedagogical practices.

In 2001, Jacobsen's investigation aimed to answer three guiding questions regarding integration of technology into elementary schools. The questions included: What does effective technology integration look like? To what extent can children be engaged in authentic learning tasks with Information and Communications Technology? How does professional development effectively support teachers to effectively integrate technology into teaching and learning? (Jacobsen, 2001).

Professional Development

In Jacobson's (2001) case study, three elementary schools participated in bi-weekly visits over a three-month period in both urban and rural settings. Interviews, observations, and electronic portfolio data were gathered on 30 teachers, 48 students, and three administrators. The study indicated that after professional development in changing pedagogical practices from teacher-centered to learner-centered, teachers implemented technology integration and learner-centered learning strategies. Students' work also exceeded teacher expectations when using tenants found in learner-centered learning, and instruction that followed the professional development focused on the curriculum, not the technology that supports the curriculum. Jacobson's (2001) research is important to the current study in that a positive change of teacher pedagogy from student-centered to learner-centered was found to increase when technology integration increased.

In a large-scale study by Barron, Kemker, Harmes, and Kalaydjian (2003), technology integration as related to the National Technology Standards (NTS) from the International Society for Technology in Education (ISTE) was investigated. The integration levels for a large Florida public school district were calculated from 2,156 teachers (1,100 elementary teachers) in a quantitative survey method study. Using a Level of Technology Integration (LOTI) eight-point level of integration scale, teachers categorized their technology use in different areas using the levels from a level of technology implementation scale developed by Moersch (1995). Moersch's study created a scale of technology integration from (in rising order) non-use, awareness, exploration, infusion, integration (mechanical), integration (routine), expansion, to refinement. These categories include technology competencies in: basic operations and concepts; social, ethical and human issues; technology productivity tools; technology communication tools; technology research tools; and technology problem-solving and decision-making tools.

In a similar study that evaluated teacher computer skill level by Barron, Kemker, Harmes and Kalaydjian (2003), researchers concluded that six percent of the teachers fell into the category of high integration, eleven percent of the teachers fell into the category of integrated, twenty-four percent fell into the category of modestly integrated, 31 percent of teachers fell into limited integration practice, and 29 percent never integrated technology with students. Many of the questions that were used in the Barron et al. study were used in the survey that was administered in the current study to determine the skill level of ES teachers. A complete listing of references for survey items in the current study can be found in Appendix F.

Mills and Tincher (2003) developed standards and indicators of best practices in technology integration by creating a Technology Integration Standards

Configuration Matrix that is based on stages, standards and indicators of a professional development process for use in evaluating technology integration of teachers. Forty-six teachers participated in a pretest/posttest survey that resulted in a Cronbach alpha of .91 for the pretest and .89 for the posttest. In the Mills and Tincher study, teachers used a self-assessment survey that determined their technology integration levels before and after professional development activities. The Mills and Tincher study relates to the current study linking a learner-centered series of professional development sessions and a change in pedagogical practices of the ES teachers.

Feist (2003) completed a case study on removing barriers to changing teaching pedagogy from a student-centered environment towards a learner-centered environment within a technology rich professional development plan. Experienced online course developers focused on active learning to provide the appropriate instructional pedagogy. In-depth interviews were conducted and the results of the data reported that professional development must be congruent to the learning style of the teacher and course, and that active learning must directly support the teacher's needs to provide just-in-time learning. The current study incorporated Feist's technology integration methodology by connecting learner-centered professional development to the practices of teachers. Feist's research provides support for increasing the duration of technology use with students.

Gibbons and Wentworth (2001) suggest that the primary responsibility for learning should be transferred from facilitator to learner. The authors related that professional development in a collaborative learning model that is experiential and learner-centered must be in place for a framework to work with nontraditional learners. Gibbons and Wentworth indicate that professional development is most successful in a LCL environment.

Brookfield (2005) has earned critical acclaim by using instruction techniques such as self-directed learning, critical reflection, experiential learning, and learning to learn in order to provide exemplar adult learning. Self-directed learning occurs when adults take control over their own learning and set personal learning goals. LCL has become widespread and is used frequently. During the reflection process there are three interrelated processes: questioning and re-framing an assumption, taking an alternative perspective, and recognizing the presence of the dominant culture as an influencing factor. Lawler and King (2002) added that professional developers need to understand attitude, credibility, authenticity, respect, consistency, and responsiveness to be successful with LCL. In the current study, a reflective process was used within each of the small group professional development sessions. This research is important for the current study as many tenants included in LCL are derived from these techniques.

King’s (2002) three-year study on adult professional development with teachers on integrating technology with students included 175 teachers enrolled in a masters program in educational technology. The research indicated that teacher pedagogy may impact teachers’ practice of integrating technology into daily practice. The data included surveys, interviews, and reflective essays. Through triangulation, data attributed transformational learning with engaging teachers in professional development and in classroom practice of technology integration. Although this research did not use interviews and essays, the current study closely matches the survey portion of King's study.

In reviewing Baylor and Ritchie's (2002) research, professional development in technology requires "prolonged exposure" (p. 398) to new skills and pedagogy before classroom technology integration behaviors occur. This exposure can take up to six years. Teachers must also be able to have input on the topics related to their school situation to adequately "embrace the concepts delivered" (p. 398) during the professional development sessions. In the current study, teachers were able to have direct influence on the topics that were selected for the professional development sessions from items in the pretest survey.

Teacher Skills

In this section the researcher will review research on ES teacher technology skill levels as related to the current study. A study on classroom technology use by Vannatta and Fordham (2004) measured teacher philosophy and technology use. The researchers surveyed 177 teachers in Northwest Ohio using a 71-item Teacher Attribute Survey (TAS). This survey instrument was developed by combining adapted existing surveys with items written expressly for the TAS study. The results of this study indicate a Cronbach alpha from .61 to .89. The results indicated that classroom technology use was fairly low among teachers and students (Vannatta & Fordham, 2004). The teachers who leaned toward a learner-centered and constructivist environment were not only open to change, but had above average use of technology. The discussion that followed the results also reported, "research has shown that a constructivist teacher is more apt to utilize technology in the classroom, typically a constructivist teacher uses technology as a tool to advance constructive learning” (p. 261).

Becker and Ravitz (1999) completed research on the influence of computer and Internet use on teachers’ pedagogical practices and perceptions. Their research included 441 elementary and secondary teachers. The results indicated a positive correlation between the use of technology and an increase of constructivist practices. The 55-question survey was given to teachers at 153 schools. In this study, a positive correlation between the teachers’ sustained use of computers and learner-centered teaching practices was found.

In 1994, Becker studied how computer-using teachers differ from other teachers. The study related implications for realizing the potential of computers in schools. In a study that began with 516 elementary school teachers, a questionnaire was given that resulted in 45 teachers who were considered to be in the top five percent (of the original 516 elementary school teachers) of computer using teachers, and were considered Exemplary Computer-Using (ECU) teachers. The ECU teachers were given surveys of pedagogical practices that identified certain teaching conditions (Becker, 1994). A positive correlation was found between learner-centered pedagogy and a higher rate of technology integration with their students.

In case-study research, Pierson (2001) found a correlation between learner-centered teaching and levels of technology use. The case study approach was “nestled with a larger comparative case effort” (p. 415). A group of twenty-four teachers was identified by a district technology director for having a high level of technology use. The district that was chosen had a divergent population in socioeconomic and ethnic population. The group of twenty-four teachers was narrowed down by teacher approval and an onsite observation to a group of three teachers. Interpretive data analysis found patterns in the data that indicated that teachers taught with and about technology according to their own pedagogical practices. Research indicated teachers who used technology in a LCL environment were more likely to use LCL in classroom environments that did not include technology.

In a quantitative research study, multiple methods were used to determine if long-term professional development sessions increased teachers' technology skill level and the use of LCL. Brinkerhoff (2006) indicated in a pretest/posttest survey that statistically significant results in increasing the technology skill level of teachers were found; no statistically significant results were found for learner-centered approach to teaching. In exit interviews, teachers reported that changes were found in their pedagogical practices.

An advantage of the Brinkerhoff study is that the researchers employed exit interviews. The exit interviews allowed the study to indicate that teachers believed that their pedagogical practices moved from teacher-centered to learner-centered, even though the survey data did not indicate significant results in pedagogy. The Brinkerhoff study was similar to the current study in that professional development was provided within an LCL environment was related to a positive change in mean pretest to posttest results in pedagogy.

Student Skills

This section contains research and information on student skills. In a research project completed by Taylor, Casto, and Walls (2004), teachers were given intensive technology integration training for a week. The participants were 1,284 k-12 teachers, 600 of whom were elementary school teachers. Teachers in attendance of this weeklong technology integration series used learner-centered technology with their students. A significant difference in student computer use from the previous years resulted. Assessments were compared from students who used integrated technology, and indicated a significant increase in mean test scores. Participants were responsible for providing other participants at least ten constructivist-based, technology-integrated lessons. “Results indicated statistically significant increases in (a) teacher use (frequency and skill) of technologies, (b) student use of technologies, (c) classroom observations of interdisciplinary constructivism, and technology categories, and (d) pre- and post-student learning with technology versus no technology” (Taylor, Casto, & Walls, p. 121). The Taylor, Casto and Walls project is closely related to the research questions proposed in the current study due to the focus on learner-centered technology professional development activities. Results indicated an increase in: learner-centered pedagogical practices, teacher technology skill, and student technology use.

Background of Technology Professional Development at ABC Elementary

Prior to the current study, technology professional development at ABC Elementary had been delivered by the researcher in a traditional teacher-centered approach to learning. In a teacher-centered approach to learning, the teacher transfers information to the students, which is passively received by the student. In this behaviorist-like environment the expert teacher's goal is to pass on content specific knowledge that is measured by student achievement (InTime, 1999).

Learner-Centered Learning

Learner-Centered Learning (LCL) is at the core of the current study. In all of the research questions, learner-centered learning plays a key role. In this section research connected to the use of a learner-centered learning environment and technology is explored. As many tenants of learner-centered learning and constructivism overlap, both terms will be used interchangeably within this section. First, Dewey and Jonassen are presented as the theoretical foundation to the current study, followed by recent studies on learner-centered learning.

Dewey's (1916) perspective of constructivism relies on a community of learners. These learners build knowledge together with the use of materials to create new knowledge. Dewey proposed real-world workshops so that students could demonstrate their knowledge (Clark, 2000) by doing actual jobs.

In modern constructivist pedagogy, Jonassen's work exemplifies the use of constructivism and technology. Jonassen believes that "knowledge is constructed, not transmitted", and individuals makes sense of their surroundings and construct meaning from prior experiences.

Jonassen sees constructivism as a process that follows context-rich, experience-based activities. Jonassen's goal in his publications is to lay foundations of constructivism and to add a continued discourse in interpreting learning and improving instruction. In a constructivist environment, the role of the teacher is significantly different than in an instructionalist environment. An instructionalist teacher imparts information, and students are passive receptacles, while in a constructivist learning environment, the teacher is more of a facilitator of learning.

A Constructivist Learning Environment's (CLE) focus is "on the question or issue, the case, the problem, or the project that the learners attempt to solve or resolve". This may include many approaches to learning. Jonassen (1999) describes generic design principles that any CLE should include: a problem/project, related cases, information resources, cognitive tools, conversation/collaboration tools, and social/contextual support. Elements of creating projects, using collaboration, and using technology to integrate curriculum where technology had not been used before were included in the creation of the professional development framework of this current study.

Halpin (1999) used a pretest and posttest survey to measure the level of 73 undergraduate pre-service teachers' computer skills. The data were collected over a span of two years. The questionnaires were tested with a reliability coefficient of .84. These pre-service teachers then participated in educational methods courses. After the administration of the posttest survey (after all methods courses were completed), results indicated that students who had methods courses delivered instruction (using computers and not using computers) in a learner-centered approach, and had a high transfer rate of implementing technology into their classrooms. The study also indicated a positive correlation that demonstrated that teachers who learned computer skills in an isolated manner integrated technology less with their students. Conclusions of this study did not perceive technology integration as a separate instructional resource, and also found that a constructivist approach to technology integration relates to a higher-level of K-12 student technology use (Halpin, 1999).

Becker (2001) reported that the educational philosophy of a teacher was linked to the use of technology in a learner-centered environment. Teachers who reported that their classroom structure was based on a learner-centered environment used technology in a learner-centered method. Becker also reported that teachers' technology use, in a direct or indirect method, was associated with the teachers' technology skill level. Becker also indicated that teachers who use technology within a teacher-centered instruction used technology less than teachers who used technology in a learner-centered pedagogy. In the current study, teachers' technology use and skill level increased within a learner-centered learning environment.

Matzen and Edmunds (2007) presented results of a study from the Centers for Quality Teaching and Learning. A Cronbach alpha of .89 was found for the survey portion of the study. This mixed methodology evaluation of a long-term professional development program was successful in creating a learner-centered environment that included modeling and co-teaching. Data included surveys, case studies, reflection logs, and interviews. Survey results indicated that a statistically significant increase in the use of technology integration in a learner-centered environment was found. Teacher skill level, technology integration with students, and changes in learner-centered pedagogy were all examined in the Matzen and Edmunds study and the current study.

Summary

The current research literature indicates that when a shift from a teacher-centered to a learner-centered pedagogy occurs, the following may also increase: technology integration with students (Becker, 1994; Matzen & Edmunds, 2007), teacher technology skill (Halpin, 1999; Taylor, Casto, and Walls, 2004), and direct instruction with technology (Brinkerhoff, 2006; Matzen & Edmunds, 2007). Pedagogical practices in teaching also change (Becker, 2001, Matzen & Edmunds, 2007, Mills & Tincher, 2003).

In creating a historical perspective of technology integration, examples of noteworthy research studies have been discussed. The three examples (Logo®, Jasper Woodbury®, and WebQuests®) were directly linked to a learner-centered pedagogy that has a place in best practices of technology integration.

The professional development activities from 2000 through 2005 of ABC Elementary School are extremely important to the instructional pedagogy that has changed within the past five years. Research on the use of a learner-centered pedagogy, including a constructivist-learning environment is quite prolific (Wesley, 2004).

With local trends in XYZ County moving from a teacher-centered style of professional development to a learner-centered style, it is apparent that the national research has many specific examples of this change (Wesley, 2004). There has been a rise in the amount of research skills and technology integration. With the efforts of preservice institutions and the inclusion of technology integration within state standards, the technology skill level of teachers entering the workforce has increased.

At the root of the professional development series, change in teacher pedagogy is key to addressing three of the research questions. The professional development selection of activities in the 2005 - 2006 school year was based on the expertise of the researcher as well as teacher input. This professional development (2005 - 2006) was skill based, teacher-centered, and based on increasing ES teacher's productivity tools. The professional development during the 2006 - 2007 school year was based on the pretest survey and learner-centered learning, and focused on integration of technology and curriculum. The technology integration during the 2006 - 2007 school year was focused on increasing direct instruction.

The literature provided indicates a strong link between the increase of student skills to a professional development series delivered in a learner-centered manner. The three most salient studies that can be compared to the current study are the studies by Brinkerhoff (2006), Matzen and Edmunds (2007), and Mills and Tincher (2003). The pretest/posttest survey was used to identify changes in the use of technology by ES students, ES teachers' technology skill, the use of computer technology to meet curricular objectives, and ES teacher's pedagogy.

CHAPTER III. METHODS

Research Design

The research design for this study was a quasi-experimental, one-group pretest/posttest design. A straightforward assessment allowed the researcher to determine if there has been change between the pretest and the posttest practices and attitudes. The design is appropriate for the school-based research setting in this study. In order for this study to be approved by the school administrator, all ES teachers were required to participate in the technology professional development activities. No ES teachers were allowed to be in a control group that did not receive the professional development. With attention to the external validity and crafting of the research and pretest/posttest questions, results provide validity and evidence for continuation of professional development at ABC Elementary. The methodology of the current study encompasses the: research design, variables of the central questions, research variables, research settings, professional development plan, sample of participants, pilot of the survey, research questions, survey, Cronbach alpha, limitations and assumptions, items of importance, data collection and analysis, and summary.

Research Questions

As a direction for the current study the following central questions were proposed: to what extent –

1. Does a learner-centered series of technology professional development sessions for ES teachers increase technology integration with their ES students?
    a. Are there differences based on grade level taught?
    b. Are there differences based on ES teachers' years of experience?
    c. Are there differences based on ES teacher technology skill level?
2. Does a learner-centered series of technology professional development sessions for ES teachers increase their technology skill level?
3. Does a learner-centered series of technology professional development sessions for ES teachers increase direct instruction with technology?
    a. Are there differences based on grade level taught?
    b. Are there differences based on ES teachers' years of experience?
    c. Are there differences based on ES teacher technology skill level?
4. Does a learner-centered series of technology professional development sessions for ES teachers increase learner-centered pedagogical practices of ES teachers?

Variables

The independent variable of the current study was the learner-centered professional development series in which the ES teachers participated. The independent variable (a change in the researchers pedagogy) was selected, as it was the major change from the professional development series of the previous five years. The dependent variables included: technology integration with ES students, ES teacher technology skill level, direct instruction with technology by the ES teacher, and change of ES teacher's pedagogical practices. Professional development topics were selected by the ES teachers with input from the pretest survey.

Research Setting and Procedures

The research was completed in a suburban elementary school in the Baltimore-Washington area. There were several procedural formalities that were in place in order to gain permission to conduct research. Permission was granted by XYZ County School Administration in addition to the Towson University IRB. A county specific form was completed, and submitted to the head of the assessment offices. A formal interview and review of the research occurred. A formal letter of approval was received by the researcher, (Appendix G) before any research began. XYZ County requested a copy of the final research document when completed as the only formal request.

ABC Elementary had a population during the 2006 - 2007 school year of just fewer than 650 students with a Free and Reduced Meals (FARM) population of approximately 40%. The student population at ABC Elementary was approximately 48% African American, 12% Asian, 10% Hispanic, and 28% Caucasian at the time of the posttest survey. There were 93 staff members; 91 are female, and two were male. At the time of the pretest, there were 25 homeroom teachers.

Both the pretest and posttest were administered in the media center approximately 30 minutes prior to the beginning of the ES teacher's workday. ES teachers were directed to complete the survey in two sittings without discussing the content with their co-workers. The survey booklet (Appendix H) was confidentially administered and was distributed and collected by a third party. The pretest survey was administered by non-school system employees, while the posttest was administered by a non-homeroom teacher at ABC Elementary. Efforts were made to protect the identity of the participants so that individual results cannot be connected to a specific ES teacher. The pretest was administered in early October 2006 and the posttest in April 2007. Each of the participants completed and signed an Informed Consent form that can be found in Appendix I.

For the past five years, teachers at ABC Elementary have been receiving professional development in technology in a job embedded structure. A teacher-centered model of technology integration has been used. Over the past year, through direct observation and review of scheduling documents, it has been observed that ES teachers were gaining skill in using technology for personal and professional use, though student use has remained remarkably unchanged. ES students were then using the computer for drill and practice and to publish work using a word processor. For the current study, the professional development that the teachers at ABC Elementary School participated in was changed from a teacher-centered to a learner-centered approach.

Professional Development

The professional development scope and sequence was determined from the pretest survey (questions 70-75, & 105-106) and through informal assessments from prior professional development sessions. The survey provided immediate feedback from the ES teachers to the researcher that expressed ES teacher-reported technology needs. In identifying these needs, the ES teachers had a significant input on the scope of their professional development series. The survey also identified skills and pedagogical needs of the ES teachers. These skills and pedagogical needs were integrated into the professional development series using a learner-centered pedagogy. The survey indicated the teachers' areas of interest, which included personal technology use and an increased understanding of integration practices with their ES students.

The development of professional development sessions was created using the ADDIE model of instructional design (Dick & Carey, 1996). The design model was chosen due to its ease of use and the circular use of assessment throughout the process.

On a monthly basis, the researcher met with classroom ES teachers in grade-level groups. The groups participated in one small group session as well as individual sessions. The small group session was no larger than seven ES teachers and was approximately one hour in duration. Individual sessions were from 30 minutes to two hours. The small-group professional development sessions took place in either the computer lab or in the researcher's office using laptop computers during common planning time embedded in the ES teachers' work day. On three occasions, the professional development sessions were re-scheduled to a later date in the week due to ES teacher absences. The co-teaching and modeling sessions were conducted in the ES teacher's office area or in the participating ES teacher's classroom.

Group Sessions. The group sessions followed a professional development model that uses a learner-centered approach to achieve technology integrated learner-centered learning. A diagram of the professional development structure can be found in Appendix J and as a graphical framework in Appendix K. This model has at its center a small group session that contained the following steps: review of research, review of curricular objectives, review of software to meet those objectives, review of specific examples, collaborative planning to meet curricular objectives using a learner-centered method of delivering technology, and sharing of ideas created in small group session.

Current research on the learner-centered approach to teaching and learning, relevant to the monthly session, was delivered electronically to ES teachers at least a week prior to the professional development. The research was selected to connect learner-centered best practices with an area of interest that ES teachers reported in several survey questions.

Each small group session included a review of existing student curricular objectives that were taught to the K-5 ES students within two months. Identifying these student objectives allowed the ES teachers to identify curricular areas that benefit from the integration of technology. An electronic review of software was provided to ES teachers as a reference point to the actual use of the software.

An electronic review of the software or hardware was delivered using technology in a self-paced tutorial. The tutorial was used by the ES teachers to support their individual levels of technology skill. Curricular examples created by central office staff and the researcher using the technology were explored and reviewed. This provided examples of the software being directly integrated into the curriculum using computer technology.

Collaborative grouping was used in each group session to discuss the use of technology and how it could be integrated successfully into instruction for the upcoming month. ES teachers began planning lessons to facilitate direct technology instruction with a learner-centered approach to learning. At the end of each group session, ES teachers shared with their peers to how they planned to integrate technology into their curriculum, and any other ideas they discovered or created. The group sessions were designed to be the starting point of planning integrated lessons. At the end of the small group professional development sessions, ES teachers were encouraged to sign-up for any technology or developmental support that they needed for their lessons. Having the physical resources (i.e. computer lab, mobile lab, video projector) allocated to teams at the time of lesson creation encouraged the use of technology.

A learner-centered technology integration lesson-planning sheet was developed after input was received from ES teachers who attended the first month of planning. This planning sheet was made available for ES teachers to use in future small group collaborative sessions. ES teachers were encouraged to use their next planning period to complete the lesson planning for the lesson that they created during the small group session. Each ES teacher was provided a Compact Disk (CD) of the resources provided in the small group lesson at the time of the lesson. This CD provided a how-to multi-media presentation of the use of the specific technology that referred to the specific content in the group session, along with examples that integrated the software directly into the county's curriculum. Many of the lessons on the CD were developed by ES teachers in the county or central office staff, and were approved by the district's instructional technology facilitator. The CDs were created to supply procedural background on the use of the software and provide curricular models for the ES teachers to create new activities that were tailored to the needs of their students.

In this study, the researcher used a reflective process after each of the professional development sessions. After the completion of a small group session, the researcher purposefully reviewed the interactions of the group and the questions that were asked, and incorporated informal feedback from participating ES teachers. As similar small group lessons were delivered in kindergarten, grade one, and grade two, the researcher had the opportunity to refine small professional development sessions for future groups. For example, after working with grade one in using Kidspiration® to write sentences on a student-selected topic, the researcher was able to use information from that session to improve the small group session in grade two on using Kidspiration® to write complete sentences on a student-selected topic. Refining each lesson slightly, whether in the description of a topic or by providing analogies that were better suited for a particular grade level, allowed the researcher to use reflective practices in order to impact LCL.

Co-Teaching and Modeling. The individual professional development sessions were in the form of planning assistance, software assistance, co-teaching, and/or modeling. Planning assistance was provided to integrate a learner-centered approach to learning and specific curricular objectives, and to meeting the ISTE and National Educational Technology Standards (NETS, 2008) for teachers. Individually, ES teachers were encouraged to have the researcher work directly with them using a co-teaching model. Co-teaching allowed the ES teacher and researcher to plan and execute lesson(s) that best met the differentiated needs of the ES students, while also meeting specific curricular objectives.

Modeling technology integration in either a whole-group or small group approach was also available to classroom ES teachers. Allowing modeling to occur permitted the classroom ES teacher to step back from active teaching and concentrate on the principles of learner-centered instruction, while attending to meeting the objectives as planned. Modeling and co-teaching sessions were encouraged for all ES teachers. Both modeling and co-teaching involved scheduling the researcher.

Professional Development Content

The current status of the ES teacher's individual use of technology determined the type of individual session suggested. As an example, a ES teacher with a high-level of technology skill level was encouraged to individually meet with the researcher to plan long-term, performance-based or collaborative technology activities. A ES teacher with little technology skill was encouraged to allow the researcher to model lessons that integrated state voluntary curriculum and technology in a multiple day project. Professional development topics were selected by the ES teachers with input from the pretest survey. These topics were developed from content areas that were supported by a similar software program. Although ES teachers worked on different projects during the professional development series due to grade level objectives, the ES teachers all worked on the same software skills and curricular areas. An example would be that during a session of using Microsoft Excel®, primary ES teachers (grades PreK-2) collaboratively created a self-correcting worksheet on number sense, while intermediate ES teachers (grades 3-5) collaboratively created a self-correcting worksheet on the use of mathematical operators.

As a result of administering the pretest survey, the professional development series was focused on: using graphic organizers to effectively integrate writing and technology, using a variety of multi-media to present and organize information, using simulations to promote critical thinking, and using the Internet to link curricular objectives with technology. An example of the small group facilitation resulted in the teachers of ABC Elementary creating projects that allowed for active participation of the ES students in determining the content of Internet research, and multi-media group projects. This resulted in second grade students learning about the United States and self-selecting a state to report on to the class using self-selected method of sharing (ES students created a fact sheet or pamphlet using Microsoft Office ®), a Microsoft PowerPoint® presentation, or a framework using Kidspiration®. ES teachers participated in two small-group, modeling, and co-teaching professional development sessions for each of the above areas. Individual sessions were available before, during, and after the school day. These meetings were scheduled on a regularly scheduled day (for example, the first Tuesday of the month). All small group sessions took place during a regularly scheduled team meeting time embedded in the school day. ES teachers who missed their small group meeting due to absence were encouraged to meet with another team of similar grade level, or were able to participate in an after-school small group session. The researcher kept a log of group sessions and individual sessions. This log contained:

participatory data, the integration of teacher technology standards, and the integration of curricular objectives. The log can be found in Appendix L.

Each month, professional development was provided on the same topic to all teachers. Specific small group lessons were modified to meet the needs of grade level curriculum. As an example, while presenting on the use of graphic organizers, the researcher used the software Kidspiration® to demonstrate the use of a graphic organizer to improve informational writing with intermediate grade level children (grades 3-5), while using the same software to create complete sentences for primary grade level children (grades k-2).

Sample

There were 25 classroom teachers at ABC Elementary, which represented all of the survey respondents. All teachers that were assigned a homeroom at ABC Elementary School took the pretest and posttest survey. This excluded special education ES teachers, related arts (physical education, media, art, music) and Title I ES teachers. The survey data collected was used for the current study, but also was used as a needs assessment to direct ES teachers' professional development for the 2006 - 2007 school year. Twenty-five ES teachers participated in the pretest survey. The survey asked ES teachers to respond with last year's ES students in mind. The average age of the ES teachers completing the survey was 36.92 years, the average years at ABC Elementary was 7.11, and the average total teaching experience was 10.42 at the posttest date.

Pilot

The purpose of the pilot survey was to condense the number of survey questions, improve the survey wording and enhance validity. When it was administered in May 2006,the survey was given as a pilot to four teachers who were not homeroom teachers at ABC Elementary and not part of the final research study. Two teachers who worked at ABC Elementary (who did not have a homeroom class) and two teachers who worked within the county (outside of ABC Elementary) were selected. The four ES teachers that reviewed the survey completed a feedback form (Appendix M). Feedback was provided by these ES teachers regarding the number of questions and a few individual concerns about the focus of a specific question. The researcher reviewed the comments and changed the wording of questions that were confusing to the pilot group. Questions that arose on two or more feedback forms were removed. Initially 156 questions were included in the survey. Forty-six questions were removed based on feedback from the comments of the four pilot respondents.

Additionally four expert reviewers (not the peer reviewers listed above) also completed the survey and submitted feedback orally and in writing, resulting in a reduction of the survey's questions to 104. The experts were employed by XYZ County, were university-level faculty, and each have at least ten years of technology integration experience. Expert reviewers suggested the addition of six additional questions, which brought the final question count to 110. A list of the survey reviewers and experts can be found as Appendix N.

Survey Instrument

The pretest/posttest survey included 110 questions. The pretest/posttest survey addresses the research questions. The topics of technology integration, ES teacher skill level, direct instruction, and ES teacher pedagogy are embedded throughout the survey, while standard demographic information can be found on the first page. In Appendix D, a question breakdown that identifies each question from the survey and the central question it relates to can be found. This breakdown indicates which of the composite central questions each survey question is categorized under. The survey was adapted from eight surveys created by: Asan (2003), Bebell (2005), Boston College (2005), Denton, Davis, Strader & Durbin (2003), EdTech Profile (2005), Ravitz & Mergendoller (2002), Sun Associates (2006), and a Towson University technology integration skills student survey (2006). Appendix F indicates which questions were used from each of the authors. In general, the questions that were used from each of the surveys did not represent a large portion of any of the referenced work. Questions regarding technology integration and teaching philosophy are both positively and negatively stated (a seven-point Likert-type scale is used for many of the questions).

Surveys commissioned from the states of Texas, California, and Massachusetts were used, as well as from Boston College and Towson University, to complete the survey for the current study. The largest number of questions that was taken from any one survey was twenty-one from the UseIt® survey as reported by Bebell (2004). The use of these twenty-one survey items represented less than thirteen percent of the total UseIt® survey.

Reliability

For the current study, a Cronbach alpha was calculated for the THSS, TUI, and pedagogical practices composite questions. A Cronbach alpha of .79 was calculated for the THSS composite question. The THSS composite was created from five survey items. A Cronbach alpha of .79 was calculated for the TUI composite question. The TUI composite was created from ten survey items. A Cronbach alpha of .87 was found for the pedagogy survey composite question. The pedagogy survey question contained 38 survey items.

Limitations and Assumptions

Limitations of this study are that the findings are not generalizable to ES teachers across the country or within the state of Maryland. Findings may be generalizable to Title I schools (as ABC Elementary is a Title I participating school) in the same school district. A ES teacher's lack of attendance or participation on professional development days may also limit the findings of the study.

First order barriers that are external in nature, and second order barriers that are internal or personal, may have impacted this study (Ertmer, 1999). Assumptions of the study were that the staff remained the same, no new first or second level barriers impede the ES teachers' completion of the professional development series, and that the school improvement team did not change the school-wide professional development focus from reading, mathematics, and technology. First order barriers that were noted within this study include: the removal of old laptops and the delivery of new laptops for ES teachers, technology skill level differences, and availability of technological resources (availability of equipment). Second order barriers that were found within this study were: a change in pedagogical thinking, a change in pedagogical practice, and time to explore the benefits of these changes.

From a philosophical viewpoint, the assumption that a learner-centered approach to teaching can be increased by the use of technology can be a limitation to this study. In literature on pedagogy and technology, Riel and Becker (2002) discuss the uses of technology in a learner-centered capacity as tools that can become integral parts of meeting the needs of curriculum. A learner-centered approach to technology integration shifts the role of teachers from the gatekeepers of technology (Cuban, 1993) toward facilitators. This shift is at the center of the data that was collected.

Data Collection and Analysis Plan

Two types of data were collected in the current study. Primary data was collected through a 110 question survey. This survey data was collected in a pretest/posttest manner. This was used to identify if significant changes in: the time that ES teachers' used technology with their ES students, ES teachers' technology skill level, direct instruction with technology, and change of pedagogical practices that occurred after the treatment period. A set of twenty-five classroom teachers at ABC Elementary completed both pretest and posttest surveys. This represented 100% of the homeroom ES teachers. Pretest and posttest surveys were compared using a two-tailed *t* test between the demographic sub-questions and the composite score. *T* tests were employed for comparing pretest and posttest survey questions. A composite variable is defined as combining several related survey items together that use a common scale to obtain a composite score.

Computer Lab Usage Data. As a secondary source of data, Computer Lab Usage (CLU) data was collected. A CLU entry was required for anyone wanting to use the mobile or stationary computer lab at ABC Elementary. In this school, each of these computer labs consists of 30 state-of-the-art multi-media computers. Classroom ES teachers, resource ES teachers, and all other staff members are required to physically sign in with a log book to register for CLUs. ES teachers signed for blocks of time that range from 25 minutes to more than two hours. ES teachers were responsible for signing out either of the computer labs as needed within their teaching practices. All ES teachers were allowed equal access to the computer labs without regard to grade level, curricular areas, or previous use. A first-come, first-served basis was used when reserving the computer lab. When two ES teachers requested the computer lab at the same time, the researcher was able to mediate conflicts. CLU data was collected and categorized by grade level, subject level, and duration of the term of use. As an indicator of CLU, data was collected from September through April for both of the school years.

The CLU data were collected in two binders from the two school years. Data were compared using *t* tests in SPSS to determine if the entries from the 2005 - 2006 school year and the entries from the 2006 - 2007 school year indicated any significant increase. Actual hours spent using the computer labs were also compared. Appendix C shows an example of the data collected for CLU use. During the 2006 - 2007, school year ABC Elementary began a new computer program to increase mathematics fact retention. Since this program was not implemented or apparent in 2005 - 2006, data for this program was collected and coded separately. The CLU

Fastt Math® (FM) data was noted, but not used in the current study. The use of Fastt Math® reduced access for ES teachers to use the computer lab. Careful consideration in scheduling by the researcher was made to decrease the impact of Fastt Math® computer usage to allow for optimum availability. CLU data was used in conjunction with survey data to determine if technology integration with ES students increased.

Survey Data. Survey data was collected and entered into the statistical software program SPSS. Survey data was completed in a paper-based manner and then manually entered by the researcher. A series of statistical tests was preformed, comparing the pretest and the posttest. These tests included several paired *t* tests to determine if the pretest and posttest results were statistically different. Three surveys had an entire page left blank on the posttest. The researcher was able to have participants (after the survey was scored) complete the omitted page. Statistics were processed before the new information was added and then after the information was added showed no change in significance.

The first set of questions relate to Technology Hardware and Software Skills and are referred to as THSS, while the second set of questions relate to ES teacher Use for Instruction and are referred to as TUI. Individual survey questions, such as using a computer to deliver instruction, creating research activities, and the use of computers to help deliver instruction were used to create a composite TUI score in order to better understand how the ES teacher uses their existing technology skills in instruction. A composite score for both THSS and TUI indicated if a significant difference was measured using *t* tests. THSS questions required ES teachers to self-assess their technology skills. Individual survey questions, such as using a word processor, a digital camera, and the use of multi-media software were used to indicate a composite score for each ES teacher. These sets of questions were based on a scale of one to ten. Questions from the THSS required ES teachers to answer in a scaled-type response, which, in a six-category response, ranged from “daily” to “never”. Significant individual survey question *t* test results are also reported.

Along with CLU data, survey pretest and posttest data were compared using paired *t* tests to determine if a learner-centered series of technology professional development sessions for ES teachers is associated with increases in technology integration with their ES students. Survey questions were used to create a composite score. This composite was compared pretest to posttest to determine if there was a significant change in technology use and integration. Survey items that measure pretest/posttest use of technology were grouped by subject, and by minutes per average week. ES teachers self-reported in the survey the actual number of minutes that they used technology in reading/language arts, mathematics, social studies, science, and other curricular areas for an average week. As an example of use, ES teachers self-reported the number of hours that they used the program Inspiration® to help ES students organize their writing. ES teachers self-reported this CLU data, which was evaluated by reviewing the number of entries and number of actual hours from the 2005 - 2006 and the 2006 - 2007 school year during the September through April time period. Significant individual *t* test results from the survey were reported.

Using the survey data, three demographic sub questions were evaluated through comparing the composite to a demographic sub-group for further study of ES teachers' technology integration with their ES students. The first demographic sub question grouped ES teachers based on their grade level taught. Primary (PreK-Grade 2) and Intermediate (Grade 3-Grade 5) designations were used as XYZ County uses these designations throughout the curriculum.

The second demographic sub question grouped ES teachers based on their years of teaching. A decision was made to divide the grade levels to provide for three evenly populated groups. Experience from zero through two years, three through ten years, and eleven plus years were used to designate as years of teaching. The third demographic sub question grouped ES teachers on their self-reported technology skill level. A decision was made to divide the groups to provide for two evenly populated groups. Two self-reported levels were considered. A 3.00 to 4.99 (low) and 5.00 through 7 (high) skill level designations were used.

Pretest and posttest data were also compared using paired *t* tests to determine if a learner-centered learning environment for ES teachers is related to a change in their technology skill level. Composite grouping and individual questions were used to determine if there was a significant change in ES teacher technology skill from the pretest to posttest data. Within the TUI and THSS questions, some individual questions are more important to the researcher in determining the overall technology skill level. These items include: multi-media computer use, the use of a digital camera, delivering instruction through the use of technology, differentiating instruction with technology, using technology to better understand concepts, and using technology in the assessments of ES students. These six individual results will be reviewed and reported.

Items of importance. At the time of the current study, XYC County was focusing on using technology to differentiate assessment. Several county initiatives were being put forth to increase the use of multi-media by purchasing equipment such as digital cameras. These cameras were purchased to increase the student use of multi-media technologies. Assessment of ES students using technology was also a county initiative due to the introduction of online science high stakes state testing.

Pretest and posttest data were compared using *t* tests to determine if a learner-centered learning environment for ES teachers is related to a change in direct instruction with technology. The survey data compared pretest and posttest data of actual self-reported average minutes per week using technology. Direct instruction is an instructional term that is widely used in XYZ County to describe instruction that is delivered to the students. Examples of direct instruction include: using the Internet for research, creating multi-media projects to meet curricular objectives, and creating writing organizers. Examples of indirect instruction (or reinforcement of instruction) include: math fact practice, typing programs, typing a final draft, and edutainment games. Direct questions were used to compare pretest and posttest levels of direct instruction in ES teacher-reported average minutes per week in curricular areas. Significant individual survey question *t* test results are reported. Indirect instruction and direct instruction were used in the current study to determine if a learner-centered professional development program is associated with a change in direct instruction using technology.

Using the survey data, pretest and posttest surveys were compared using a two-tailed *t* test between the demographic sub-questions and the composite score for further study of direct instruction with technology. The first demographic sub question grouped ES teachers based on their grade level taught. Primary (PreK-Grade 2) and Intermediate (Grade 3-Grade 5) designations were used as XYZ County uses these designations throughout the curriculum.

The second demographic sub question grouped ES teachers based on their years of teaching. A decision was made to divide the groups to provide for three evenly populated groups. Experience from zero through two years, three through ten years, and eleven plus years were used to designated as years of teaching. The third demographic sub question grouped ES teachers on their self-reported technology skill level. A decision was made to divide the groups to provide for two evenly populated groups. Two self-reported levels were considered. A 3.00 to 4.99 (low) and 5.00 through 7 (high) skill level designations were used.

Pretest and posttest data was compared using *t* tests to determine if a change of ES teacher pedagogy has occurred. Survey questions were combined to create a composite score for evaluation. The questions combined to evaluate this question were taken from the EdTech Profile in California, the Texas Public School Technology Survey, the Boston College Study of Educational Technology, and the Idaho Professional Development Survey. These sets of questions are based on a seven-point scale. A chart of the central questions and the relevant survey questions can be found as Appendix O. Significant individual survey question *t* test results are also reported in the results chapter of this study.

Within the pedagogy composite question, some individual questions are more important to the researcher in determining the overall pedagogical practices. These items include: computer use and student research, computer use and its importance in teaching, and a change in the way instruction is delivered. These three individual results will be reviewed and reported.

After the survey data was imported to SPSS, demographic data was generated from fifteen questions. A breakdown of all of the questions and their testing categories is located in Appendix D.

Summary

The methodology of the current study encompasses the: research design, variables of the central questions, research variables, research settings, professional development plan, sample of participants, pilot of the survey, research questions, survey, and data collection and analysis. Using a pretest/posttest as a tool for determining relationships between these areas allowed the researcher to determine if there was a statistically significant difference between the use of a learner-centered learning environment for professional development and: an increase in technology integration, ES teacher skill level, direct instruction using technology, and a change of ES teacher pedagogy.

CHAPTER IV. RESULTS

The purpose of this study was to determine if there was a relationship between learner-centered professional development and the use of technology with ES students at ABC Elementary. The first three chapters presented the context of a learner-centered professional development learning environment, the literature pertaining to the theoretical base of information, and a description of the methodology used in this study. In this chapter, the results of the data analysis are reported. An overview of the research questions and the data related to each question is presented, followed by specific details of the results of the study outcomes.

Data Sources

Data was collected using two separate methods, a pretest/posttest survey and CLU data. As primary data, a pretest/posttest survey instrument was used to identify if, after the treatment period, significant changes occurred in: time that ES teachers used technology with their ES students, ES teachers' technology skill levels, and direct instruction with technology. A set of 25 classroom ES teachers at ABC Elementary participated in both pretest and posttest surveys. This represents 100% of the homeroom ES teachers. Data were evaluated using two-tailed *t* tests comparing composite results from pretest and posttest survey questions. For sub-questions, two-tailed *t* test between the demographic data and the composite score were used.

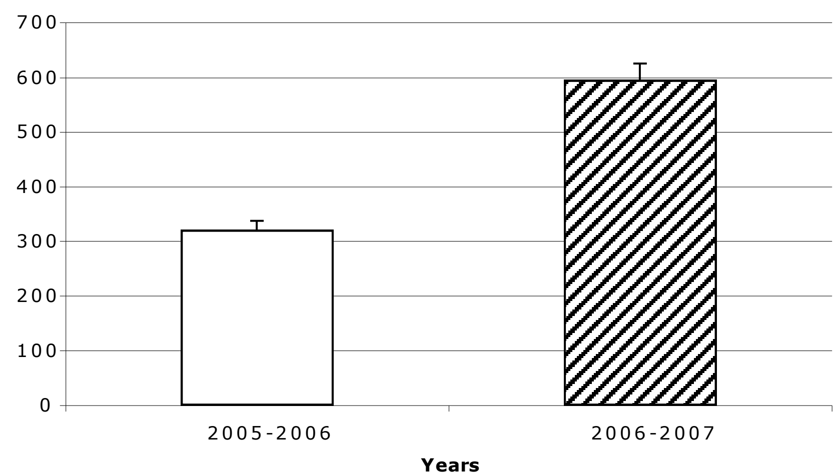
Survey Data. The primary set of data consists of pretest and posttest survey results from homeroom ES teachers at ABC Elementary. As part of this quasi-experimental study, survey data was collected from a 110-question survey (see Appendix H) compiled from surveys used mainly in large-scale research projects (see Appendix F). The eight survey instruments that were used to create the current study survey used different response metrics. Each of these eight survey instruments employed: Likert scales, other numeric scales of usage, and skill gradations. After organizing all of the data, 99 survey questions were used in further analysis. One multi-part question was used in determining needs of future professional development for the ES teachers, while the remaining questions were related to the subject's demographics (e.g. age, years of teaching).

Of the 99 questions, individual *t* tests (2-tailed) were run and fifteen of those returned significant results at the .05 significance level. Although various scales were employed within the survey, results from pretest to posttest indicated an increase in means in each of the 99 questions, indicating growth was found. Survey questions were used in a composite index only if they used a similarly calibrated scale. Six individual *t* test results were described as being of high importance to the researcher in the survey composites of technology skill level.

In reviewing the survey items that were assigned to each of the four central questions (see Appendix D), individual survey items that had significant results were found in each of the four central questions. A review of all of the four composite questions indicated statistically significant results for central questions one, two, and three.

CLU Data. Student Computer Lab Use (CLU) data was used as a secondary source of data; this data represented the computer labs use at ABC Elementary. CLU data was collected for the 2005 - 2006 and 2006-2007 school years and was compared to determine if the amount of time that technology was used changed. This CLU data represented entries for the 2005 - 2006 period, and an increased number of entries for the 2006 - 2007 school year. An increase in over 200 hours from 2005 - 2006 to 2006 - 2007 was noted (see figure 1). Data from a new computer-based mathematics program that began in the 2006 - 2007school year was not included in the above calculation.

Figure 1: CLU Data, Q1, Hours of Use, 2005-2006 an 2006-2007



Increasing Technology Integration with ES students

The first research question investigated the effect of learner-centered professional development on technology integration with ES students. This question was answered by examining data from CLU's and by examining five questions (see

Attachment B for specific question numbers) to create a composite question from the survey. The CLU data was examined by compiling the number of entries and the hours actually spent integrating technology and the curriculum for 2005 - 2006 to 2006 - 2007 (Table 1). The analysis of the number of hours yielded a significant difference result *t*(218)=2.00;p=.046 with a pretest mean of .91 and a posttest mean of 2.30. Total number of student hours for the 2005 - 2006 school year, for the September 1 through April 1 time period, was 321.5 hours, while the number of hours for the same time period for the 2006 - 2007 school year was 596.09. The Fastt Math program, which was not included as a part of this study, during the 2006 - 2007 school year added an additional 53.10 hours.

Table 1: CLU Data, Q1, ES Teacher Technology Integration with ES students

September 1 – April 1	Mean Number of Hours per week	Standard Deviation	Standard Error Mean	T	Significance
2005 - 2006	.91	6.71	.45	2.00	.046
2006 - 2007	2.30	16.93	1.14		

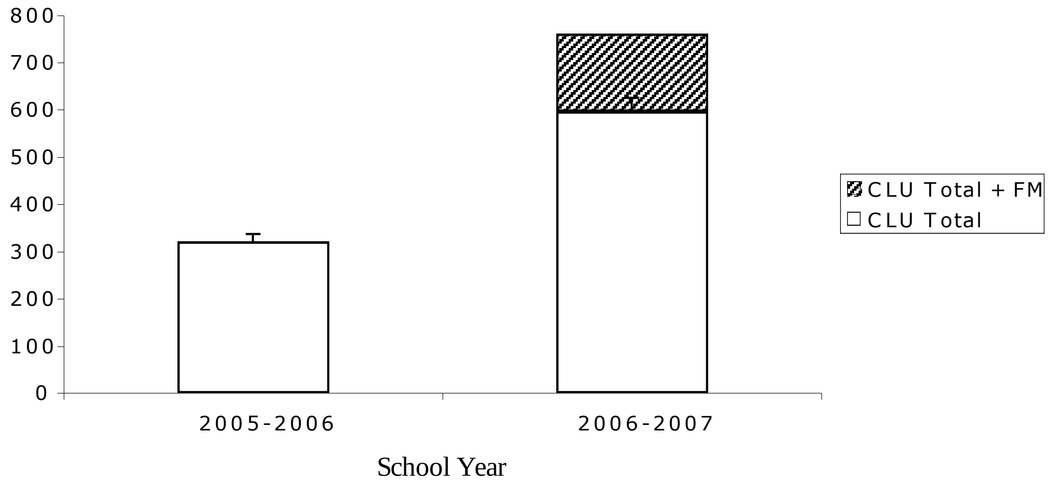
Survey Data. Pretest and posttest data from the ES teacher survey was analyzed using paired samples *t* tests. Multiple *t* tests were preformed on pre and posttest surveys to indicate if there was a change in technology use and integration. Five survey questions, which were combined as a composite variable that measures ES teacher technology integration with ES students, were evaluated. Results for the composite variable were significant *t*(16)=-3.17;p=.006. ES teachers reported a positive change (Figure 1) in technology integration with ES students that increased from a pretest mean of 9.48 to a posttest mean of 21.46 (Table 2).

Table 2: Survey Results, Q1, ES Teacher Technology with ES students.

Technology Integration - Survey	Mean Hours per Week	Standard Deviation	Standard Error Mean	*T*	Significance
Composite Pretest	9.49	8.84	2.15	3.17	.006
Composite Posttest	21.47	15.13	3.67		

Computer Lab Usage. CLU's for 2005 - 2006 school year indicated a combined overall use of the computer labs at ABC Elementary School of 321.5 hours. This increased to 569.09 hours the subsequent year 2006 - 2007 school year. During the 2006 - 2007 school year, a new mathematics computer program for ES students in grades 3-5 began. This program used the computer lab during mathematics instructional time to increase math fact retention. Fastt Math® (Fluency and Automaticity through Systematic Teaching with Technology) was used at ABC Elementary and the data has been shown separately in figure 2. On a related note, the available time for computer use during the 2006 - 2007 school year during the mathematics instructional time was reduced due to the implementation of Fastt Math®.

Figure 3:CLU Data, Q1, Hours of Use Š Including Fastt MathØ



CLU's were categorized into curricular areas to determine if there was a change in hours between the 2005 - 2006 and 2006 - 2007 school years. A 85.41% increase was found in total for all curricular areas (Table 3). In Language Arts (LA) and Reading the number of hours of use increased by 28.07%. In Mathematics a positive change of 1.14% was found. Social Studies and Science were generally taught at the same time in many grades, but alternated by weeks. This resulted in the researcher grouping together data for social studies and science. Social Studies and Science increased 709.11% from the 2005 - 2006 to the 2006 - 2007 school year. Other content use increased 155.20%. After reviewing the CLU data, mathematics classes were used almost continuously during mathematics time, thus creating a ceiling effect of potential usage. Combining the new Fastt Math® program with the existing 2006 - 2007 mathematics data indicated an overall increase of 116.70%.

Table 3: CLU Data, Q1, by Curricular Subject Area in Hours.

	2005 - 2006	2006 - 2007	2006 - 2007 with Fastt Math
LA/Reading	76.6	98.1	
Mathematics	143.36	145.0	310.66
Social Studies / Science	12.07	97.66	
Inter-Disciplinary	89.47	228.33	
Total	321.5	596.09	761.75

Data from the survey identified the largest positive change in teacher-reported time used on a weekly basis in the areas of LA/Reading and Mathematics. While reading hours increased with a positive change of 81%, language arts provided a 70% increase, and mathematics revealed a positive change of 74%. The CLU data indicated a 46% increase in technology use time, while the self-reported survey data indicated a 56% increase in technology use in hours. When collecting CLU data, a September through April timeframe was used. The first research question is followed by these related sub-questions: Are there differences based on: grade level taught, years of teaching, or ES teachers' technology skill level? All grade level ES teachers had equal access to the computer labs.

Demographic Data. Question one included three demographic sub-questions. This study investigated: Are there differences in technology integration based on ES teachers' grade level? Due to a limited sample size data were categorized into two levels: primary and intermediate. Primary grade levels include grades PreK-2, and intermediate grade levels include grades 3-5. No statistically significant differences were found (see Appendix P).

The second sub-question included demographic information regarding years of teaching at ABC Elementary. The sample was re-configured into three specific groups (0-2, 3-10, 11+) based on years of teaching. After teaching experience data were regrouped, no significant difference was found among the three categories (see Appendix P).

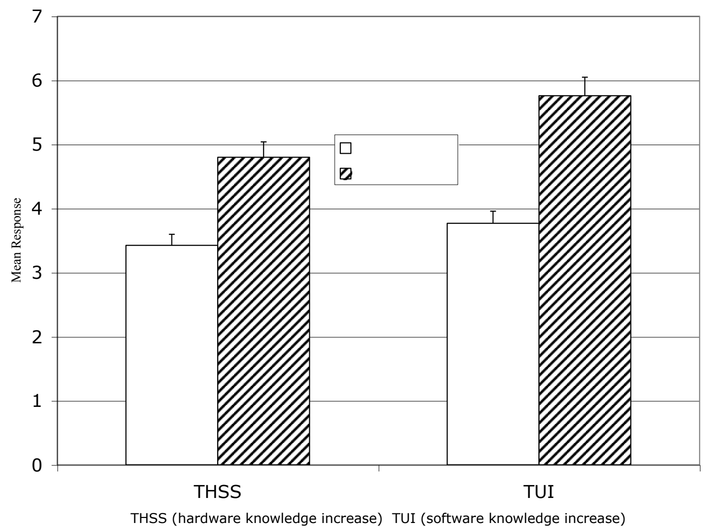
The third sub-question included demographic information regarding ES teacher-reported technology skill level. The sample was re-configured into two specific groups, low and high (A self reported score of 3 to 4.99 and 5 to 7) technology skill levels. After ES teacher technology skill level data were regrouped, no significant difference was found between the two categories (see Appendix P).

Learner-Centered Environment and Teacher Skills and Usage

In evaluating question two, "Does a learner-centered learning environment for ES teachers increase their technology skill level," two sets of survey questions were used. The questions from the survey were divided into two groups due to item content and a difference in survey scales. Questions regarding Technology Hardware and Software Skills (THSS) were used to create one set of composite variables, while the second composite set was combined to include questions regarding Teacher Usage for Instruction (TUI).

Pretest and posttest data from the teacher survey was analyzed using paired samples *t* tests. Both TUI and THSS composites indicated a significance differences (see figure 3).

Figure 3: Survey Data, Q2, Composite THSS and Composite TUI Skill Level (Mean Response, n=25)



The THSS composite results indicated a significance difference *t*(24)=3.29;p=.003 when comparing a pretest mean of 4.8 to a posttest mean of 5.76. The TUI composite results showed a significant difference *t*(24)=2.65;p=.014 between a pretest mean of 3.42 and a posttest mean of 3.77 (see table 4 for more information).

Table 4 : Survey Results, Q2, THSS & TUI Data for Technology Skill Level

	Mean	Standard Deviation	Standard Error Mean	t	Significance
THSS - Composite Pretest	4.8	1.80	.36		
THSS - Composite Posttest	5.77	1.84	.37	2.65	.003
TUI - Composite Pretest	3.43	.67	.13	3.29	.014
TUI – Composite Posttest	3.77	.67	.13		

Two separate composites of survey questions were employed to determine if there was an increase in ES teachers' technology skill and usage levels (THSS and TUI) from prettest to posttest. Each of these composites contained individual items that have a high level of interest to the researcher and to the administrators in XYZ County. Within the THSS composite, four individual questions out of ten returned statically significant responses. In the TUI set of questions, two individual questions (of six) returned statistically significant results. This, based on the totals of all TUI and THSS questions, six individual statistically significant results were found regarding technology, including: delivery, differentiating, use, assessment, digital cameras, and multi-media. This indicates that 38% of the items that are of importance to the researcher and XYZ County regarding teacher technology skill level yielded significant results. A full reporting can be found as Appendix Q.

Items of Importance: Teacher Usage for Instruction (TUI). Within the data, there were several items that were important to the researcher. In the TUI composite, a significance was found in using a computer and digital cameras. This was based on a pretest mean of 5.64 and a posttest mean of 6.40, with a significance of $t(24)=2.35; p=.027$. This is an incidental finding as digital cameras were available, but were not used during the professional development sessions. A TUI survey question, which compared ES teacher use to the creation of a multi-media product, showed a pretest mean of 5.56 and a posttest mean of 7.28 with a significance of $t(24)=3.80; p=.001$. An incidental finding is noted that during the 24 hours of professional development, digital cameras were available, but were not used.

Items of Importance: Technology Hardware and Software Skills. (THSS). A question from the THSS data, how often do you use a computer to deliver instruction to your class, showed a pretest mean of 3.83 and a posttest mean of 4.13 with a significance of $t(23)=2.60; p=.016$. A THSS question, how often do you adapt an activity to ES students' individual needs using computers, indicated a pretest mean of 3.75 and a posttest mean of 4.33 with a significance of $t(23)=2.17; p=.040$. A question, how often do you use a computer to help ES students better understand a concept, showed a pretest mean of 3.68 and a posttest mean of 4.44 with a significance of $t(24)=3.26; p=.003$. Another significant result in the THSS data, how often do you assess ES students using a computer, indicated a pretest mean of 2.04 and a posttest mean of 3.04 with a significance of $t(24)=3.16; p=.004$.

The data from both the TUI and THSS composite survey questions indicated (three) statistically significant results. No data from Computer Lab Usage (CLU) was used to answer the research question regarding ES teacher technology skill. The statistically significant results in the areas of assessment, adapting lessons, and developing a strong understanding of curricular objectives, are all items that have been in ongoing embedded professional development sessions in accordance with the strategies of XYZ County's current initiatives.

Learner-Centered Learning Environment and Direct Instruction

The third research question was: Does a learner-centered learning environment for ES teachers increase direct instruction with technology? The question was answered by examining data from six questions from the pretest and posttest surveys. The question required ES teachers to categorize the time that they spent with their ES students while using technology into two types of instruction. The first type of computer use was in a direct instructional approach. Direct instruction has been a term used by XYZ County over the past five years to describe instruction that meets curricular objectives in an active manner. An example of the use of direct instruction in language arts includes the software Kidspiration® and would include using the software for students in second grade to learn how to expand sentences. Indirect or reinforcement of instruction is the second category. This category includes repetitive activities that re-teach objectives that have been previously introduced and taught (drill and practice).

Survey Data. ES teachers responded to survey items that compared means (in minutes/week) of direct and indirect instruction in the curricular areas of: reading/language arts, social studies, science, and mathematics (see Appendix R). In the curricular areas of reading/language arts, social studies, science, and mathematics, an increase in use between the pretest and the posttest was noted.

Questions from the survey regarding instructional and non-instructional time spent using technology were combined and evaluated, yielding in a pretest mean of 8.99 to a posttest mean of 13.42, resulting in a significance of $t(17)=2.31; p=.034$ (Table 5).

Table 5: Survey Results, Q3, Direct Instruction, Pretest to Posttest

	Mean of Direct Instruction per week	Standard Deviation	Standard Error Mean	T	Significance
Direct Instruction – Composite Pretest	9.213	12.457	2.936	2.31	.034
Direct Instruction – Composite Posttest	17.472	20.327	4.791		

The current study question number three contains the following related sub-questions: to what extent does direct instruction change based on: grade level taught, years of teaching, or teacher's technology skill?

Figure 5: Survey Data, Q3, Mean of Composite of Direct Instruction

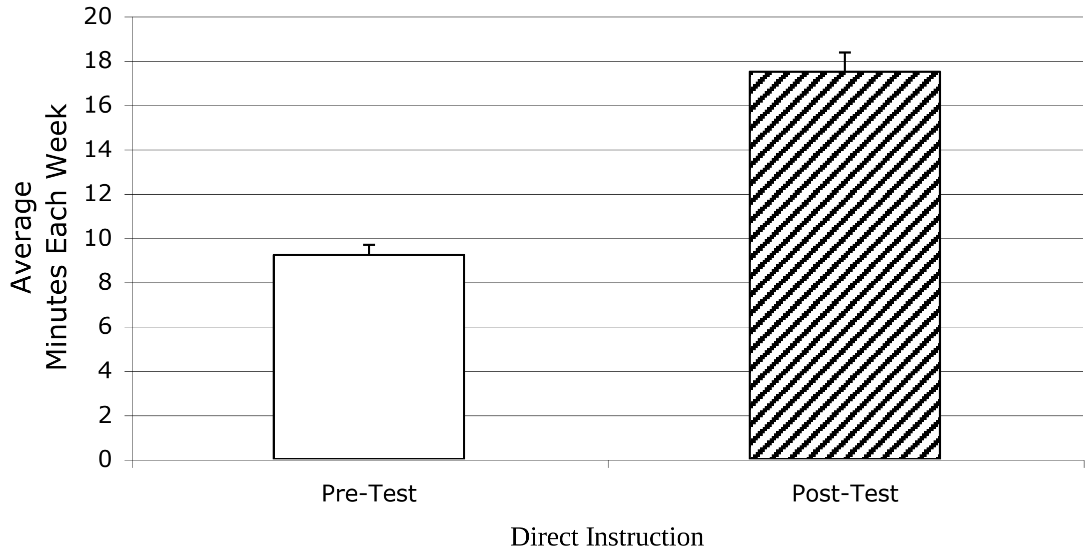


Figure 4 – Mean response of ES Teacher Survey (n=18) for pretest and posttest.

Demographic Implications. To determine if direct instruction increased after treatment, three demographic sub-questions were also reviewed. This study investigated: teacher grade level (primary and intermediate), teacher years of experience (three categories), and technology skill level (low and high). Primary grade levels include grades PreK-2 and intermediate grade levels include grades 3-5. Pretest and posttest surveys were compared using a two-tailed *t* test between the demographic sub-questions and the composite score. No significance was found (see Appendix R). This means that there is no relationship between grade level taught and technology skill level.

The second sub-question included demographic information regarding years of teaching at ABC Elementary. The sample was re-configured into three specific groups. After data were regrouped into three categories, no significant difference was found (see Appendix R). This means that no relationship between years of teaching at ABC Elementary and technology skill level were found.

The third sub-question included demographic information regarding ES teacher-reported technology skill level. The sample was re-configured into two specific groups (low and high). No significant difference was found for the low skill level (see Appendix R). A significant difference ($t(13)=2.47; p=.028$) was noted for ES teachers who self-assessed their technology with a high level of skill (See Appendix R) . This means that there was no relationship for teachers with a low technology skill levels and the amount of time that direct instruction was employed, but there was a positive relationship for teachers with high skill levels and the amount of time that direct instruction was used.

Learner-Centered Environment and Teacher Skills and Usage

During the 2006 - 2007 school year, the researcher changed pedagogical practices of technology professional development from teacher-centered to learner-centered. Pretest and posttest data from the ES teacher survey was compared using paired samples *t* tests. Pedagogical change in practices composite question showed a pretest mean of 5.27 to a posttest mean of 5.34; results were not significant ($t(24)=1.00; p=.326$). Table 6 provides specific results.

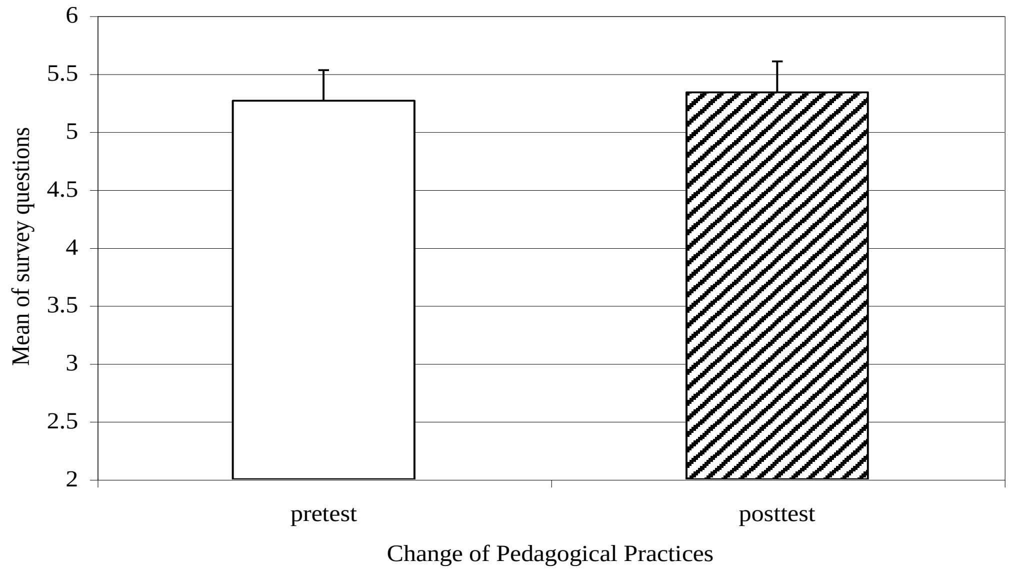
Table 6: Survey Data, Q4, Change of Pedagogical Practices

Pedagogical Practices (n=25)	Mean	Standard Deviation	Standard Error Mean	*T*	Significance
Composite Pretest	5.27	.46	.09	1.00	.326
Composite Posttest	5.34	.45	.09		

Survey Data. Survey questions were employed to create a composite that indicated changes in pedagogical practices (Figure 5). Of those survey questions, four returned statistically significant responses using *t* tests out of 35 individual survey questions.

Items of importance: Pedagogical practices. Statistically significant results were found in three areas: computer use and student research $t(24)=-2.22;p=.036$, computer use and its importance in teaching $t(23)=-2.83;p=.009$, and a change in the way instruction is delivered $t(24)=-2.68;p-.013$ (see Appendix Q). These individual results were of higher interest to the researcher.

Figure 6: Mean of Composite, Pedagogicasl Practices, n=25



Conclusion

After reviewing the survey results and CLU, the data indicates that a learner-centered series of technology professional development sessions at ABC Elementary was related to changing pedagogical practices. This result indicates an increase in: the time that ES teachers used technology with their ES students, ES teachers' technology skill levels, and direct instruction with technology. The data does not indicate that a learner-centered professional development series at ABC Elementary changed teachers' pedagogical practices in the curriculum.

CHAPTER V. DISCUSSION

The discussion chapter of this study is divided into four sections. The first section contains a summary of the results of the four research questions and ties external research to the findings. The second section reviews the limitations of the research. Section three includes implications and recommendations for the current study for researchers, and for future professional development. Section four brings the research to a conclusion.

Summary of the Results

Recent research indicates that professional development in technology that models learner-centered instructional practices increases teachers' use of technology with their students (Joyce & Showers, 1995; Matzen & Edmunds, 2007; and Pierson, 2001). Technology use not only increases, but as the teachers are more comfortable using technology, they tend to use it in more learner-centered means.

A study from Matzen and Edmunds (2007) indicated similar results to the first research question: Does a learner-centered series of professional development sessions for ES teachers increase technology integration with their ES students. Their 2007 survey was similar to the current study in that questions related to integration, technical skills, instructional use of computers, and general instructional practices were studied. The Matzen and Edmunds (2007) quasi-experimental, time-series research study indicated a significant positive change from pretest to posttest survey results. They surveyed over 148 paired subjects' pretest to posttest responses, and a positive overall significance was found in the time that teachers used technology with students, teachers' technology skill levels, and change of pedagogical practices.

The demographic sub-questions for the current study revealed that although there was a statistically significant change in technology integration with ES students, the grade level, years of teaching, and self-reported skill level of ES teachers was not a significant factor. All ES teachers at all grade levels were included in the professional development regardless of their years of teaching. Individual follow-up sessions were conducted from each professional development small group setting (from five to six ES teachers) that allowed the staff to improve their use of technology with their ES students. These sessions apparently indicated a positive increase for all groups in the school and this positive increase was not limited to specific sub-groups based on grade, or experience of ES teachers.

During the follow-up professional development sessions, a majority of the sessions included modeling of the strategies created in the small group professional development meeting. Glazer, Hannafin, and Song (2005) describe the importance of modeling, collaborating, and coaching in technology integration as it is "progressively infused as peer-teachers learn to design technology rich lessons" (p. 57).

Modeling technology integration with teachers is an effective way to have teachers integrate technology in a student-centered capacity. According to Glazer, Hannafin, and Song (2005), the results from their research parallel the findings of this study. Modeling a learner-centered environment in technology increases technology integration with students. Modeling technology was also found in the Matzen and Edmunds (2007) professional development research, and provided similar results as the Glazer, Hannafin, and Song (2005) research. This modeling process, over a long period of time, eventually leads to an increase of learner-centered practices (Matzen & Edmunds, 2007).

For the second question: Does a learner-centered series of technology professional development sessions for teachers increase their technology skill level, recent research supports this relationship (Brinkerhoff, 2006; Glazer, Hannafin and Song, 2005; and Matzen and Edmunds, 2007). This current study indicates statistically significant results in teachers' technology skill and learner-centered learning.

In Brinkerhoff's (2006) research, a significant increase in technology professional development program also indicated teacher's self-assessment of their technology skills. Results from Brinkerhoff's research (n=12) indicated that participants: self reported an increase in their technology skills, became less fearful of technology, and felt that the professional development migrated their general teaching pedagogy towards a more learner-centered approach. The long-term (120 hours) professional development plan (two year technology academy) deviated from the previous years "sit-and-get training sessions" (Brinkerhoff, 2006, p.26) that had been previously used with little to no support after the training. The change from teacher-centered professional development towards learner-centered activities in the Brinkerhoff research is parallel to the change in the current study.

Glazer, Hannafin, and Song (2005) address professional development that is within the context of their teaching, this professional development contains practice, reflection and integration into their daily teaching practices as an effective approach to increase technology integration (2005). Similar to the current study, in Matzen and Edmund's (2007) research the use of a learner-centered professional development learning environment with technology indicated an increase in the teacher's technology skill level. In the Glazer et al. study the comparison of a pretest to posttest self-assessed technology skill level indicated a positive and significant change.

Studies indicate that a learner-centered environment can significantly change the technology skill level in teachers (Matzen & Edmunds, 2007; Mills & Tincher, 2003; Mouza, 2002). Professional development that was conducted prior to the current study at ABC Elementary School in a teacher-centered environment was not the most effective way of transmitting information to the staff. Mouza (2002) related that the traditional teacher-centered professional development sessions, without planned follow up is an ineffective way to increase technology skill level and integration habits for teachers.

The third research question: Does a learner-centered series of technology professional development sessions for ES teachers increase direct instruction with technology, indicated a significant change using a survey composite. This means there is a relationship between the learner-centered learning environment and direct instruction through the use of technology. In a 2003 study by Mills and Tincher, similar indications were found. In this study, a professional development model that encouraged teachers to “be the technology” (Mills & Tincher, 2003, p.382) created a development model for technology integration by modeling a LCL with their students. This technology integration model was based on locally created (Kansas) technology standards and standards created for students from ISTE. Mills and Tincher employed a pretest and posttest design. Results from the Mills and Tincher research indicate a statistically significant difference in the use of technology to integrate student learning. This data was collected in a beginning of the year to end of the year method, with a series of learner-centered professional development sessions throughout the school year. In a Matzen & Edmunds 2007 research study, results indicated that when a teacher’s technology skill level increases, they integrate technology using a direct instructional method.

Sub-questions for question three indicated no statistically significant result for the grade level of the teacher and years of teaching at ABC Elementary School. A positive correlation between the increase of direct instruction with technology and the technology skill level of the ES teacher was identified.

This study indicates that ES teachers who have a high level of technology skill use technology to meet the needs of the curriculum more than ES teachers who have a low level of technology skill. Other researchers indicate that ES teachers who engage in long-term learner-centered professional development technology program use technology more frequently with their students than teachers who participate in short term duration professional development (Brinkerhoff, 2006; Matzen and Edmunds, 2007; Mills and Tincher, 2003).

The research does not indicate that there is any statistical significance that is related to ES teachers' years of teaching experience. ES teachers who are new to teaching or have been receiving technology professional development at ABC Elementary for the prior six years used technology in a direct instructional methodology equally. The results of the current study also indicate that ES teachers use technology equally as often in primary and intermediate grades.

The fourth research question, Does a learner-centered series of technology professional development sessions for ES teachers increase learner-centered pedagogical practices of ES teachers, indicated no statistically significant results. In the current study, results of this question indicated a pretest mean of 5.26 and a posttest mean of 5.33 using a scale of 6.00. This high pretest mean created a ceiling effect within the data. At the start of this current study, teachers at ABC Elementary used learner-centered pedagogical practices in teaching at a high level. With many tenets of learner-centered instruction integrated into professional development, XYZ County has been promoting learner-centered learning as a general practice.

In a 2007 research study, Park and Ertmer investigated learner-centered learning with 78 preservice teachers in a technology integration (a one-credit, sixteen hour) college course. After completing the course, the students who were in the treatment group indicated a statistically significant change in their lesson plans from a teacher-centered to a learner-centered pedagogy as compared to the students in the control group that were not enrolled in the technology course. The Park and Ertmer study revealed similar results to the current study in that learner-centered instruction was related to a change of pedagogical practices of the participants towards a greater use of learner-centered pedagogy.

In the Matzen and Edmunds study (2007), research tools included surveys, case studies, teacher reflections, and interviews. In the first week-long program (n=17), teachers took the roles of students participating in a "constructivist compatible, learner-centered, environment" (p.412). Data collected from the Matzen and Edmunds research indicated an increase in learner-centered practices in technology. Participants indicated a positive correlation between instructional practices and technology use. In support of the current study, Matzen and Edmunds identified an increase in technology use through a professional development series that was learner-centered. There was a correlation between the Matzen and Edmunds study and the current study in that a change of pedagogical practices was implemented for the duration of the research.

In Becker's research, teachers who identified their teaching style as using tenets of learner-centered instruction (2001) were stronger users of computers and they used learner-centered practices in all of their instructional areas. Becker and Ravitz (1999) also notes a relationship between technology use and teachers' pedagogical practices changing toward learner-centered practices due to the positive results that teachers see while using technology in a learner-centered approach. Park and Ertmer (2007) agree with the findings of Becker, in that changes in pedagogical practices after technology professional development activities occur after "a process of enculturation and social construction" (Park & Ertmer, 2007, p. 258) that follows a change in their educational pedagogy. Becker (2001), Park and Ertmer (2007), and

Matzen and Edmunds (2007) all see a similar result of an increase of technology use after the employment of a learner-centered approach to technology professional development. These results are also found within the current study.

Limitations

Limitations of the current study include the survey instrument, the length of the professional development session, the sample size, ES teachers self-reporting, date of pre-test administration, technical obstacles, and the nature of quantitative research.

Survey. The survey was created from an amalgam of large-study surveys. Items from the survey were grouped to create rigor in the survey. With a 110-question survey, the pretest and posttest delivery times were divided into two separate survey administrations. ES teachers participated in the survey in one location. The mean time for ES teachers to complete the survey was approximately 47 minutes. It is possible that ES teachers completing the survey may have suffered fatigue due to the length of the instrument. The timing of the pretest survey occurred prior to the first progress report while the posttest survey occurred during the fourth quarter, after state testing. These school events may have had a modest impact on ES teachers' survey responses.

Length of professional development. The length of the professional development sessions varied from 24 to 50 hours for each teacher over the course of a school year. The variation of the hours spent in training was at the request of the classroom ES teacher. Each ES teacher received a minimum of 24 professional development hours. Within the confines of the position that the researcher holds, there was no way to limit the amount of additional time a ES teacher could request for co-teaching, mentoring, and planning. This variation in professional development sessions may have influenced survey results.

Sample size. The sample size of the study limits the generalizability. Although all ES teachers completed the pretest and posttest, a sample size of 25 is not generalizable to a larger population outside of XYZ County. As no other elementary schools in XYZ County have had a dedicated technology professional development specialist for the past eight years, results are limited to ABC Elementary School.

Self-reporting. Data contained in the survey portion of the current study was self-reported by the ES teachers. ES teachers can easily underestimate or overestimate responses to survey questions. In the CLU portion of the data, actual time to the minute was collected and was represented in CLU data. ES teachers could have arrived or left early or later then what was noted in the CLU data. ES teachers could have used the computer labs without signing in, or not shown up for time previously reserved.

Pretest administration. The pretest was given at the beginning of the 2006 - 2007 school year. In the survey, ES teachers were asked to answer the questions, as they would have at the end of the 2005 - 2006 school year. There are several factors that may have changed their recollections of the 2005 - 2006 school year. They include: summer technology courses, independent learning, and accurate recollections of the time and events of the 2005 - 2006 school year.

Obstacles. Technological obstacles were held to a minimum during the CLU data collection time. For each year of collection the time period was from September 1st through April 1st. During the 2005 - 2007 school years, ES teachers reported similar technical obstacles that hindered their use of technology. Since ES teacher laptop loaners were available to ES teachers, the loss of individual computers was minimized.

Outside factors. There are many outside factors that could impact a ES teacher's pedagogical practices. During the academic year of the study, ES teachers participated in professional development within XYZ County, attended professional conferences, and participated in graduate courses. These professional development sessions may have impacted their general pedagogical practices.

Methodology. In reviewing the methodology used in this study, the researcher would choose to add a qualitative interview component. Questions that probe reasons and gain evidence of direct instruction with technology would have been helpful to expose a critical understanding of the ES teachers' understanding of direct instruction. Open-ended questions would have been able to give a more accurate picture of the epistemological approach that is used in daily instruction.

Including a qualitative interview with the participating ES teachers would have lead to a richer understanding of the research questions. If ES teacher interviews were added to the research, ES teachers would have been able to compare their general teaching practices and identify them with learner or teacher-centered pedagogical practices. Socratic and open-ended questions are suggested to enhance understandings of the motives and practices of ES teachers in this study.

Recommendations for Future Research

In this section, recommendations for future research are reviewed. The findings from the current study have several implications and lead the researcher to a change in technology professional development pedagogy. Recommendations will follow in the following areas: technology integration, direct instruction with technology, and professional development to change pedagogical practices.

Technology integration. While most recent studies have touted the use of learner-centered practices, few studies have included adult learners within the confines of being the "student." During the year-long research, ES teachers in XYZ County were busy taking graduate courses, Maryland State Department of Education courses, countywide in-service courses, school-based learning, and independently improving their technology integration skills to affect their use of technology with students. Including an open ended question for ES teachers to describe any other professional development would have identified factors related to how or why their teaching practices changed. Collecting this data would have also led to a more detailed understanding of the data and experiences related to the professional development series and increased technology integration with their students.

*Direct instruction with technology***.** A goal of the professional development series was to increase direct instruction with technology. Research over the past decade has suggested that teaching with technology can be an effective tool for reaching learners of today. The current study found that a learner-centered, technology integrated professional development program was related to an increased amount of time that ES teachers used technology to deliver direct instruction to the ES students. This study suggests that future researchers should investigate methods for enhancing the use of technology to directly meet curricular objectives.

Recommendations for Future Professional Developers

In reflecting on the development and implementation of the professional development model, many suggestions can be made. As an ongoing learner, professional development changes would include an increase of multi-day professional development sessions, an end-of-the-year gallery walk, and holding more scaffolded training sessions.

Findings from this study support embedded small group technology meetings that were held monthly by grade level as an effective way of meeting the needs of technology professional development activities. Further recommendations for professional developers would be to hold multi-day professional development sessions that use a curricular continuum. After reflecting on the time between professional development sessions, the researcher would recommend that a follow-up session within a week would be of tremendous benefit to the participants.

Follow-up sessions from the original professional development plan would be more effective if dates and times were set up in advance, with attendance by several grades rather than individual sessions. These sessions would build collegiality and collaborative learning by the ES teachers. This connectedness could increase the desire and implementation of technology using learner-centered learning.

Recommendations for further research include a multi-year professional development program. This program would include professional development sessions during the summer months that go beyond the one-hour time frame of this study. Adding summer hours for professional development for the current study would create time for the participants to understand the pedagogy as well as the specifics of the technology hardware and software. Inclusion of another school within the same county without the professional development series could serve as a baseline or comparison group.

Based on this research it is suggested that including a multi-day, scaffolded summer session would allow the participants to review the materials that were distributed (on CD) during the professional development session, evaluate and reflect on the usefulness of the content, and add additional content that was used successfully as a result of the professional development activities. This self-assessment would allow the ES teachers to reflect on prior learning and to direct their future learning.

Conclusion

In the discussion section of this study, the researcher examined the results of a professional development plan that was steeped in the framework of a learner-centered pedagogy. The results of the current study indicate that results found at ABC Elementary mirror the results from the studies of Brinkerhoff, 2006; Matzen and Edmunds, 2007; Mills and Tincher, 2003; and Park and Ertmer, 2007, in that a learner-centered technology professional development program is related to: the time that ES teachers used technology with their ES students, ES teachers' technology skill level, and direct instruction with technology. The limitations of the current study included the long survey booklet, the sample size, and the self-reported data.

Implications and recommendations for further research were discussed. More research is needed in learner-centered technology integration instruction to create technology-rich learner-centered classrooms. In increasing the direct instruction of curricular objectives with technology, further research is needed in identifying the difference between direct instruction and indirect instruction and how direct instruction looks in a learner-centered pedagogy. In reviewing the needs of future research in professional development and technology integration, differentiation within the heterogeneous grade level groups that met throughout the year-long professional development, and modifying the length of time from a one-hour session to several day (summer) sessions are suggested to increase the effectiveness of the current study results.

APPENDICES

Appendix A

Definitions

Term		Definition
Access		Computers or other technology that is in proper working order.
Composite Variables		Composite variables are defined as combining several related survey items together to obtain a composite score for a specific research question.
Computer Lab Use (CLU)		Computer Lab Usage (CLU) data was used to measure technology integration time with students. Entries within sign-in sheets gave details of what grade level, teacher, time of day, duration of use, and curricular areas using technology. Entries within sign-in sheets provided supporting data to the survey data.
Direct Instruction		Direct instruction was a term used in the current study to describe teaching or facilitating instruction with technology that meets curricular objectives. Direct instruction refers to student computer uses and/or the teacher using technology to instruct the students in reading/language arts, mathematics, science, and social studies.
Indirect Instruction		Indirect instruction, also known as drill and practice, uses technology to deliver repetitive practice to students a particular educational skill. The teacher's role in indirect instruction is limited to physically setting up the students; and the teacher then relinquishes teaching. During indirect instruction, objectives have been previously introduced and are reviewed before the use of technology.
Multi-Media		A combination of text, music, video, and sound to communicate. (Gayton 2002)
MST		Math Support Teacher. A county-level position that is responsible for professional development of mathematics instruction at low-performing schools.
RST		Reading Support Teacher. A county-level position that is responsible for professional development of reading and language arts instruction at low-performing schools.
Learner-centered Learning & Learner-		In the current study, Learner-Centered Learning (LCL) refers to the pedagogy associated with the environment used to deliver instruction to the teachers at ABC Elementary. A learner-centered environment promotes a focus of instruction: the planning, the delivery, and the assessment with a deliberate focus on the student's: learning needs, the learning styles of the student, the students' abilities, and the

centered		student's background knowledge in a particular curricular area.
Technology		Computer based technologies includes personal computers, LCD projectors, smart boards, and digital cameras.
Technology integration		The use of technology to meet, extend, and differentiate curricular objectives.
Technology Skill Level		Responses to 15 survey questions to develop a technology skill level (numerical value) for each participant.
THSS		Sub-group of questions that determine teacher skill level of Technology Hardware and Software Skills. Technology Hardware and Software Skills (THSS) are skills such as using a word processor, a digital camera, or peripherals.
TUI		Sub-group of questions that determine teacher skill level of Teacher Usage for Instruction. TUI was also used to identify how a teacher used technology for instruction with their students. Eleven survey questions were used to create a composite score.

Appendix B

Summary of Professional Development and Teacher Skills

August 2001 - June 2006

As a snapshot of teacher skills prior to the 2006 - 2007 school year, this document provides background information on the hardware and software skills of the teachers at ABC Elementary. Included in this document are the: background, delivery method of professional development, content, and teacher use of computer technology with their students.

Background

For the past five years, teachers have been receiving embedded professional development in computer technology with their grade-level peers. The hour-long professional development sessions were mandated by the principal and delivered by the researcher. Topics of the professional development sessions included: the use of grade book software, Microsoft Office®, how to login to computers, e-mail use, computer management software, and how to use hardware that was available at ABC Elementary. During the past five years, teachers did not have input into what topics would be covered. The researcher decided scope and sequence of the professional development. Each hour-long session was delivered on a single topic (for example, Microsoft PowerPoint®) with follow through by the researcher using modeling or co-teaching techniques that reviewed the previous month's topic. A typical month was formatted: small group (grade level) instruction on Microsoft PowerPoint®, followed by grade level planning on a following day, followed by co-teaching with the researcher. At the principal's request, the researcher would provide technology professional development in large groups (approximately 30 teachers) on topics such as report card software and e-mail. Large group professional development was offered approximately four times per year on teacher productivity software.

Delivery

The delivery of professional development for the past five years has been in a traditional, sit and get method that held many characteristics of a behavioristic environment. This environment included the researcher with the knowledge to be passed to the teacher. A typical small group professional development session would include an introduction of the topic and rationale. The researcher would then inform the group how to perform specific tasks to reach the session objective. This involved the researcher giving: an introduction of Microsoft PowerPoint®, a rationale as to why teachers should use the software, and a lengthy description of how to use the different features of PowerPoint. The small group sessions were delivered during the common planning time of teachers, in the office of the researcher using laptop computers, or in the computer lab using desktop computers. These sessions were held each month from September through May for each of the five years prior to the 2006 - 2007 school year.

At the teachers' request, follow-up sessions included: planning assistance, co-teaching, and modeling. The follow-up sessions were voluntary and allowed the researcher to gain direct knowledge of the teachers' ability to use technology with their students. As the researcher had no direct instructional responsibilities for student instruction, the majority of the researcher's day to day responsibilities included:

providing professional development in technology, monitoring the use of the computer labs, and monitoring teacher use of computer technology.

Content

The majority (80%) of the content for professional development in technology from 2001-2006 included teacher productivity (e-mail, Microsoft Office®, and the Internet), with student software instruction accounting for 20% of technology professional development.

During the teacher productivity sessions teachers would receive instruction on topics including: general computer use; troubleshooting; Microsoft® Word, Excel, and PowerPoint; searching the Internet; Internet browsers; e-mail; grade book; how to print; and report card programs. As these topics were discussed, the researcher emphasized a focus on how the teachers could use these products to improve their productivity.

During the student software instruction sessions, teachers reviewed how to use software with their students. The use of software was directed towards the technical use of software, not the instructional use of the software. These sessions included software review on the use of: Kidspiration®, Inspiration®, Timeliner®, JumpStart® software, and Type to Learn®.

Teacher Computer Use

During the years from 2001-2006, the use of computer technology by the teachers saw a tremendous increase. In the beginning of 2001, the majority of teachers were using computers on a weekly basis to communicate to other staff or parents. The basic use of computers at this time was limited to creating worksheets that were unavailable for reproduction. Trouble-shooting technology problems on a regular basis gave the researcher a first-hand understanding of the skill levels of the teachers. During the 2001-2002 school year, the researcher performed trouble shooting with a mean daily response of four. Routine general computer use and troubleshooting increased while printing and other technical problems were steadily declining from the 2001 - 2007 school years. During the 2005 - 2006 school year, the mean daily response was less than one. By the end of the 2005 - 2006 school year, teachers were generally using technology on a daily basis to e-mail, create worksheets, and to keep track of grades. The professional development sessions aimed at increasing teacher productivity seemed to be effective as the number of technology service calls decreased.

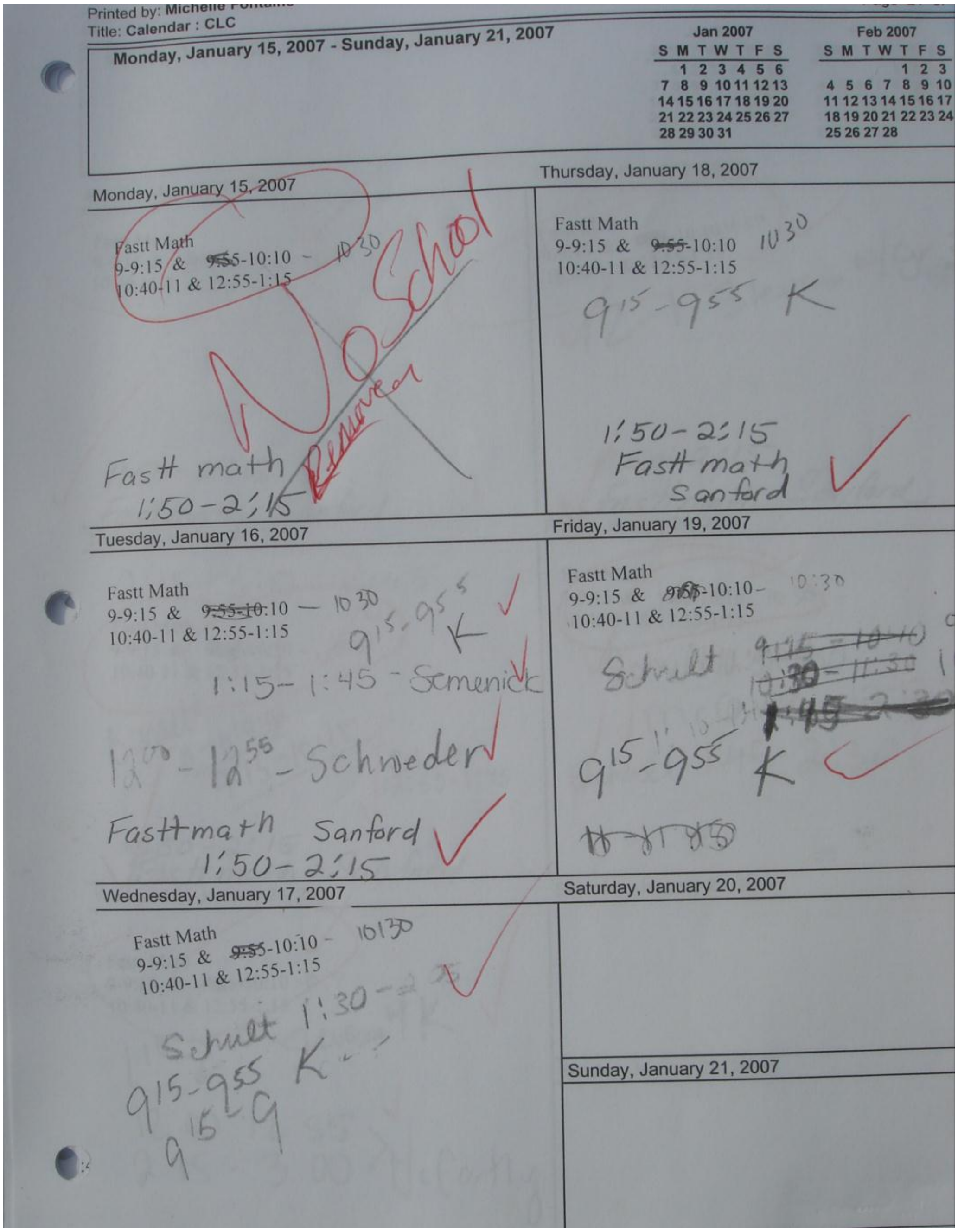
Student Computer Use

During the years from 2001 - 2006, the use of computer technology by the students remained stagnant. Students in early 2001 used computers to learn how to type, and used software programs such as JumpStart@ to reinforce skills that were taught in prior lessons. Indirect instruction was used approximately 90% during these years while using technology. Occasionally teachers would allow students to type original stories in Microsoft Word® for publishing purposes. By the end of the 2005 - 2006 school year, student computer use remained similar to previous years, with the addition of the use of the Internet as a tool for drill and practice activities. Students were mesmerized with the use of the Internet and would work for long periods of time on skills that they previously mastered. Differentiation of computer use for this time was not implemented. By the end of 2005, students in intermediate classrooms (grades

3-5) used the computer for typing practice and typing papers, while primary students (grades K-2) used drill and practice software. Although students used computers more in the 2005 - 2006 school year than the 2001-2002 school years, the types of computer use continued to be in an indirect instructional practice.

Appendix C

Computer Lab Usage (Raw Data) Example


Printed by: Michelle Fontaine
Title: Calendar : CLC
Monday, January 15, 2007 - Sunday, January 21, 2007
Jan 2007
Feb 2007

Monday, January 15, 2007
Fastt Math
9-9:15 & 9:55-10:10 - 10 30
10:40-11 & 12:55-1:15
No School
Removed
Fastt math
1:50-2:15

Tuesday, January 16, 2007
Fastt Math
9-9:15 & 9:55-10:10 — 10 30
10:40-11 & 12:55-1:15
9:15-9:55 K
1:15-1:45 - Semenick
12:00-12:55 - Schneder
Fastt math Sanford
1:50-2:15

Wednesday, January 17, 2007
Fastt Math
9-9:15 & 9:55-10:10 - 10:30
10:40-11 & 12:55-1:15
Schult 1:30 -
9:15-9:55 K

Thursday, January 18, 2007
Fastt Math
9-9:15 & 9:55-10:10 10:30
10:40-11 & 12:55-1:15
9:15-9:55 K
1:50-2:15
Fastt math
Sanford

Friday, January 19, 2007
Fastt Math
9-9:15 & 9:55-10:10 - 10:30
10:40-11 & 12:55-1:15
Schult
9:15-9:55 K

Saturday, January 20, 2007

Sunday, January 21, 2007

Appendix D

Survey Question: Categories

Demographics

Question #	Question
1	Gender
2	Age
3	Years teaching @ ABC Elementary
4	Years teaching at any school
5	Do you have a computer at home
6	Ethnicity
7	What grade do you teach
8	Type of access to the internet
9	What subjects do you teach?
45	Do you enjoy using a computer
107	How many student s in class of high technology users
108	What is average ability level of the high tech users
109	How many students in class of low tech users
110	What is the average ability level of the low tech users

Professional Development & Pedagogy

Question #	Question
70	Three needs of professional development - skill or student learning
71	How important is teachers sharing examples ?
72	How important is that there are computers in your room
73	How important is that someone has demonstrated uses
74	How important is it that I have worked with colleagues to design lessons that require computer use
75	How important are that someone outside of my team has given pd workshops
105	It is important to understand student & teacher technology standards
106	It is important to review technology standards before developing curriculum.

Teacher Philosophy – Learner-Centered

Question #	Question
19	A classroom needs to be quiet to have effective learning
20	A teacher decides what activities
96	A teacher knows more than students
98	Students take initiative if they sit in seat
99	Teachers and central office should agree on assessment points
101	Student backgrounds are important - facts are important
103	Students work less when using computers
104	Students are less willing to make second drafts when using a computer

Teaching Philosophy – Negative to Technology

18	Computers have weakened students research skills
22	Technology allow students to avoid other work
25	Student writing is worse on computers
29	Computers encourage students to be lazy

Teaching Philosophy – Learner-Centered

26	The role of the teacher is to be a facilitator
27	It is good to have different activities vs. whole class
32	Students interests/effort in academic is more important than learning from textbooks
77	Are you more inclined to involve students in cooperative learning
78	Are you more inclined to involve students in higher order thinking skills
79	Are you more inclined to bridge the outside world to school
80	Are you more inclined to serve as coach
81	Are you more inclined to assess students achievement based on products, progress, & effort
97	Students should decide activities
100	Instruction should be built around problems with several correct answers
102	Instruction is most effective when teachers collaborate

Philosophy of Computers - Pedagogy

21 Technology can help students
23 Technology help students grasp diff concepts
24 Students work harder when they use Technology
28 Computers are important for teaching
30 Technology are important to me this year
31 Students interact more with other students while working w/technology
33 Technology were important in my teaching 3 years ago
44 In a class it is important 2 use tech to improve tech scores

Teacher Practices - Pedagogy

11 3 frequent activities - students in your class

17 Student use of comp- drills, tutorials, learning games

34 I am confident in using technology this year

35 I was confident in using technology 3 years ago
47 How often do you use to deliver instruction
48 How often do you use tech to adapt to individual needs

49 How often do u use tech to create a test quiz or assign

59 How often do your students use a computer to create reports
60 How often do your students create multimedia projects
61 How often do your students create original pictures or art
62 How often do your students create original stories or books
63 how often do your students create graphs or charts using computers
64 How often do your students create videos or movies
65 How many minutes in an average week. Reading Use tech direct vs. reinforcement
66 How many min …… language arts
67 How many min……. Social studies
68 How many min ….. Science
69 How many min …..other
69a How many min. . . . Mathematics
76 I am currently using technology during instruction as much as I would like
82 Students work individually on school work without computers
83 Students work individually on school work using computers

84 Students work in groups on school work without using computers
85 Students work in groups on school work using computers
86 Students research without a computer
87 Students research with a computer
92 Students use a computer for games or fun
93 Present information to the class without using a computer
94 Present information to the class with a computer
95 Students use spreadsheet / database to record, explore analyze data

Teacher Uses/Skills

10 3 frequent activities – you
12 Skill of video camera
13 Skill of drawing
14 Skill of digital camera
15 Skill of scanner
16 Skill of multimedia
46 How often do you shop online
50 How often do you use the internet to research & lesson plan
51 How often do you create web quests or build the internet into a lesson
52 How often do you use a computer to present info
53 How often do you use a computer to helps students understand concept
54 How of ten do you use a computer to model relationships & functions
55 How often do you create and maintain web pages
56 How often do you assess students using a computer
57 How often do you use a computer to communicate with teachers, parents, or administration

* Question #58 was removed prior to the survey distribution.

Appendix E

Maryland Teacher Technology Standards
http://mttsonline.org/standards/

The Maryland Technology Consortium has developed Maryland Teacher Technology Standards, technology outcomes and indicators that all teacher candidates will need to achieve prior to graduation. Click each link to view the outcome and indicators.

To download the current PDF version of the standards that includes indicators, click here.

Standard I: Technology Information Access, Evaluation, Processing and Application
Access, evaluate, and process information efficiently and effectively

Standard II: Communication
A. Use technology effectively and appropriately to interact electronically.
B. Use technology to communicate information in a variety of formats.

Standard III: Legal, Social and Ethical Issues
Demonstrate an understanding of the legal, social, and ethical issues related to technology use.

Standard IV: Assessment for Administration and Instruction
Use technology to analyze problems and develop data-driven solutions for instructional and school improvement.

Standard V: Integrating Technology into the Curriculum and Instruction
Design, implement and assess learning experiences that incorporate use of technology in the curriculum-related instructional activity to support understanding, inquiry, problem-solving, communication or collaboration.

Standard VI: Assistive Technologies
Understand human, equity, and developmental issues surrounding the use of assistive technology to enhance student learning performance and apply that understanding to practice.

Standard VII: Professional Growth

Develop professional practices that support continual learning and professional growth in technology

Appendix F

Survey References

Reference	Survey Question Numbers (Total Number of Questions)
Asan, A. (2003). Computer Technology Awareness by Elementary School Teachers: A Case Study from Turkey.	8, 45, 46 (3)
Bebell, D. 2005, Technology Promoting Student Excellence: An Investigation of the First Year of 1:1 .	47-57, 59-64, 70, 88-95 (21)
Denton J. Davis, T., Strader, A, & Durbin, B., 2003, Report of the 2002 Texas Public School Technology Survey.	33-44 (11)
California Department of Education, EdTech Profile (2005), California Department of Education State Educational Technology Service (SETS).	18-32 (14)
Ravitz, J. & Mergendoller, J., 2002, Teaching with Technology: A Statewide Professional Development Program.	96-104 (8)
Sun Associates (2006). Sample Technology Survey.	82-87 (5)
Boston Teacher Survey (2005), Boston College, Study of Educational Technology.	71-81 (10)
Towson University, Technology Integration Skills, Student Survey (2006).	12-17 (5)
*Demographic questions from more than one survey.	1-7, 9, 10 (8)

Appendix G

XYZ County Approval Letter

Dear Ms. Stevens:

Your request to conduct research in the XYZ County Public School System has been approved. The study titled "Does a learner-centered/ constructionist learning environment professional development plan increase technology use of students in an elementary school?" will be conducted at ABC Elementary School. Mrs. Principal (Principal at ABC Elementary) has indicated her support of your research. It is understood that teachers at ABC Elementary will participate on a voluntary basis. The research survey will be administered to teachers outside of the normal school day. Also, this study will not allow you to contact or approach students in the XYZ County Public School System.

This approval will expire on October 19, 2007. Should you require additional time, you must make a formal request to my office prior to the expiration date.

Coordinator of Research and Program Evaluation
Student Assessment and Program Evaluation

Telephone # here

(Original Letter to be kept with Advisor – Dr. Wizer)

Appendix H

Survey

This is a voluntary survey for teachers. If you would like to find more about the privacy of this survey, please see attached sheet. Please complete the following....

Participant Demographics

1 Gender ◎ Female ◎ Male

2 Your age range ◎ 20-25 ◎ 26-30 ◎ 31-35 ◎ 36-41 ◎ 42-50 ◎ 50-60 ◎ 61+

3. teaching @ ABC ◎ less than a year ◎ 1-2 years ◎ 3-5 years ◎ 6-10 years ◎ 11-15 years ◎ 16+ years

4 Years teaching @ any school ◎ less than a year ◎ 1-2 years ◎ 3-5 years ◎ 6-10 years ◎ 11-15 years ◎ 16+ years

5 Do you have a computer at home (other than the school laptop)? ◎ yes ◎ no

6 Your ethnicity ◎ African American/Black ◎ Asian ◎ Latino/Hispanic ◎ Caucasian/White (other than Latino) ◎ Other

7. What grade do you teach? ◎ PreKindergarten ◎ Kindergarten ◎ 1 ◎ 2 ◎ 3 ◎ 4 ◎ 5

8. What type of access to the Internet does your home computer have? ◎ cable ◎ DSL ◎ dial-up ◎ don't know ◎ no access

9. Select all of the subjects that you teach. ◎ Reading ◎ Language Arts ◎ Mathematics ◎ Science ◎ Social Studies ◎ Other

Teacher Use

10. List three of the most frequent activities for which you use a computer.

11. List three of the most frequent activities in the past for which your students used a computer

Rank yourself from 1-10 in your skill level.

1 being something that you can not do and 10 that you are an expert.

If you select 10, this means that you can operate EVERY part of the hardware/software and there is no aspect that you can not manipulate or teach. For example, in using a video camera and computer to make a digital movie or slide show, you must understand the difference between NTSC and PAL, understand the similarities of movie formats of 3G, Hinted Movie, and FLC..

Selecting a 5 would relate that you can operate the software/hardware and get expected results (e.g.- open iPhoto, create a slideshow, add music, manipulate options, and present the slideshow).

A 1 being that you do not know iPhoto and you cannot open it to view photos.

How far along are you in.......	Your skill level on a scale of 1-10
12. Using a video camera and a computer to make a video. iMovie, iPhoto, etc...	
13. Using a drawing or painting software to create pictures (e.g. Photoshop, Picture It).	
14. Using a digital camera to get pictures into a computer.	
15. Using a scanner to get pictures into a computer.	
16. Using multimedia software (HyperSudio, PowerPoint) to create a product.	
16a. Other	

Teaching Practices

Looking at all of the time your students used the computer in the past year, what do you predict that your students will use the computer as a percentage in the following categories, **the total should = 100%** (17)	**%**
Learning basic skills and facts through drills, tutorials, and learning games	
Learning computer skills such as keyboarding, how to use a word processor, the Internet, spreadsheets, etc.	
Using problem solving programs such as Microworlds, Logo, spreadsheets, and databases	
Writing reports, essays, poems, Kidspiration, Inspiration, PowerPoint, etc.	
Simulations in science and social studies	
Looking up information (e.g. CD-ROMs, www, and other computer resources -	
Other	

Teaching Philosophy

Rate the following statements:	Strongly Agree	Somewhat Agree	Agree	Disagree	Somewhat Disagree	Strongly Disagree
18. Computers have weakened students' research skills.	○	○	○	○	○	○
19. A quiet classroom is generally needed for effective learning.	○	○	○	○	○	○
20. It is better when the teacher, not the	○	○	○	○	○	○

students decides what activities are done.						
21. Computers can help students.	O	O	O	O	O	O
22. Many students' use computers to avoid doing more important schoolwork	O	O	O	O	O	O
23. Computers help students grasp difficult curricular concepts.	O	O	O	O	O	O
24. Students work harder at their assignments when they use computers.	O	O	O	O	O	O
25. Students' writing quality is worse when they use word processors.	O	O	O	O	O	
26. The role of the teacher is to be the facilitator vs. the instructor	O	O	O	O	O	
27. It is good to have different activities going on in the classroom vs. one assignment for the whole class.	O	O	O	O	O	
28.Computers are important for teaching.	O	O	O	O	O	
29. Computers encourage students to be	O	O	O	O	O	

lazy.					
30. Computers have been important in my teaching this year.	O	O	O	O	O
31. Students interact with each other more while working with computers.	O	O	O	O	O
32. Students' interests/effort in academic work is more important than learning information from textbooks.	O	O	O	O	O
33. Computers were important in my teaching three years ago.	O	O	O	O	O
34. I am confident in using computers this year.	O	O	O	O	O
35. I was confident in using computers three years ago.	O	O	O	O	O
Within your classroom, computer use is important in...	Strongly Agree	Somewhat Agree	Agree	Undecided	Somewhat Disagree
36. changing the way that	O	O	O	O	O

instruction has been traditionally delivered..					
37. satisfying parents' and community interests.	◎	◎	◎	◎	◎
38. improving student computer skills and abilities.	◎	◎	◎	◎	◎
39. improving student proficiency in research.	◎	◎	◎	◎	◎
40. improving productivity and efficiency.	◎	◎	◎	◎	◎
41. improving classroom instruction.	◎	◎	◎	◎	◎
42. teaming and collaboration.	◎	◎	◎	◎	◎
43 analyzing data.	◎	◎	◎	◎	◎
44. improving test scores.	◎	◎	◎	◎	◎

Teacher Use

45. Do you enjoy using the computer ◎ yes ◎ no

46. Do you shop online ◎ Never ◎ A few times a year ◎ Monthly ◎ Weekly ◎ Several times a week ◎ Daily

How often do you . . .	Daily	Several times a week	Several times a month	Several times a year	Once or twice a year	Never
47. use a computer to deliver instruction to your class?	◎	◎	◎	◎	◎	◎
48. adapt an activity to students' individual needs using computers?	◎	◎	◎	◎	◎	◎
49. create a test, quiz or	◎	◎	◎	◎	◎	◎

assignment using a computer?						
50. perform research and lesson planning using the Internet?	O	O	O	O	O	O
51. create WebQuests for a lesson?	O	O	O	O	O	O
52. use a computer to present information to your class?	O	O	O	O	O	O
How often do you . . .	Daily	Several times a week	Several times a month	Several times a year	Once or twice a year	Never
53. use a computer to help students better understand a concept?	O	O	O	O	O	O
54. use a computer to model relationships and/or functions?	O	O	O	O	O	O
55. create and maintain web pages?	O	O	O	O	O	O
56. assess students using a computer?	O	O	O	O	O	O
57. use a computer to communicate with teachers, parents, or administration?	O	O	O	O	O	O
How often do your STUDENTS create...	Daily	Several times a week	Several times a month	Several times a year	Once or twice a year	Never
59. reports?	O	O	O	O	O	O
60. multimedia projects?	O	O	O	O	O	O
61. original pictures or artwork?	O	O	O	O	O	O
62. original stories or books?	O	O	O	O	O	O
63. graphs or charts?	O	O	O	O	O	O
64. videos or movies?	O	O	O	O	O	O

Student Use

If I divided the time that your students used a computer into two categories (direct instruction, indirect / reinforcement), **how many minutes in an average week do your student use technology.**	**Direct Instruction** (Teacher facilitates) New objectives are met.	**Reinforcement of instruction** (Repetitive activities to review objectives that have been previously introduced).
Reading (65)		
Language Arts(66)		
Social Studies(67)		
Science(68)		
Mathematics(69)		
Other (69a)		

Professional Development

Identify your **<u>three</u>** greatest technology professional development needs, then select whether you want skill development or student learning (or both) to be the focus. (70)

	Developing Your Skills	Enhancing Student Learning	An integrated Approach - Both Simultaneously
Word processor (Word)			
Database			
Spreadsheet (Excel)			
Drawing/painting software (KidPix)			
Digital camera/scanner			
Presentation software (PowerPoint)			
Multimedia software (iMovie)			
E-mail			
Online discussion forums (CLC)			
Web authoring software			
Electronic / online references			
World Wide Web			
Digital Video (still & motion)			
Graphic organizer/			

systems thinking software (Kidspiration, Inspiration)			
Other	O	O	O

Teacher use

How important have each of the following been in influencing how you use computers in your classroom:	Great Influence	Some Influence	No Influence	Some Negative Influence	Great Negative Influence
Other teachers have shared examples of how they use computers with their students (71)	O	O	O	O	O
The fact that XYX County has put computers in my classroom encourages me to use them with my students.(72)	O	O	O	O	O
Someone has demonstrated uses that I have adapted to my classroom (73)	O	O	O	O	O
I have worked with my colleagues to design lessons that require classroom use of computers.(74)	O	O	O	O	O
Professional development workshops led by someone outside of the school have demonstrated uses that I have adapted to my classroom.(75)	O	O	O	O	O

About your classroom	Strongly Agree	Somewhat Agree	Agree	Undecided	Disagree	Somewhat Disagree	Strongly Disagree
With my classes , I am currently using technology during instruction as much as I would like. (76)	O	O	O	O	O	O	O

Teacher Philosophy

As a result of your use of technology in teaching and learning, are you more inclined to....	Strongly Agree	Somewhat Agree	Agree	Undecided	Disagree	Somewhat Disagree	Strongly Disagree
Involve students in cooperative, not competitive learning? (77)	O	O	O	O	O	O	O
Involve students in activities that require higher level thinking skills? (78)	O	O	O	O	O	O	O
Involve students in interdisciplinary activities? (79)	O	O	O	O	O	O	O
Serve as coach, not lecturer or whole-group discussion leader? (80)	O	O	O	O	O	O	O
Assess students achievement based on products, progress, and effort? (81)	O	O	O	O	O	O	O

Student Use

During class time, how often did students perform the following activities this past year	**Never**	Once or twice a year	Several times a year	Several times a month	Several times a week
Students work individually on school work without using computers (82)	O	O	O	O	O
Students work individually on school work using computers (83)	O	O	O	O	O
Students work in groups on school work without using computers (84)	O	O	O	O	O
Students work in groups on school work using computers. (85)	O	O	O	O	O
Students perform research or find information without using a computer (86)	O	O	O	O	O

Students perform research or find info using the Internet or CD ROMs (87)	O	O	O	O	O

During class time, how often did students perform the following activities this past year	Never	Once or twice a year	Several times a year	Several times a month	Several times a week
Student use a computer or portable writing device for writing. (88)	O	O	O	O	O
Student use a computer to solve problems. (89)	O	O	O	O	O
Students learn keyboarding skills. (90)	O	O	O	O	O
Students use a computer to play educational games. (91)	O	O	O	O	O
Students use a computer to play games for fun (92).	O	O	O	O	O
During class time, how often did students perform the following activities this past year	Never	Once or twice a year	Several times a year	Several times a month	Several times a week
Students present information to the class without using a computer. (93)	O	O	O	O	O
Students present information to the class using a computer. (94)	O	O	O	O	O
Students use a spreadsheet / database to record, explore or analyze data. (95)	O	O	O	O	O

Teacher philosophy

Indicate how much you disagree or agree with each of the following statements about teaching and learning:	Strongly Agree	Somewhat Agree	Agree	Undecided	Disagree	Somewhat Disagree	Strongly Disagree
Teachers know a lot more than students, they shouldn't let students muddle around when they can just explain the answers directly. (96)	O	O	O	O	O	O	O
It is better when the students, not the teachers decide what activities are done. (97)	O	O	O	O	O	O	O
Students will take initiative to learn if they sit quietly at their seat. (98)	O	O	O	O	O	O	O
Teachers and central office staff only should establish criteria on which the students will be assessed.(99)	O	O	O	O	O	O	O
Instruction should be built around problems with several correct answers, and ideas that are complex. (100)	O	O	O	O	O	O	O
How much students learn depends on how much background knowledge they have - that is why teaching facts is so necessary. (101)	O	O	O	O	O	O	O
Instruction is most effective when teachers collaborate. (102)	O	O	O	O	O	O	O
Students work less at their assignments when they use computers.(103)	O	O	O	O	O	O	O
Students are less willing to make second drafts when writing using a computer (104).	O	O	O	O	O	O	O

It is important to understand student and teacher technology standards (105)	O	O	O	O	O	O	O
It is important to review technology standards before developing curriculum (106)	O	O	O	O	O	O	O

Teacher Practice

Think about the class in which you use technology the **most**:

107. How many students are in that class? ______

108. What is the average ability level of these students? O **Above** O **On** O **Below**

Think about the class in which you use technology the **least**:

109. How many students are in that class? _______

110. What is the average ability level of these students? O **Above** O **On** O **Below**

Thank you for completing this survey !

Appendix I

Informed Consent

Informed Consent

I (CarolAnn Stevens) am attempting to identify and acknowledge best practices in technology integration and professional development. Your role in this project may consist of, completing face-to-face interviews, and a survey. The data collected will be used to improve the professional development of teachers at ABC Elementary. All of the activities will be conducted during the normal operating hours of ABC. All activities will take place from the date of consent to June, 2007.

The end result of this data gathering will be an anonymous study with no individual results presented. The school name and county will not be provided.

Applicant Assurances:

1. Data are confidential and will not contain identifiers that real the subject in any way.
2. Participation in the survey and interviews are optional.
3. Participants are able to withdraw from interviews at any time.
4. The participants may choose time and location of interviews.
5. Participation in the interviews or study will not affect employment status.
6. Questions will be answered if any questions arise.
7. Independent survey assistants will collect data from surveys.
8. Contact information for CarolAnn Stevens - castev@yahoo.com, (h) 410-795-7671.
9. Faculty & Dissertation Advisor: Dr. David Wizer, 410-704-6268

I, ____________________________, affirm that I have read and understand the above statement and have had all of my questions answered.

Date __________________________ Signature _______________________________

Witness _________________________________

Appendix J

Structure of Professional Development

Group Session Structure

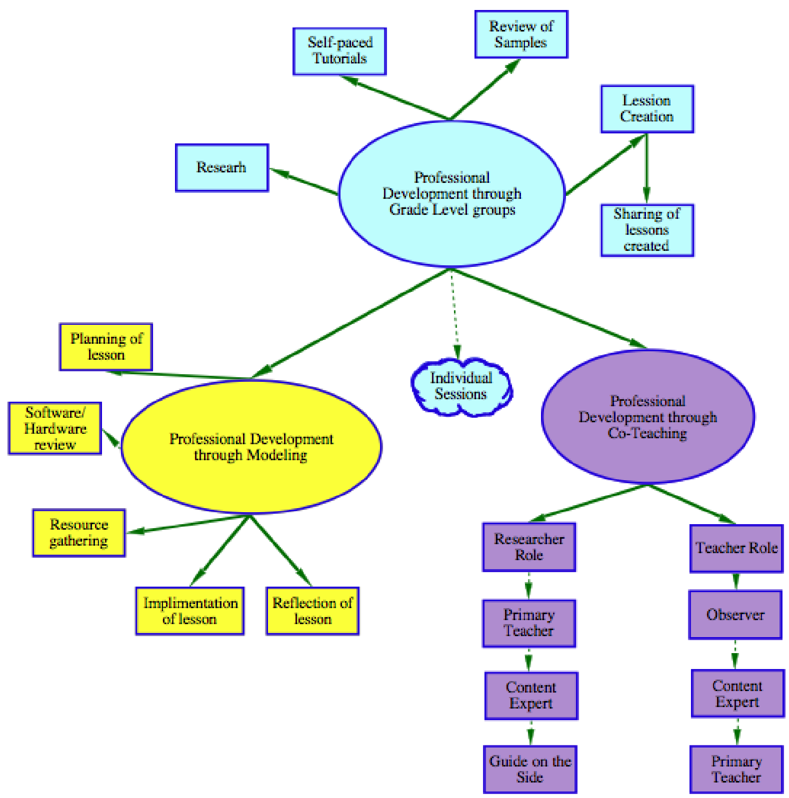
1. Relevant research
2. Self-paced tutorial of software
3. Preview examples
4. Collaborative brainstorming
5. Lesson creation
6. Sharing of lesson & ideas

Individual Session Structure

- Planning
- Software review
- Co-teaching
- Modeling

Appendix K

Overview of Professional Development



Appendix L

Participatory Data
Professional Development & Technology Integration

Date	

Team	

In Attendance:	

Technology Standards	

Curricular Objectives:	

Notes:

Appendix M

Survey Feedback Form

Technology Survey
_______ Review

Question #	I could have answered 2	Not Clear	Doesn't point to any large question	Other

Appendix N

Survey Reviewers & Experts

Reviewers

K. Wisniewski, Technology Specialist, XYZ County Public Schools ,

S. Keaton, Reading Support Teacher, ABC Elementary, XYZ County Public Schools

L. Brickner, Math Support Teacher, ABC Elementary, XYZ County Public Schools

J. Katz, Assessment Office, XYZ County

Experts

G. Meiselwitz, Towson University

C. Walker, Title I Coordinator, XYZ County

D. Wizer, Doctoral Committee Chair, Towson University

J. Wray, Technology Facilitator, XYZ County

Appendix O

Correlation of Survey Questions to Research Questions

The central and sub-questions to be answered in this study are: to what extent -

1. Does a learner-centered series of technology professional development sessions for teachers increase technology integration with their students?

Possible Questions:10, 21, 23, 28, 30, 47-57, 59-64, 65-69, 82-87

Sub Questions

   a. Are there differences based on grade level taught?
   b. Are there differences based on teachers' years of experience?
   c. Are there differences based on teacher technology skill level?

2. Does a learner-centered learning environment for teachers increase their technology skill level?

Questions for TUI:
47-57
Questions for THSS:
12-16

3. Does a learner-centered learning environment for teachers increase direct instruction with technology?

Possible Questions: 11, 17, 47, 48, 51, 52, 59-69, 85-95, 107-110

a. Are there differences based on grade level taught?

b. Are there differences based on teachers' years of experience?

c. Are there differences based on teacher technology skill level?

2. Does a learner-centered series of technology professional development sessions for teachers increase learner-centered pedagogical practices of teachers?

Possible Questions: 18-32, 36-44, 77-81, 96-104

Items of Importance

Possible Questions: 15, 16, 56, 18, 47, 48, 53, 36, 101, 30

Appendix P

The sub question to be answered in this study: to what extent –

Question 1 – Sub Question – Grade Level - Results

Does a learner-centered series of technology professional development sessions for teachers increase direct instruction with technology? Are there differences based on grade level taught?	
Grade Level Taught	**Significance**
Primary Grades	.570
Intermediate Grades	.663

Question 1 – Sub Question – Teacher Years - Results

Does a learner-centered series of technology professional development sessions for teachers increase direct instruction with technology? Are there differences based on teachers' years of experience?	
Years Taught at ABC Elementary	**Significance**
0-2	.861
3-10	.504
11+	.173

Question 1 – Sub Question - Skill

The sub question to be answered in this study: to what extent -

Does a learner-centered series of technology professional development sessions for teachers increase direct instruction with technology?

Are there differences based on teacher technology skill level?

Skill Level Mean	**Significance**
3.99 – 4.99	.938
5-7	.293

Appendix Q

Individual Statistically Significant Results

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
15 - Pretest	5.65	2.41	.48	2.35	.027
15 - Posttest	6.40	2.80	.56		

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
16 - Pretest	5.56	2.38	.48	3.80	.001
16 - Posttest	7.28	1.80	.36		

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
18 - Pretest	4.68	1.73	.35	2.22	.036
18 - Posttest	5.28	1.54	.31		

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
30 - Pretest	5.04	1.46	.30	2.83	.009
30 - Posttest	5.96	1.27	.26		

Individual Statistically Significant Results

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
36 - Pretest	5.36	1.32	.26	2.68	.013
36 - Posttest	5.96	.98	.20		

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
47 - Pretest	3.83	1.09	.22	2.60	.016
47 - Posttest	4.13	1.12	.23		

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
48 - Pretest	3.75	1.15	.24	2.17	.040
48 - Posttest	4.33	1.01	.21		

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
53 - Pretest	3.68	1.07	.21	3.26	.003
53 - Posttest	4.44	1.05	.21		

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
56 - Pretest	2.04	1.60	.32	3.16	.004
56 – Posttest	3.04	1.57	.31		

Individual Statistically Significant Results

Question	Mean	Standard Deviation	Standard Error Mean	t	Significance
101 - Pretest	3.50	1.41	.29	2.16	.041
101 - Posttest	4.29	1.27	.26		

Appendix R

The sub question to be answered in this study: to what extent -

Question 3 – Sub Question – Grade Level - Results

Does a learner-centered series of technology professional development sessions for teachers increase direct instruction with technology? Are there differences based on grade level taught?	
Grade Level Taught	**Significance**
Primary Grades	.387
Intermediate Grades	.051

Question 3 – Sub Question – Teacher Years - Results

Does a learner-centered series of technology professional development sessions for teachers increase direct instruction with technology? Are there differences based on teachers' years of experience?	
Years Taught at ABC Elementary	**Significance**
0-2	.160
3-10	.107
11+	.705

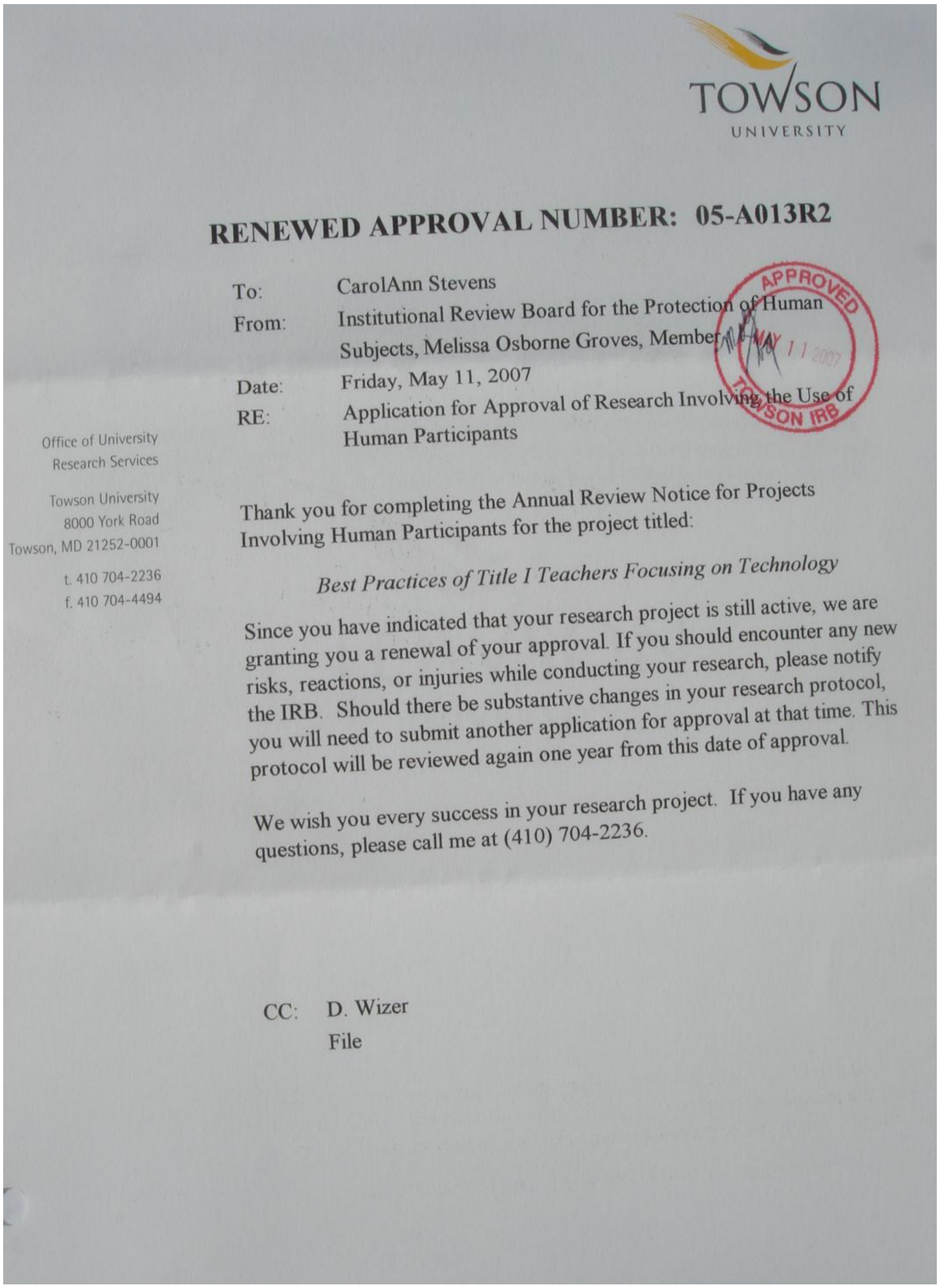
The sub question to be answered in this study: to what extent –

Question 3 – Sub Question - Skill

Does a learner-centered series of technology professional development sessions for teachers increase direct instruction with technology? Are there differences based on teacher technology skill level?	
Skill Level Mean	**Significance**
3.99 – 4.99	.650
5-7	.028

Appendix S

Approval for Research – IRB – Towson University



TOWSON UNIVERSITY

RENEWED APPROVAL NUMBER: 05-A013R2

To: CarolAnn Stevens

From: Institutional Review Board for the Protection of Human Subjects, Melissa Osborne Groves, Member

Date: Friday, May 11, 2007

RE: Application for Approval of Research Involving the Use of Human Participants

APPROVED MAY 11 2007 TOWSON IRB

Office of University Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for completing the Annual Review Notice for Projects Involving Human Participants for the project titled:

Best Practices of Title I Teachers Focusing on Technology

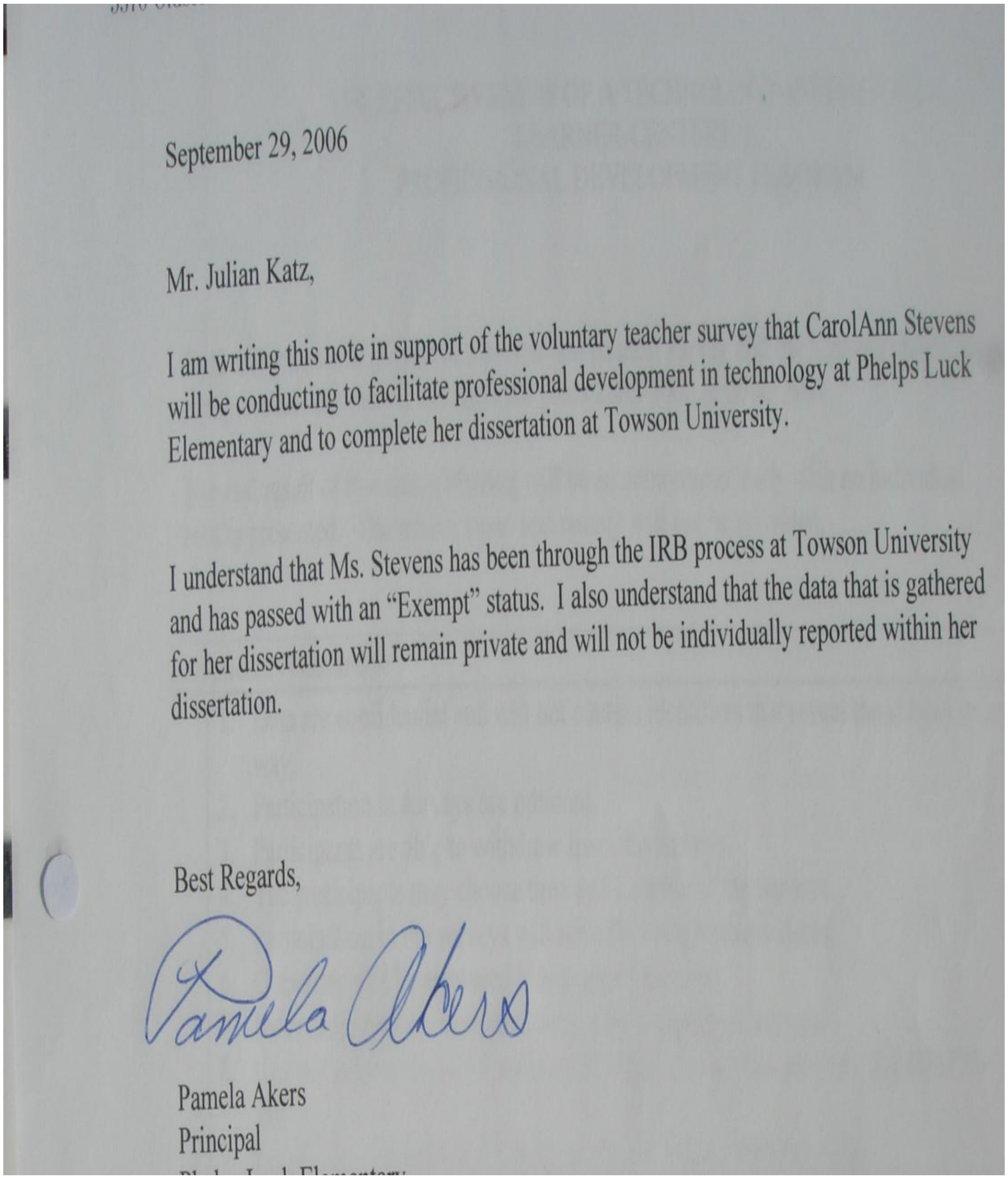
Since you have indicated that your research project is still active, we are granting you a renewal of your approval. If you should encounter any new risks, reactions, or injuries while conducting your research, please notify the IRB. Should there be substantive changes in your research protocol, you will need to submit another application for approval at that time. This protocol will be reviewed again one year from this date of approval.

We wish you every success in your research project. If you have any questions, please call me at (410) 704-2236.

CC: D. Wizer
File

Appendix T

School Based Approval Letter



September 29, 2006

Mr. Julian Katz,

I am writing this note in support of the voluntary teacher survey that CarolAnn Stevens will be conducting to facilitate professional development in technology at Phelps Luck Elementary and to complete her dissertation at Towson University.

I understand that Ms. Stevens has been through the IRB process at Towson University and has passed with an "Exempt" status. I also understand that the data that is gathered for her dissertation will remain private and will not be individually reported within her dissertation.

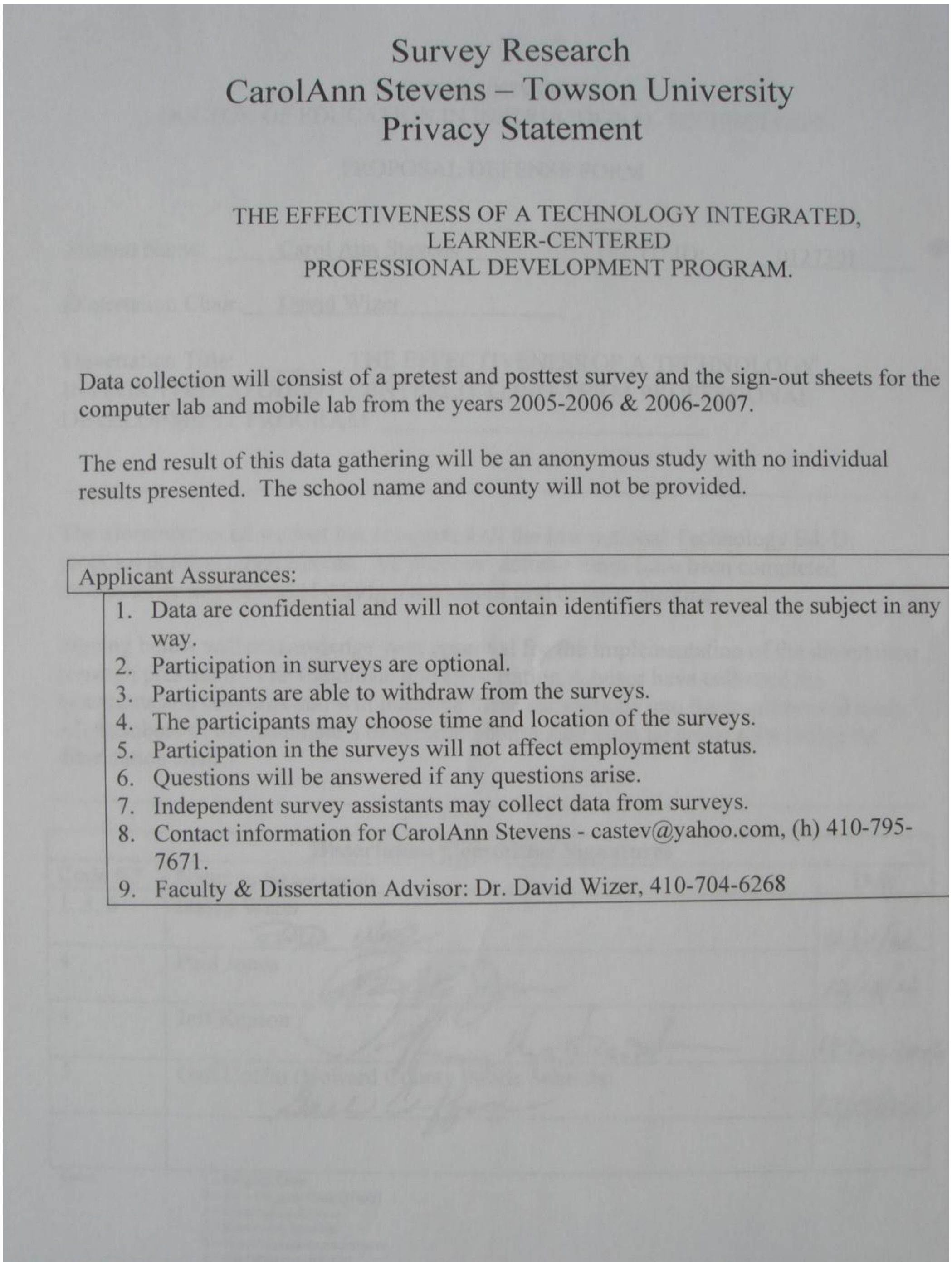
Best Regards,

Pamela Akers

Pamela Akers
Principal

Appendix U

Privacy Statement



Survey Research
CarolAnn Stevens – Towson University
Privacy Statement

THE EFFECTIVENESS OF A TECHNOLOGY INTEGRATED, LEARNER-CENTERED PROFESSIONAL DEVELOPMENT PROGRAM.

Data collection will consist of a pretest and posttest survey and the sign-out sheets for the computer lab and mobile lab from the years 2005-2006 & 2006-2007.

The end result of this data gathering will be an anonymous study with no individual results presented. The school name and county will not be provided.

Applicant Assurances:

1. Data are confidential and will not contain identifiers that reveal the subject in any way.
2. Participation in surveys are optional.
3. Participants are able to withdraw from the surveys.
4. The participants may choose time and location of the surveys.
5. Participation in the surveys will not affect employment status.
6. Questions will be answered if any questions arise.
7. Independent survey assistants may collect data from surveys.
8. Contact information for CarolAnn Stevens - castev@yahoo.com, (h) 410-795-7671.
9. Faculty & Dissertation Advisor: Dr. David Wizer, 410-704-6268

Appendix V

Proposal Defense Form

TOWSON UNIVERSITY
DOCTOR OF EDUCATION IN INSTRUCTIONAL TECHNOLOGY

PROPOSAL DEFENSE FORM

Student Name: Carol Ann Stevens TU ID: 0127301

Dissertation Chair: David Wizer

Dissertation Title: THE EFFECTIVENESS OF A TECHNOLOGY INTEGRATED, STUDENT-CENTERED, LONG-TERM PROFESSIONAL DEVELOPMENT PROGRAM

The aforementioned student has completed all the Instructional Technology Ed. D. proposal defense requirements. All proposal defense items have been completed satisfactorily and defended during a scheduled oral defense meeting.

Signing below will acknowledge your approval for the implementation of the dissertation research presented. The Candidate and Dissertation Advisor have collected the comments and concerns and will integrate these suggestions into the implemented study. All members of the candidate's dissertation committee must be present, including the dissertation chair.

Dissertation Committee Signatures

Code # *	Name (typed and signed)	Date
1, 3, 6	David Wizer	12/18/06
4	Paul Jones	12/18/06
4	Jeff Kenton	18 Dec 2006
5	Gail Coffin (Howard County Public Schools)	12/18/06

Codes
1 = Program Chair
2 = Co – Program Chair (if any)
3 = Dissertation Advisor
4 = Committee Member
5 = Non-Program Representative
6 = Specialization Advisor

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