TECHNOLOGY ADOPTION AND INTEGRATION LEVELS: A COMPARISON STUDY
BETWEEN TECHNOLOGY-MINDED GENERAL EDUCATORS AND
TECHNOLOGY-MINDED DEAF EDUCATORS

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The purpose of this study was to determine whether working in the field of deaf education, as opposed to general education, results in a higher level of technology integration. A secondary goal was to determine if deaf educators who are deaf integrate technology at a higher level than their hearing counterparts. The instrument chosen for this study was the LoTi Technology Use Profile, a tool used to explore the role of technology in the classroom.

A total of 92 participates were included in the study of which 48 were regular educators and 44 were deaf educators. The participants were selected from a population pool whereby teachers were presumably pre-disposed to using technology based upon their attendance at a technology training session in the form of a conference or a class.

Deaf educators as a whole did not perform as well as general educators on the LoTi scales. Given the fact that the technology-minded general educators who comprised the sample population of this study scored exceptionally high on the LoTi scales, further research is needed to ensure comparability between the two groups. The findings of the current study do suggest, though, that deaf educators who are deaf have the potential to integrate technology to a greater degree than deaf educators who are hearing. Thus, a primary recommendation is to conduct a national LoTi survey of typical, rather than technology-minded, deaf educators as a comparison to the 2004 national survey of typical general educators.
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CHAPTER 1
INTRODUCTION

In 1815 and 1914 paper and fountain pens, respectively, were the new technologies that teachers and principals resisted, citing preference for more familiar and traditional tools (Sullivan 2004). Similar beliefs have been expressed as each technological advance has appeared on the horizon. Though specific technologies change, the patterns of acceptance and integration into educational settings typically have remained constant. It is not until the technology becomes transparent that it is indeed integrated in the truest sense of the word (Russell, 1995). The CEO Forum asserts, “Our national emphasis should shift from whether or not technology should be used in education to how it should be applied to achieve educational objectives” (2001, p.3). While current computer technology may not be embraced by all teachers, the undeniable fact remains that it is woven into the very fabric of 21st century society and thus essential to today’s students.

Over the past two decades, numerous initiatives, grants, and projects have been established to put hardware and software in classrooms across America (Griffin, 2003). To the general public, technology means machinery (Earle, 2002) and that limited concept has contributed to the out-pacing of equipment over training and integration. The consequences are manifested in classrooms where computers and other technology tools remain either unused or under-used by teachers lacking the desire, time, or skills to transform the
curriculum as opposed to cosmetically altering it. Accordingly, researchers Knezek, Christensen, & Fluke (2003) developed a model for integrating technology, “The model includes three key elements for successful integration of technology: Will (attitude) of the teacher, Skill (technology competency), and Technology Tools (access to technology tools)” (p.10). When all of these elements are addressed, an environment conducive to technology integration is achieved.

According to Russell (1995), novice users must pass through several stages along the path towards embracing technology: Awareness, Learning the process, Understanding and application of the process, Familiarity and confidence, Adaptation to other contexts, and Creative application to new contexts. During the early stages, computer anxiety and frustration must be overcome and one way to accomplish that is by using the technology for real-world activities (Russell, 1995). Thus the attitude and the skill level work in concert with one another. By the time a user reaches the later stages, the focus of technology has turned from the tool to the task.

Researchers have noted that teachers, even those who are comfortable with technology, frequently use computers for personal productivity, rather than student instruction (Earle, 2002; Popson, 2005). Moreover, when students do use the computer, the interaction may take place in a virtual vacuum with exercises unrelated to the curriculum and reduced to computer literacy drills with emphasis on the tool, not the subject (Jacobsen, 2001; Moersch, 1995). Staples,
Pugach, & Himes (2005) conducted a qualitative study on urban schools and reported that computers functioned as an add-on activity and the teachers used them to keep students busy, to teach basic technology skills, or to give them a reward. Although access to technology and the desire to learn are critical first-steps, they should be the catalysts that launch a more in-depth application of those skills into the curriculum. “Our infatuation with the promises and possibilities of technology as hardware at the expense of technology as a process has overshadowed key lessons which we have learned from prior experiences in the field of educational technology” (Earle, 2002, ¶ Lessons).

Some teachers, however, have indeed reached the stage where computers are used in concert with the curriculum (Willis & Cifuentes, 2001). For these instructors, the technology is not so much the focus, as is the lesson and subject material. That shift is reflected in a statement by Lewis (1999, p. 49), “If schooling is to have desired meaning for children, then the various elements of the curriculum must cohere . . . technology education must establish itself not just in its own right, but crucially in relation to other subjects.” Embedding technology into the curriculum, though, means more than just duplicating paper-and-pencil activities with new tools and reinforcing basic skills (Hughes & Zachariah, 2001; Staples, Pugach, & Himes, 2005; Walker & White, 2002).

According to the Teachers’ Tools for the 21st Century: A Report on Teachers’ Use of Technology, 61% of teachers indicated that word processors and spreadsheets were the top-level computer activities performed (National
Center for Education Statistics, 2000). Moersch (2001) reports similar findings – 69% of surveyed educators use classroom computers for information gathering and other basic tasks. When fully integrated, technology should not just make tasks easier, but actually richer which requires a change in teaching pedagogy (Owen & Demb, 2004; Wetzel, 2002). “The challenge for teachers is to not just use technology to achieve certain isolated tasks but to integrate technology that supports purposeful problem-solving, and experiential learning activities” (Griffin, 2003, p. 41).

A decade has passed since Bernauer (1995) and Moersch (1996) emphasized the notion of using technology to support higher order thinking skills, but the struggle is on-going. The recently released National Education Technology Plan (2004) has a stated goal of encouraging students to use technology to think critically. “It is only the use of technology in this manner [to solve authentic problems] that allows students to reach analysis, synthesis and evaluation levels of Bloom’s Taxonomy,” (What is Technology Integration, 2004, ¶ Introduction).

In deaf education, educational technology is perhaps even more important than in general education in terms of motivation and access (Milone, 2004; Roberson, 2001). The National Agenda, published in 2005, established a set of priorities designed to improve the nature of deaf education programs with goal six being: “Technology must be made available for and used by deaf and hard of hearing students to enhance their communication and language opportunities,
enlarge their educational options, increase cognitive and academic skills, and enrich their lives now and in the future” (p.32). The report elaborates that technology should be used to evaluate, analyze, solve problems, make decisions, and increase creativity outlets (National Agenda, 2005). Two different, but similar groups of students – those that are hearing and those that are deaf – therefore have a common goal of using technology for critical thinking and problem solving. Perhaps this quote from Richardson best sums up our charge:

[Gene] Roddenberry’s future portrays a computer-driven space ship in a programmed environment, but the characters must be problem solvers of the highest level. The computer quickly calculates, organizes and contains the banks of knowledge but is still just the tool for the people who must make knowledgeable decisions. This is the direction educational technology must take (1992, p. 1).

The Problem

There is a lack of empirical evidence regarding the similarities or differences in technology integration between deaf educators and general educators. Additionally, there is a lack of empirical evidence regarding the similarities or differences in technology integration between deaf educators who are deaf and those who are hearing.

Purpose of the Study

The purpose of this study is to determine whether working in the field of deaf education, as opposed to general education, results in a higher level of
technology integration. A secondary goal is to determine if deaf educators who are deaf integrate technology at a higher level than their hearing counterparts. A final goal is to evaluate the personal computer usage between general educators and deaf educators.

**Research Questions**

This study was designed to explore the following research questions:

1. Is there a difference between the levels of technology integration of K-12 technology-minded general educators and K-12 technology-minded deaf educators?

2. Is there a difference between the levels of technology integration of K-12 deaf educators who are deaf and K-12 deaf educators who are hearing?

3. Is there a difference between K-12 general educators and K-12 deaf educators in terms of their personal computer use?

**Significance of the Study**

One of the goals of the historic No Child Left Behind law is to use technology in a way that produces evidence of improved academic achievement (Steffan, 2004). Academic achievement may ultimately be measured through standardized tests; however, it is the use of higher-order thinking skills that propel students to excel. “That is, it appears that it is not technology per se that has resulted in improved student outcomes, but rather how the technology was used and integrated into instructional process” (Bernauer, 1995, p.3). Moreover, the integration of technology into classrooms has yet to reach its full potential on
a wide-scale and few studies have examined the degree of integration (Staples, Pugach, & Himes, 2005). Both national and state standards support the idea of pushing technology use beyond the routine and into a higher cognitive domain. The International Society for Technology in Education (ISTE) details the standards that classroom teachers should achieve in the National Educational Technology Standards for Teachers (NETS*T) publication (NETS, n.d). The Texas School Technology and Readiness (STaR) Chart is a state-level tool that ascertains the stage of technology integration at which a teacher is functioning. The Texas Education Association’s goal for teachers is the ‘Target Tech’ level which means technology is being used to create an atmosphere conducive to higher-order thinking skills (Texas STaR chart, n.d.).

Given these mandates and the associated grant and project incentives, it is therefore both a responsibility and an opportunity to identify ways to move technology toward the desired integration level. In a national survey of almost 50,000 teachers from twenty states during the 2003-2004 school year, 23% were not using technology at all and another 66% were using it below the integration level leaving only 11% who used technology as a tool for developing higher-order thinking skills (LoTi Technology Use Profile, 2004). By identifying sub-groups that are performing at deeper integration levels, it may be possible to extrapolate ways that general educators might move beyond their current plateaus.

The sub-group of particular interest to this study is deaf educators. An excerpt from a Preparing Tomorrows Teachers with Technology (PT3) report 
highlights the rationale for this choice: “Faculty also note the increased frequency with which they work with deaf education colleagues from around the nation and how they are often perceived to be one of the more technologically proficient individuals within their own colleges” (U.S. Department of Education, 2005, ¶ Objective 1.2F). Additionally, of the seven communities that were involved in the Star Schools Project from the United Star Distance Learning Consortium (USDLC), the deaf education group out-performed all the others in terms of technology integration based on qualitative observations (Rodgers, 2003).

The literature review will show, however, that much of the existing research with regards to deaf educators’ use of technology is descriptive in nature, focusing primarily on individual projects, hardware/software availability, and skill proficiencies. Several researchers have noted that there is very limited research in regards to deaf education and the use of technology at the K-12 level (Popson, 2005; Roberson, 2001). A review of the deafness-related dissertations for the years 2002-2004, as reported by the American Annals of the Deaf, resulted in 108 papers of which 10 were technology oriented. None of these ten dealt with technology integration levels in the K-12 environment.

Among deaf educators, there may also exist a difference in how technology is used between teachers who are deaf and teachers who are hearing. “The Deaf Power movement heightened awareness of the relationship between deaf and hearing persons in the Deaf community. As a consequence, researchers began to look at differences between deaf and hearing teachers”
Although Marlatt’s study did not address technology, the students did rank deaf teachers as more effective than hearing teachers in regards to lesson structure, engagement, classroom management, lesson planning, and lesson procedure (2004). It is therefore essential that further research be conducted so as to support or refute the notion that deaf educators, including both deaf and hearing, integrate technology at a higher level than general educators. For if they do, then perhaps there are lessons to be gleaned that would ultimately benefit a generation of students – both deaf and hearing.

**Basic Assumptions**

It is assumed that teachers respond to the Levels of Technology Integration (LoTi) survey honestly. Furthermore, it is assumed that someone who attended a technology conference or course in the past year is inclined to use technology in his/her classroom to some degree.

**Limitations of the Study**

This study surveyed only general educators and deaf educators who attended a technology-related conference or course. The primary conference attended by the deaf educator subjects was the Instructional Technology and Education of the Deaf Symposium. The general educator subjects were primarily students in the Masters Across Technology (MAT) program at the University of North Texas. The MAT program is an on-line opportunity for current K-12 teachers to earn a Masters degree in teaching and learning with technology.
Therefore, the results may not be applicable to the community of educators at large.

This study will encompass a broad spectrum of educators from K-12. Although the pool of potential subjects for both groups is similar, there will be no attempt made to match up teachers who have similar teaching backgrounds on a one-to-one basis. Therefore, there will be uncontrolled variables that may influence the results.

Definition of Terms

*Deaf persons*: “The Deaf community is a well-recognized minority population with its own language, culture, and beliefs” (Zazove et al, 2004). However, for the purpose of this study a deaf person will be anyone who has a hearing loss regardless of their affiliation with the hearing or Deaf community. Therefore, a lowercase ‘d’ will be used when referring to deaf individuals.

*Deaf educator*: A teacher who works with deaf or hard-of-hearing students. This teacher may be at a residential school, a regional day school, or in a mainstream setting.
CHAPTER 2
REVIEW OF RELATED LITERATURE

Introduction

“Educators working with all age groups have been increasingly called upon to include technology in their teaching repertoire” (Darroch & Castle, 2005, ¶ Technology in the Classroom). Including and integrating are not interchangeable terms though – the later implies a focus on curriculum blended with technology versus the technology itself. Staples, Pugach, & Himes (2005) found that teachers may say they believe in integration, but that doesn’t mean they are putting it into practice. Integration is the desired approach to using technology because it promotes higher-order thinking skills (CEO Forum, 2001; Hawkins, 1997) aligned with the top levels of Bloom’s Taxonomy, the cognitive learning classification model used as the theoretical basis of the study. Bloom’s Taxonomy has six levels of cognitive complexity: knowledge, comprehension, application, analysis, synthesis, and evaluation (Forehand, 2005). As Earle stresses:

[Technologies] must go beyond information retrieval to problem solving; allow new instructional and learning experiences not possible without them; promote deep processing of ideas; increase student interaction with subject matter; promote faculty and student enthusiasm for teaching and learning; and free up time for quality classroom interaction – in sum, improve the pedagogy (2002, ¶ A Closer Look).
This chapter thus highlights the recent technology integration research studies and initiatives in order to provide a framework for the current project. The first section concentrates on general education while the second section concentrates on deaf education. The chapter concludes with a brief look at the available instruments to measure technology integration including the Levels of Technology Implementation Questionnaire (LoTi) which was ultimately chosen.

Technology Integration in General Education

Numerous studies look at the amount of technology available to teachers and students along with the frequency and reasons for using those computers. The focus of this literature review, however, will be studies that dealt specifically with the degree and manner of integration or the barriers preventing integration. “Integration is defined as making pedagogical and curricular changes to include technology” (Wetzel, 2002, p.43). Walker and White assert, “The technorealism approach in teacher education suggests the integration of technology that can facilitate ‘powerful’ approaches to teaching and learning including meaningful, creative, challenging, inquiry-based, and active applications” (2002, p. 65).

Integration Issues: Training

In that spirit, the Apple Classrooms of Tomorrow (ACOT) project, which concluded in 1998, was conducted for thirteen years and looked at the use of technologies in 100 classrooms across the United States. ACOT classroom teachers progressed through a series of stages (entry, adoption, adaptation, appropriation, invention) and were encouraged to view technology as a medium
for thinking, collaborating, and communicating (ACOT History, n.d.). These stages are similar to those outlined previously by Russell (1995).

Pope, Hare, & Howard (2002) noted that pre-service teachers were being required to take a technology skills course, but not integrating those skills in their method courses which resulted in a disconnect between the two. Therefore, they conducted a quantitative study with 26 participants to determine if their confidence level would increase after a treatment of instruction and modeling on specific integration techniques during the methods course. The survey was called ‘Technological Proficiency and Confidence Level for classroom integration (TPCL). The assumption was that as confidence increased so would positive attitudes about computers and that would lead to deeper integration (Pope, Hare, & Howard, 2002). The idea of confidence and integration being tied together was also reported in a study by Christensen: “The amount of confidence a teacher possesses in using computers and related information technologies (often referred to as simply ‘technology’) may greatly influence his or her effective implementation of technology methods in the classroom” (2002, p. 411). A survey administered by Alexiou-Ray, Wilson, Wright, & Peirano found simply that the discomfort of the unknown could explain much of the initial resistance to technology (2003).

In another study on pre-service teachers, Willis & Cifuentes concluded that teachers must be trained in the process of integrating technology rather than trained in specific computer applications (2001). They also state, “Technology
training that is aligned with the curriculum and relevant to what teachers do in the classroom is most effective” (2001, ¶ Results). Their study used the Concerns-Based Adoption Model (CBAM) instrument with the concern being technology integration (Willis & Cifuentes, 2001). The CBAM instrument outlines seven stages that a person goes through as they engage in a new practice: Awareness, Informational, Personal, Management, Consequence, Collaboration, and Refocusing (Horsley & Loucks-Horsley, 1998). These stages move from self concerns, to task concerns, and finally to impact concerns.

Impact concerns describe our thoughts on how we can make a program work better for learners (typically students) (Stage 4, Consequence), how to make it work better by actively working on it with colleagues (Stage 5, Collaboration), and, ultimately, being successful with the program and seeking out a new and better change to implement (Stage 6, Refocusing) (Horsley & Loucks-Horsley, 1998, p.18).

Bober echoes that student teachers must go beyond learning about the technology itself (2003). A qualitative study by Staples, Pugach, & Himes also noted that the educators interviewed for their study did not feel properly trained during their teacher preparation programs (2005). Their definition of using technology well was, “using technology in the service of the curriculum” (Staples, Pugach, & Himes, 2005, p. 305).
Integration Issues: Leadership

Once teachers move into classrooms of their own another factor becomes paramount for successful technology integration – the support of administrators and leadership figures. “Experts would agree that the success or failure of technology integration could be linked to the behaviors and ideologies of the instructional leader” (Hughes & Zachariah, 2001, ¶ Introduction). These researchers and others (Griffin, 2003; Schechter, 2000) found that integration barriers included a lack of shared vision, non-existent or minimal staff development programs, and a failure to empower teachers. The hypothesis of their study was that a correlation existed between teachers’ perception of leadership and effective integration of technology in the classroom. Findings showed that 89% of teachers who had a democratic leader versus 50% who had an authoritarian leader were inclined to have more positive attitudes towards technology (Hughes & Zachariah, 2001). Teachers who feel pressured may feel that their own role is being minimized, so, “Enabling teacher-leadership is another way that leaders can make technological innovation a reality in our schools” (Hughes & Zachariah, 2001, ¶ Conclusion).

In regards to supportive leadership activities, Owen & Demb (2004) recommend: encouraging innovation, providing development incentives, recognizing projects, establishing mentor programs, creating peer pressure, and publicizing efforts. Jacobsen summarizes, “The transformation of classroom technology from hardware, software, and network connections into thinking tools
for teaching and learning requires effective and enabling leadership by visionary and knowledgeable school administrators and boards, and effective ongoing professional development and support from teachers” (2001, ¶ Introduction).

Integration Issues: Time

The literature also reveals that ‘time’, both for planning and for collaborating, was a top barrier for technology integration in several studies (Earle, 2002; Jacobsen, 2001; Wetzel, 2002). Norris & Soloway bring that concern to light: “[Teachers] need more time to fully integrate technology into their curricula and more opportunities to interact with their colleagues around the use of educational technology” (2000, p.13). Given the current state of standardized testing and accountability, educators may feel stretched even further in terms of prioritizing materials and learning avenues. Whether it is time, leadership support, training, comfort level, or any number of other factors: “Still, the gap between technology presence in schools and its widespread effective use is too wide” (Jacobsen, 2001, ¶ Conclusion).

Technology Integration in Deaf Education

There is a limited amount of data in the literature about classroom technology research in deaf education and even less on technology integration and the impact of technologies upon academic performance (U.S. Department of Education, 2005). To illustrate the magnitude of the situation, Roberson stated, “A review of the literature for the present study showed that no new information
on the use of educational technology within teacher preparation programs has been gathered since 1986” (2001, p.61).

Comparison to General Education

The studies that have been conducted indicate that deaf educators and general educators face similar issues. Instructional context plays a pivotal role regarding the impact of technology and makes it possible for deaf students to have meaningful learning activities within subject disciplines (Moeller, 1994). For deaf students, the innovative use of technology not only helps learning, but reduces isolation (Pillai, 1999; U.S. Department of Education, 2005).

In deaf education training programs, however, computer technology often takes a back seat to host of other required courses such as sign language, audiology, reading, etc. In a survey by Dodd & Scheetz, whereby 110 deaf educators in Georgia were surveyed on their college coursework, there was no mention of any technology integration courses (2003). Roberson (2001) sent a technology survey to faculty of deaf education programs and to administrators in deaf education programs. He reported, “Although faculty members indicated that the majority of the [technology] competencies were important, the integration and modeling of these competencies was minimal” (Roberson, 2001, p. 65). His recommendation of not relying on separate technology courses, echoed that of the general education researchers previously mentioned.

Roberson (2001) found that the number one issue stopping deaf education teachers from using more computers was time, again mirroring general
education. Time, resources, and training, however, are first-order barriers to technology integration; attitudes, beliefs, and practices are second-order barriers (Earle, 2002). It may be that deaf educators and general educators share first-order barriers, but distinguish themselves in terms of second-order barriers since technology is arguably more intertwined in the daily lives of deaf people than hearing people.

The Council on the Education of the Deaf (CED) accepted ISTE standards concerning technological proficiencies, and a technology strand was added to the annual convention of ACE-D/HH (U.S. Department of Education, 2003).

During year three of the grant the focus evolved from encouraging faculty and pre-service teachers to learn and use technology, to now collaboratively developing new instructional settings in which instructional content, e.g., literacy, math and science, rather than instructional technology is the focus (U.S. Department of Education, 2003, p.2).

A similar phenomenon occurred during the Star Schools Project. At the beginning of the program there was very little technology use, but by the end teachers had seen how beneficial it could be especially in a bilingual classroom with a visual language. The study took a descriptive look at the five participating schools and detailed many examples of technology integration (Nover, Andrews & Everhart, 2001).
Technology Integration Projects - PT3 Grants

In the past few years, deaf education leaders have polished their modeling behaviors as well. Johnson (2004) relays that a $2.1 million Preparing Tomorrow’s Teachers to Use Technology (PT3) grant was awarded to the Association of College Educators- Deaf/Hard of Hearing (ACE-D/HH).

As of March 31, 2002, a total of 145 deaf education teacher preparation program faculty in 58 of 71 programs across 32 of 34 possible states had made 462 choices to enhance their instructional programming by either learning, using, or assigning their pre-service teachers to use computer-based Internet-linked technologies and resources (Johnson, 2004, p.88).

As part of this grant, a virtual community of learners was established at www.deafed.net. Here, for example, exceptional teachers serve as clinical faculty to model and explain instructional strategies (Johnson, 2004). As of July 2004, there were over 16,000 registered users on the deafed.net site (U.S. Department of Education, 2005).

Another part of the PT3 grant awarded to the ACE-D/HH group, funding years of October 2003 to September 2006, was ‘Objective 2.3’ which addresses best practices competence of pre-service teachers. In order to establish a baseline, a survey was sent to Master Teachers to determine what technology resources and competencies they had (U.S. Department of Education, 2005). “Overall, the survey data indicates that Master Teachers appear to be more comfortable/competent in the personal vs. professional uses of technologies . . .
[i.e.] less confident of their ability to use technology to increase the higher order thinking skills [emphasis added] of their students” (U.S. Department of Education, 2005, ¶ Objective 2.3 B).

Additional Technology Integration Project Examples

Technology in Education Can Empower Deaf Students (TecEds) was another national initiative to train teachers of deaf and hard of hearing students to integrate technology into the instructional process (Milone, 2004). The two main goals were to improve technology skills of deaf educators and to train teachers to integrate those technology tools into their work with deaf students (Mackall, 2002). As a result, two databases were established online – one of which houses lesson plans and activities that integrate technology with a current repertoire of 95 modules (Mackall, 2002).

Through funding support from the National Science Foundation, an information warehouse for disseminating information to deaf education professionals was created called COMETS – Clearinghouse on Mathematics, Engineering, Technology and Science (Comets, n.d). According to principle investigator Harry Lang, one of the goals of the project was to make best practices research available to deaf educators who might not be aware of journal articles and scholarly studies.

Besides the initiatives described above, Parton (2005; 2006) described a variety of projects, both large and small, which focused on the use of technology to creatively reach deaf students through multimedia designs, distance learning,
signing avatar and captioning projects, and virtual reality. For example, SOAR-High is a web-based science class for deaf students. “By its very nature and design, SOAR-High increased student’s exposure not only to the science content but also to technology” (Parton, 2005, p. 67). Likewise, the ‘What’s the Weather’ project incorporates signing avatars and also includes interactive features such as sharing through web-based forms that lead to “hands-on, minds-on” experiences (Parton, 2006). As previously mentioned, however, most of these projects have only been described and evaluated qualitatively, not quantitatively.

Measurement of Cognitive Learning

Introduction

The International Society for Technology in Education (ISTE) has developed the National Educational Technology Standards for Teachers (NETS*T). According to the NETS*T:

Teachers must be prepared to empower students with the advantages technology can bring. Schools and classrooms, both real and virtual, must have teachers who are equipped with technology resources and skills and who can effectively teach the necessary subject matter content while incorporating technology concepts and skills (NETS, n.d, ¶ Introduction). “The term computer efficiency is defined as the degree to which computers are being used to support concept-based or process-based instruction, consequential learning, and higher order thinking skills (e.g., interpreting data, reasoning, solving real-world problems)” (Moersch, 1996, p.52). These higher-
order thinking skills are represented as analysis, synthesis and evaluation on Bloom’s Taxonomy, a cognitive level of complexity classification chart published in 1956 and widely-used today (Boatman, 1998; Forehand, 2005). In order to help teachers move their students toward these higher order cognitive skills, it is beneficial to be able to quantify the classroom technology integration practices.

**Instruments**

There are several instruments available to measure technology usage and integration including Profiler, iAssessment, Mankata, and LoTi (Moersch, 2002). All these instruments have been aligned with the ISTE NETS*T. The percentage of questions that focus on integration rather than skills for the instruments are as follows: Mankato (3%), iAssessment (16%), Profiler (80%), LoTi (80%). The difference between the two types of questions can be summarized as:

Technology integration items focus on those statements involved with the use of computers in the classroom setting ranging from how computers are used to complement students’ understanding of the content to the manner in which computers are used to promote higher order thinking processes (Moersch, 2002, p.12).

**The LoTi Survey**

The Levels of Technology Implementation (LoTi) survey is a nationally-validated assessment created in 1998 used to explore the role of technology in the classroom. The LoTi has been used to assess tens of thousands of classroom teachers’ level of technology use. It incorporates the work of the
Concerns-Based Adoption Model (CBAM) discussed in Chapter 1, and aligns with the School Technology and Readiness (STaR) Chart (Moersch, 2001). The STaR Chart helps schools determine if they are making progress towards technology goals and measures the impact on student learning due to technology (Star Chart, n.d.).

“Research studies have verified that the higher the Level of Technology Implementation (LoTi), the higher the level of Bloom’s Taxonomy is achieved” (What is Technology Integration, 2004, ¶ Introduction). A dissertation study by Griffin (2003) found that administrators tended to score higher on the LoTi than teachers and among teachers, elementary level educators scored higher than secondary ones. Her findings also indicated: “Even though these younger teachers have higher personal computer use skills, it does not translate directly into these teachers having a higher technology level of use than those with more years of teaching experience” (2003, p.119).

Summary

“True [technology] proficiency goes well beyond isolated skills to the ways in which knowledge, skills, and values converge or meld to affect the teaching and learning dynamic and contribute to pedagogical excellence” (Bober, 2003, p. 211). After years of putting computers and related technologies into schools and distributing over 400 PT3 grants (Bober, 2003), proficiency, in this sense, is still lacking. A majority of educators, even those with high incidents of personal computer use still use technology for either a limited amount of time or within a
limited range of activities (LoTi Technology Use Profile, 2004). Those activities often are also not ones that directly involve the students.

The barriers confronting educators as they try to integrate technology appear to cluster around three central themes: training, leadership, and time. Training barriers encompass both the resistance to change that many educators feel when presented with new technologies and the lack of integration experience during teacher pre-service or in-service classes. Leaders have the power in many cases to encourage or discourage technology integration through their example and directives especially in regards to mentoring. Time as a barrier is a thread throughout the literature, however some researchers argue that not having time for technology really means that technology integration is not a priority (U.S. Department of Education, 2005).

Research studies, especially in deaf education, tend to describe individual projects or report on the skills of educators. Many of the same barriers to technology integration that are cited by general educators are also cited by deaf educators. Although there is a general sense that deaf educators rely upon technology in a more sophisticated way than general educators, there are no empirical studies in the literature that describe that phenomena or whether it exists.

Researchers have developed a battery of instruments over the years to measure technology use. These have ranged from primarily demographic type surveys that report on the amount of computers available to students and the
classroom time devoted to their use, to surveys focused on the educator’s attitude and readiness to embrace technology, and finally to surveys that examine the extent to which available technology is being used to deepen the cognitive processing of students. The LoTi survey is one such instrument that has been used across a wide spectrum of educational settings and is considered a robust tool for placing teachers on a scale which parallels the ordered thinking skills pyramid known as Bloom’s Taxonomy.
CHAPTER 3

METHODOLOGY

Purpose

The main purpose of this study is to determine whether working in the field of deaf education, as opposed to general education, results in a higher level of technology integration among K-12 teachers who are already inclined to possess both the skills and desire to use computers and related technologies. Additionally, the study will seek to determine if the sub-groups within deaf education (i.e. deaf teachers and hearing teachers) vary in regards to technology integration. Furthermore, a goal is to evaluate whether personal computer usage varies between general educators and deaf educators.

Null Hypotheses

The study was designed to test the following hypotheses:

1. There is no significant difference between the level of technology integration of K-12 technology-minded general educators and K-12 technology-minded deaf educators.

2. There is no significant difference between the levels of technology integration of K-12 technology-minded deaf educators who are deaf and K-12 technology-minded deaf educators who are hearing.

3. There is no significant difference between K-12 technology-minded general educators and K-12 technology-minded deaf educators in terms of their personal computer use.
Research Participants

Since researches have studied the number of teachers using technology and shown that around 25% in recent years are at a non-use level (LoTi, 2004), this study sought to use participants who were likely to not fall within that category. Therefore, participants from a national, educational technology-focused conference and a local, technology-focused course were targeted. For the pool of general educators, the course was part of the Masters Across Technology (MAT) program at the University of North Texas. For the pool of deaf educators, the conference attendee list from the Instructional Technology and Education of the Deaf Symposium was selected. These two groups are comparable in that both are aimed at teachers with an interest in technology, and both include teachers at all grade levels/subject disciplines. The two training events are approximate in size – due to the nature of deaf education, the symposium is a small conference attracting approximately 200 people. The number of eligible students in the MAT class was approximately 150. Both groups have enough people to render a satisfactory sample size. The conference took place in the summer of 2005 and the courses occurred during spring of 2006. Only attendees or students who are currently teaching in a K-12 classroom in the United States were invited to participate. This research will use a convenience sample whereby conference attendees and students will voluntarily self-select into the study.
Instrumentation

The instrument chosen for this study is the LoTi Technology Use Profile, a nationally-validated assessment created in 1998 used to explore the role of technology in the classroom. It has been taken by over 180,000 educators across the United States and used in over 40 dissertations (Stoltzfus, 2005). There are three measures within the questionnaire: 1) the LoTi scale 2) the Personal Computer Use (PCU) and 3) the Current Instructional Practices (CIP). The LoTi scale measures classroom technology integration within the following levels and associated implications (LoTi, 2004; see also Appendix A):

- Level 0 – Nonuse
- Level 1 – Awareness
- Level 2 – Exploration
- Level 3 – Infusion
- Level 4a – Integration (Mechanical):
- Level 4b – Integration (Routine)
- Level 5 – Expansion
- Level 6 – Refinement

The PCU portion assesses classroom teachers’ comfort and skill level with using a personal computer on a scale of 0 to 7 (see also Appendix B). The CIP portion assess classroom teachers’ current instructional practices relating to a subject-
matter versus a learner-based curriculum approach also on a scale of 0 to 7 (LoTi, 2005). For the purposes of this study, only the LoTi and the PCU will be analyzed.

An extensive validation study of the Loti Questionnaire was recently performed by Stoltzfus and Moersch (2005). Their findings indicate that the three measurements within the LoTi survey (LoTi levels, CIP, and PCU) had internal reliability meaning that the parts correlated well with each other. Inter-rater reliability and test-retest reliability were not appropriate measures since the LoTi is a self-report survey and scores are expected to increase over time. They also achieved content validity, meaning the survey measures what it claims to measure. For example, the LoTi has a high correlation with a standardized rubric showing the technology implementation complexity of teachers’ lesson plans (Stoltzfus & Moersch, 2005). Previously Griffin (2003) also reported, “Reliability measures from this study found the LoTi Questionnaire to have an overall reliability coefficient of .94. . . [it] is a reliable instrument for measuring levels of technology use” (p. 62).

Procedures

Permission to survey the attendees from the Symposium for Technology and Deaf Education was granted in October 2005. Permission to survey the MAT students at the University of North Texas was granted in January 2006. In both cases a prepared email with a consent agreement, instructions, and a link to the on-line LoTi Questionnaire was sent by the conference or class leader so that
personal data was not given to the researcher. Permission to conduct this research project was secured from the Institutional Review Board (IRB) of the University of North Texas on October 11, 2005 (Appendix C). Permission to use the on-line LoTi Questionnaire was received on July 17, 2005 from Chris Moersch (Appendix D). This research study was assigned an unique group id and password that was distributed in the aforementioned email to subjects who must then register an unique personal id and password. The survey included standard demographic questions along with two customized demographic questions. The total amount of time required to take the LoTi was approximately 20 minutes. Subjects automatically received feedback from the LoTi site indicating their current and target levels of integration along with lesson plans.

After the survey was administered to all subjects who chose to participate by February 28, 2006, the researcher was electronically given all of the raw data from the LoTi administration office. The email addresses of 94 subjects were put in a box separated according to classroom type, and then a name was drawn from each. These two people each received a $50 Wal-mart gift card which fulfilled the incentive award process.

**Data Analysis**

In order to describe the targeted population, the following demographic data was generated: subject area, grade level, years of experience, age group, gender, education level, number of computers in the classroom, internet availability, frequency of computer use, access to a personal computer at home,
internet availability at home, hours of technology-related training received, type of
technology-training received, source of technology integration assistance,
perceived obstacles to technology use, collaboration efforts, conference
attendance, and hearing status. Only a portion of these demographics were of
importance to this study. Descriptive data also included frequencies, means, and
sample sizes of both the LoTi profile score and the PCU intensity level. The .05
alpha level was applied to all data as the standard for significance. Independent
sample t-tests were used to test hypotheses one, two, and three.
CHAPTER 4

ANALYSIS OF DATA

Introduction

The following hypotheses were tested during the course of this investigation:

1. There is no significant difference between the level of technology integration of K-12 technology-minded general educators and K-12 technology-minded deaf educators.

2. There is no significant difference between the levels of technology integration of K-12 technology-minded deaf educators who are deaf and K-12 technology-minded deaf educators who are hearing.

3. There is no significant difference between K-12 technology-minded general educators and K-12 technology-minded deaf educators in terms of their personal computer use.

Description of the Study Population

A total of 94 K-12 teachers in the United States participated in the study by answering the on-line survey. Two surveys were eliminated from the analysis because the demographic responses indicated they were deaf individuals teaching in regular education classrooms. It was assumed that these individuals identified themselves accidentally with the wrong group since the described teaching scenario would be highly unusual. Therefore, a total of 92 participates
were included in the population of which 48 were regular educators and 44 were deaf educators.

The description of the group was based on seven demographic items. Respondents were asked to report their hearing status, gender, age, years of teaching experience, teaching grade level, education level, and hours of technology training completed. The electronic nature of the submissions resulted in only complete surveys being accepted.

All of the regular education teachers were hearing. A total of ten (22.7%) of the 44 deaf educators were deaf with the remaining 34 (77.3%) being hearing. Table 1 shows the demographic frequencies of hearing status among the participants.

Table 1

<table>
<thead>
<tr>
<th>Hearing Status</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing</td>
<td>48</td>
<td>34</td>
<td>82</td>
<td>89.1</td>
</tr>
<tr>
<td>Deaf</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>10.9</td>
</tr>
</tbody>
</table>

There was a greater percentage of female subjects than male subjects overall and for both sub-groups. Table 2 depicts the demographic frequencies for gender.
Table 2

Demographic Frequencies of Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>37</td>
<td>37</td>
<td>74</td>
<td>80.4</td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>7</td>
<td>18</td>
<td>19.6</td>
</tr>
</tbody>
</table>

Table 3 indicates the demographic frequencies of age and years of teaching experience. A total of 18 (19.6%) teachers had less than five years experience; 17 (18.5%) had between five and nine years of experience; 28 (30.4%) had between ten and twenty years of experience; 29 (31.5%) had more than twenty years of experience. The reported age range followed a similar pattern with 13 (14.1%) age 21-30; 21 (22.8%) between 31-40; 32 (34.8%) between 41-50; 26 (28.3%) over age 50. The deaf educators tended to be older and more experienced than the general educators in this sample population.
Table 3

Demographic Frequencies of Years of Teaching Experience and Age

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5</td>
<td>14</td>
<td>4</td>
<td>18</td>
<td>19.6</td>
</tr>
<tr>
<td>5-9</td>
<td>13</td>
<td>4</td>
<td>17</td>
<td>18.5</td>
</tr>
<tr>
<td>10-20</td>
<td>18</td>
<td>10</td>
<td>28</td>
<td>30.4</td>
</tr>
<tr>
<td>&gt; 20</td>
<td>3</td>
<td>26</td>
<td>29</td>
<td>31.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Frequency</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30</td>
<td>8</td>
<td>5</td>
<td>13</td>
<td>14.1</td>
</tr>
<tr>
<td>31-40</td>
<td>15</td>
<td>6</td>
<td>21</td>
<td>22.8</td>
</tr>
<tr>
<td>41-50</td>
<td>20</td>
<td>12</td>
<td>32</td>
<td>34.8</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>5</td>
<td>21</td>
<td>26</td>
<td>28.3</td>
</tr>
</tbody>
</table>

Table 4 shows the grade levels that the subjects reported teaching. The highest percentage of subjects, 34 (37%), reported teaching in an all-level environment with the majority of those falling within the deaf educators sub-group. Approximately one third, 30 (32.6%), reported teaching at the elementary level. The remaining 28 teachers reported teaching at the intermediate level (10.9%) or the secondary level (19.6%).
Table 4

Demographic Frequencies of Teaching Grade Level

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>22</td>
<td>8</td>
<td>30</td>
<td>32.6</td>
</tr>
<tr>
<td>Intermediate</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>10.9</td>
</tr>
<tr>
<td>Secondary</td>
<td>9</td>
<td>9</td>
<td>18</td>
<td>19.6</td>
</tr>
<tr>
<td>All Level</td>
<td>12</td>
<td>22</td>
<td>34</td>
<td>37</td>
</tr>
</tbody>
</table>

Table 5 depicts the demographic frequencies of education level. Although the sample included teachers with an Associate’s degree only, 7 subjects (7.6%), and teachers with a Doctorate, also 7 subjects (7.6%); the largest percentage of teachers held bachelors, 40 subjects (43.5%), or masters, 38 subjects (41.3%) degrees. A greater percentage of teachers in the deaf education subgroup (72.7%) held graduate degrees than teachers in the general education subgroup (27.1%).
Table 5

Demographic Frequencies of Education Level

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associates</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>7.6</td>
</tr>
<tr>
<td>Bachelors</td>
<td>32</td>
<td>8</td>
<td>40</td>
<td>43.5</td>
</tr>
<tr>
<td>Masters</td>
<td>10</td>
<td>28</td>
<td>38</td>
<td>41.3</td>
</tr>
<tr>
<td>Doctorate</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>7.6</td>
</tr>
</tbody>
</table>

Table 6 reflects the amount of hours of technology training participants reported. Over half of the respondents (52.2%) have participated in greater than 30 hours of technology training. However, within the subgroups, 37 of the 48 (77.1%) general educators reported greater than 30 hours of technology training, whereas only 11 of the 44 (25%) deaf educators reported likewise. A total of 11 subjects (12%) reported experiencing less than 10 hours of technology training. The remaining subjects reported 11-20 hours of technology training (20.7%) or 21-20 hours of technology training (15.2%).
Table 6

Demographic Frequencies of Hours of Technology Training

<table>
<thead>
<tr>
<th>Technology Training</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10 hrs</td>
<td>2</td>
<td>9</td>
<td>11</td>
<td>12.0</td>
</tr>
<tr>
<td>11-20 hrs</td>
<td>6</td>
<td>13</td>
<td>19</td>
<td>20.7</td>
</tr>
<tr>
<td>21-30 hrs</td>
<td>3</td>
<td>11</td>
<td>14</td>
<td>15.2</td>
</tr>
<tr>
<td>&gt; 30 hrs</td>
<td>37</td>
<td>11</td>
<td>48</td>
<td>52.2</td>
</tr>
</tbody>
</table>

Table 7 describes the response of participants to the question of what obstacle is the greatest barrier to integrating technology in the classroom. Over half (52.2%) of respondents indicated ‘Time to Practice and Plan’ was the greatest barrier. The remainder of the participants selected ‘Other Priorities’ (22.8%), ‘Lack of Staff Development’ (10.9%), ‘Access to Technology’ (9.8%), and ‘None’ (4.3%) as the issue most interfering with classroom technology integration.
Table 7

Demographic Frequencies of Greatest Obstacles to Technology Integration

<table>
<thead>
<tr>
<th>Obstacles</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>4.3</td>
</tr>
<tr>
<td>Access to Technology</td>
<td>4</td>
<td>5</td>
<td>9</td>
<td>9.8</td>
</tr>
<tr>
<td>Time to Plan &amp; Practice</td>
<td>27</td>
<td>21</td>
<td>48</td>
<td>52.2</td>
</tr>
<tr>
<td>Other Priorities</td>
<td>14</td>
<td>7</td>
<td>21</td>
<td>22.8</td>
</tr>
<tr>
<td>Lack of Staff Development</td>
<td>3</td>
<td>7</td>
<td>10</td>
<td>10.9</td>
</tr>
</tbody>
</table>

Table 8 shows the Level of Technology Implementation (LoTi) profile score that participants within each type of classroom received. The LoTi profile ascertains the degree to which each participant integrates technology in a classroom setting. The stages range from: Level 0: Non-use; Level 1: Awareness; Level 2: Exploration; Level 3: Infusion; Level 4a – Integration (Mechanical); Level 4b – Integration (Routine); Level 5: Expansion; Level 6: Refinement (Appendix A). “Level 0: Non-use implies there is a perceived lack of
access to technology-based tools (e.g. computers) or a lack of time to pursue electronic technology implementation” (Appendix A). In contrast:

Level 6: Refinement implies that technology is perceived as a process, product (e.g. invention, patent, new software design), and/or tool for students to find solutions related to an identified “real-world” problem or issue of significance to them. At this level, there is no longer a division between instruction and technology use in the classroom. Technology provides a seamless medium for information queries, problem-solving, and/or product development (Appendix A).

Approximately one-tenth of the sample population received the lowest possible score of 0: Non-use. Only one participant from the regular education setting and one participant from the deaf education setting (2.2%) reached the highest possible level of 6: Refinement. The highest percentage of participants across the two types of classrooms (33.7%) scored a LoTi level of 3: Infusion. “Infusion implies that technology-based tools including database, spreadsheets and graphing packages, multimedia and desktop publishing applications, and internet use complement selected instructional events. . .” (Appendix A). A LoTi score of 4b: Integration-Routine is considered to be the ‘Target Technology Level’ and suggests that the use of technology is focused on higher order thinking skills and real world learning activities (LoTi Technology Use Profile, 2004). A total of 20 participants (21.8%) achieved this level. Within the sub-population of regular
educators, 14 (29.17%) scored at this level and within the sub-population of deaf educators, 6 (13.64%) scored at this level.

Table 8

*Study Participants Classified by LoTi Scores and Type of Classroom*

<table>
<thead>
<tr>
<th>Levels</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0: Non-use</td>
<td>3</td>
<td>7</td>
<td>10</td>
<td>10.9</td>
</tr>
<tr>
<td>Level 1: Awareness</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>7.6</td>
</tr>
<tr>
<td>Level 2: Exploration</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>8.7</td>
</tr>
<tr>
<td>Level 3: Infusion</td>
<td>15</td>
<td>16</td>
<td>31</td>
<td>33.7</td>
</tr>
<tr>
<td>Level 4a: Integration (Mechanical)</td>
<td>10</td>
<td>6</td>
<td>16</td>
<td>17.4</td>
</tr>
<tr>
<td>Level 4b: Integration (Routine)</td>
<td>8</td>
<td>3</td>
<td>11</td>
<td>12.0</td>
</tr>
<tr>
<td>Level 5: Expansion</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>7.6</td>
</tr>
<tr>
<td>Level 6: Refinement</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Table 9 shows the LoTi Personal Computer Usage (LoTi-PCU) scores for participants in each type of classroom. PCU scores range from an intensity level of 0 to an intensity level of 7:
A PCU Intensity Level 0 indicates that the participant does not feel comfortable or have the skill level to use computers for personal use . . . a PCU Intensity Level 7 indicates that the participant demonstrates extremely high skill level with using computers for personal use. Participants at Intensity Level 7 are expert computer users, troubleshooters, and/or technology mentors (Appendix B).

The majority of participants, 76 (82.6%) had a PCU intensity level of five or greater. The predominant level among general educators was seven - the highest possible level (47.9%); the predominant level among deaf educators was six (36.4%).

Table 9

Study Participants Classified by LoTi-PCU Scores and Type of Classroom

<table>
<thead>
<tr>
<th>Levels</th>
<th>Frequency (General Ed)</th>
<th>Frequency (Deaf Ed)</th>
<th>Frequency (Total)</th>
<th>Percent (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>6.5</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>7</td>
<td>8</td>
<td>8.7</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>9</td>
<td>19</td>
<td>20.7</td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>16</td>
<td>29</td>
<td>31.5</td>
</tr>
<tr>
<td>7</td>
<td>23</td>
<td>5</td>
<td>28</td>
<td>30.4</td>
</tr>
</tbody>
</table>
Data Analysis for Hypothesis 1

Research question one asked “Is there a difference between the levels of technology integration of K-12 technology-minded general educators and K-12 technology-minded deaf educators?”. Hypothesis one was tested using an independent samples t-test. A t-test was chosen since only two grouping variables were used. Levene’s homogeneity of variances test statistic was .365, p>.05, which supports the assumption that the means were initially similar enough to conduct a comparison using statistical procedures. The t-test statistic, (t=2.34, p <.05), indicated statistical significance between the means of the groups. Table 10 shows the t-test results.

Table 10

*Independent Samples t-test for LoTi Levels Between Classroom Type*

<table>
<thead>
<tr>
<th>Type of Classroom</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels of Technology Integration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular Educators</td>
<td>48</td>
<td>3.354</td>
<td>1.4065</td>
<td>.2030</td>
</tr>
<tr>
<td>Deaf Educators</td>
<td>44</td>
<td>2.625</td>
<td>1.5816</td>
<td>.2384</td>
</tr>
</tbody>
</table>

*(table continues)*
Table 10 (continued).

### Independent Samples Test

<table>
<thead>
<tr>
<th>Levels of Technology Integration</th>
<th>Equal variance assumed</th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.830</td>
<td>.365</td>
</tr>
</tbody>
</table>

The results illustrate statistically significant differences (p<.05) between the means of the two classroom types, therefore the null hypothesis was rejected. The alternative hypothesis that there is a difference between the levels of technology integration of K-12 technology-minded general educators and K-12 technology-minded deaf educators was accepted. The Cohen’s d statistic was calculated to determine effect size (d=.488) and the results can be interpreted as having a medium effect. Figure 1 provides a graphical representation of the difference between the means of the two classroom types.
Data Analysis for Hypothesis 2

Research question two asked "Is there a difference between the levels of technology integration of K-12 technology-minded deaf educators who are deaf and K-12 deaf educators who are hearing?". Hypothesis two was also tested using an independent samples t-test. Levene’s homogeneity of variances test statistic was .276, p>.05, which supports the assumption that the means were initially similar enough to conduct a comparison using statistical procedures. The t-test statistic, (t=2.064, p <.05), indicated statistical significance between the means of the groups. Table 11 shows the t-test results.

Figure 1. Means of the LoTi profile reported by classroom type.
Table 11

*Independent Samples t-test for LoTi Levels Between Deaf and Hearing Deaf Educators*

<table>
<thead>
<tr>
<th>Group Statistics</th>
<th>Hearing Status</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels of Technology Integration</td>
<td>hearing</td>
<td>34</td>
<td>2.368</td>
<td>1.5682</td>
<td>.2689</td>
</tr>
<tr>
<td></td>
<td>Deaf or HH</td>
<td>10</td>
<td>3.500</td>
<td>1.3540</td>
<td>.4282</td>
</tr>
</tbody>
</table>

**Independent Samples Test**

<table>
<thead>
<tr>
<th>Levene’s Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Sig.</td>
<td>t</td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
<td>---</td>
</tr>
<tr>
<td>Levels of Technology Integration</td>
<td>Equal variances assumed</td>
<td>1.219</td>
</tr>
</tbody>
</table>

The results illustrate statistically significant differences (p<.05) between the means of the deaf educators based on hearing status; therefore, the null hypothesis was rejected. The alternative hypothesis that there is a difference between the levels of technology integration of K-12 technology-minded deaf educators who are deaf and K-12 technology-minded deaf educators who are hearing was accepted. The Cohen’s d statistic was calculated to determine effect size (d=.775) and the results can be interpreted as having a large effect. Figure 2 provides a graphical representation of the difference between the means of the deaf educators based on hearing status.
Data Analysis for Hypothesis 3

Research question three asked “Is there a difference between K-12 general educators and K-12 deaf educators in terms of their personal computer use?”. Hypothesis three was also tested using an independent samples t-test. Levene’s homogeneity of variances test statistic was .058, p>.05, which supports the assumption that the means were initially similar enough to conduct a comparison using statistical procedures. The t-test statistic, (t=4.245, p <.05),
indicated statistical significance between the means of the groups. Table 12 shows the t-test results.

Table 12

*Independent Samples t-test for LoTi PCU Levels Between Classroom Type*

<table>
<thead>
<tr>
<th>Type of Classroom</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Usage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular Educators</td>
<td>48</td>
<td>6.15</td>
<td>1.052</td>
<td>.152</td>
</tr>
<tr>
<td>Deaf Educators</td>
<td>44</td>
<td>5.09</td>
<td>1.326</td>
<td>.200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Levene's Test for Equality of Variances</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.699</td>
<td>.058</td>
</tr>
<tr>
<td>t-test for Equality of Means</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.245</td>
<td></td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>1.055</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.249</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.561</td>
<td>.1549</td>
</tr>
</tbody>
</table>

The results illustrate significant differences (p<.05) between the means of the two classroom types, therefore the null hypothesis was rejected. The alternative hypothesis that there is a difference between the personal computer usage of K-12 technology-minded general educators and K-12 technology-minded deaf educators was accepted. The Cohen’s d statistic was calculated to determine effect size (d=.887) and the results can be interpreted as having a large effect. Figure 3 provides a graphical representation of the PCU difference between the means of the two classroom types.
Summary

An Independent Samples t-test was used to test the three presented hypotheses to determine whether statistical differences for the LoTi scale and PCU intensity existed related to the following variables: classroom type and hearing status among deaf educators. The analysis indicates that all three null hypotheses should be rejected in favor of the alternate hypotheses.
CHAPTER 5
SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to determine whether working in the field of deaf education, as opposed to general education, results in a higher level of technology integration. A secondary goal was to determine if deaf educators who are deaf integrate technology at a higher level than deaf educators who are hearing. A final goal was to compare the personal computer usage between general educators and deaf educators. The instrument used to measure both variables was the LoTi (Levels of Technology Implementation) survey. Subjects who completed the on-line LoTi were assigned two scores – the LoTi profile level and the PCU (Personal Computer Usage) level. Participants included K-12 teachers in the United States without regard to the teaching content area. Teachers were eligible to participate in the study only if they had attended a technology training conference or course. The majority of general educators were part of the Masters Across Technology (MAT) program at the University of North Texas; the majority of deaf educators attended the Instructional Technology and Deaf Education Symposium in Rochester, New York. The study was conducted in the spring of 2006.

Teachers who met the technology interest criteria were asked to complete an on-line survey. A total of 92 subjects participated and accurately submitted the LoTi survey. Of these subjects, 48 were general educators and 44 were deaf
educators. A total of 10 participants were deaf, all teaching in a deaf education setting, and the remaining 82 were hearing. A total of 74, or 80.4%, were female; only 18, or 19.6%, were male. The majority of the participants, 78, or 84.8% had earned either a Bachelor’s or a Master’s degree with the remaining 14, or 15.2% divided equally between teachers with an Associate’s degree and those with a doctorate. A total of 48, or 52.2%, of the subjects reported receiving more than 30 hours of technology training; only 11, or 12.0%, reported receiving less than 10 hours.

Summary of Major Findings

1. The mean scores of participants on the LoTi profile survey were statistically significantly higher for general educators compared to deaf educators.

2. The mean scores of participants on the LoTi profile survey were statistically significantly higher for deaf educators who were deaf compared to deaf educators who were hearing.

3. The mean scores of participants on the LoTi-PCU intensity indicator were statistically significantly higher for general educators compared to deaf educators.

Discussion of Findings

Data analysis was primarily confined to performing a sequence of three independent sample t-tests in order to address the three hypotheses proposed by this study. A t-test was chosen as the statistical calculation needed in each
case because there were only two groups. For each t-test, the Levene’s homogeneity of variances test was calculated and the results caused the researcher to fail to reject the null hypothesis. Therefore, the means of the groups were similar enough to warrant a t-test calculation be performed. Additionally, an effect size statistic was calculated based on the results of the t-test. Effect size deals with practical significance, and for independent samples t-tests, the Cohen’s d statistic is appropriate (Kotrlik & Williams, 2003).

Within the sample of deaf educators (N=44), the size of the sub-group of deaf educators who were deaf (N=10) was small; however, it accurately reflects the demographics of the entire population of deaf educators in the United States since most deaf educators are hearing. Therefore, in regards to hypothesis two, statistical significance would have been more difficult to establish. The data analysis, however, showed statistical significance in regards to all three hypotheses. The data analysis also showed a medium to large effect size in regards to all three hypotheses.

The data in regards to the PCU intensity level indicated that almost half of the general educators scored at the highest possible level, an intensity of 7. Therefore, there was a ceiling effect present because the data was not spread out enough to reflect a normal distribution.
Conclusions

1. It was determined that technology-minded general educators had significantly higher levels of technology implementation than technology-minded deaf educators.

2. It was determined that technology-minded deaf educators who were deaf had significantly higher levels of technology implementation than technology-minded deaf educators who were hearing.

3. It was determined that technology-minded general educators had significantly more intense levels of personal computer usage than technology-minded deaf educators.

When evaluated in terms of prior research involving the LoTi instrument to determine levels of technology implementation, the findings of this study appear to suggest that technology-minded teachers, both those working in general and deaf education, may be more successful integrators than typical instructors. The LoTi survey, as described in Chapter 2, was given to 47,955 K-12 teachers between July of 2003 and July of 2004. The percentage of teachers scoring at the ‘Target Technology Level’, a 4b, was 11% (LoTi Technology Use Profile, 2004). In contrast, the technology-minded subjects for the current study fell within the target level for 29.17% of the general education participants and 13.64% of the deaf education participants. Further, the national survey showed that 59% of the participants were positioned in the LoTi 0-2 levels (LoTi Technology Use Profile, 2004). A much smaller number, 18.75% of general
educators and 36.36% of deaf educators, were positioned in LoTi 0-2 levels for the current study.

Similarly, the national survey found that the most common score in regards to personal computer usage was an intensity level of 4 (LoTi Technology Use Profile, 2004). For the current study, the most common PCU score was a 7, (47.92%), for the general educators and a 6, (36.36%), for the deaf educators. As with the LoTi profile score, both groups scored higher than the national study participants for the PCU intensity indicator.

Therefore, the data analysis must be kept in perspective. Although the findings seem to suggest that technology-minded general educators integrate technology and use computers at a higher level than deaf educators, the particular general educators selected for this study had exceptionally high LoTi and LoTi-PCU scores.

Of particular interest, was the finding that suggests deaf educators who are deaf are perhaps better able to integrate technology than deaf educators who are hearing. These results would seem to concur with the research of Marlatt (2004) who reflected that students found deaf educators who were deaf to be more effective overall than their hearing counterparts. However, Marlatt’s research was not directed at technology specifically and there is a clear lack of research in the literature that examines the issue of technology integration based on hearing status in deaf education.
Aside from results that center around the three primary hypotheses, it is noteworthy that a full 52.2% of the participants reported that ‘Time to Plan and Practice’ was their top barrier to further technology integration. These findings match closely to the findings of other researchers who have investigated the barriers preventing technology usage in the classroom (Earle, 2002; Jacobsen, 2001; Norris & Soloway, 2000; Roberson, 2001; Wetzel, 2002).

A discussion of the findings of this study should be tied to the demographic data of the subjects. Specifically, the participants were selected from a population pool whereby teachers were presumably pre-disposed to using technology based upon their attendance at a technology training session in the form of a conference or a class. Over half of the selected subjects, 48 (52.2%), indicated that they had received more than 30 hours of technology training. Therefore, the results are not intended to reflect the performance of a typical K-12 educator, but be indicative of how technology-minded educators might perform. It is interesting to note that 10 out of the 92 subjects presented at a LoTi level of 0, but 40% of those teachers attended more than 30 hours of technology training and 30% attended at least 20 hours of technology training. Due in part to this finding and in part to the nature of the survey instrument, the researcher did not remove the subjects who scored a LoTi level of 0.

Implications and Recommendations for Future Research

“I tell you and you forget. I show you and you remember. I involve you and you understand,” is advice made famous by Eric Butterworth that rings true
for education today. When technology is integrated into the curriculum rather than taught as a superficial tool, it has the potential to propel students to higher order thinking skills resulting in deeper comprehension (U.S. Department of Education, 2005). The challenge, therefore, is to identify teachers who are able to leverage technology to guide students to more complex levels of understanding, not simply to substitute paper-and-pencil activities for electronic-based ones. Currently, the typical K-12 educator in the United States is not a very sophisticated implementer of technology in the classroom (Griffin, 2003; Staples, Pugach, & Himes, 2005; Wetzel, 2002).

Perhaps by identifying sub-groups within the teaching profession who integrate technology in a deeper, more meaningful way, it might be possible to recognize pivotal activities or practices associated with the group that leads to advanced technology implementation. An expected, but valuable finding from the present study was the LoTi profile score results for technology-minded educators in comparison to the LoTi profile score results for educators at large. Teachers who were willing to participate in some type of technology training tended to out-perform typical teachers who took part in the 2004 national LoTi profile study. It could be inferred then that exposure to technology training is making a difference in the way individuals, in general, integrate technology in the classroom.

Deaf educators as a whole did not perform as well as general educators on the LoTi and PCU scale. Given the fact that the technology-minded general
educators who comprised the sample population of this study scored exceptionally high on the LoTi and PCU scales, further research is needed to ensure comparability between the two groups. With the data analysis of the present study, however, the deaf educator sub-group does not appear to be a standout group for which to investigate their unique attributes.

The findings of the current study do suggest, though, that deaf educators who are deaf have the potential to integrate technology to a greater degree than deaf educators who are hearing. However, these findings are preliminary not conclusive due to the nature and size of the subject pool. The deaf educators represented in this study were those who were actively pursuing technology training as demonstrated by attendance at a national conference. Although the study did not investigate any causality for differences among the sub-groups, it can be speculated that factors such as deaf persons daily use of technology and group member collaboration patterns might be influencing variables. Further research is needed to determine why deaf educators who are deaf appear to be more adept at integrating technology than their hearing counterparts.

As noted in Chapter 1, there is a lack of empirical research in the literature in regards to deaf educators’ use of technology. Thus, the primary practical implication of this study is to start building a picture of the current state of technology implementation among deaf educators. If further research could show a consistent, positive relationship between technology integration and deaf educators who are deaf that exceeds the general educators’ performance then
perhaps efforts could be made to foster similar group dynamics among non-deaf educators.

It is important, however, to look at the limitations of the current study. Although all the subjects met the criteria of attending a technology conference or class, the extent of that training session varied. Some participants may have attended only one conference while others may have been involved in an intensive course of study over a period of a year or more. Additionally, the participants reported teaching a variety of subjects over the entire age spectrum represented by kindergarten through high school. There was no attempt to match the two groups by these parameters and this study may reflect, in part, differences inherent to instructors of particular subjects or learning environments. Additionally, the survey was distributed in written English only; it is possible that deaf educators whose first language is ASL (American Sign Language) may have self-rated themselves differently if the survey had been presented in their primary language.

Accordingly, the following five recommendations have been made for further research regarding the relationship of deaf educators and levels of technology implementation:

1. Conduct a study that uses the LoTi instrument to survey typical deaf educators, both deaf and hearing, rather than those who are specifically targeted as technology-minded. Investigate how the results of that study compare to the United States national profile report on general educators.
2. Conduct a study that places deaf educators into groups based on additional variables such as type of instructional setting, i.e. bilingual/bicultural deaf schools or self-contained classrooms for the deaf. Investigate whether the instructional setting, as opposed to the hearing status of the instructor, influences the technology integration practices.

3. Replicate this study with technology-minded general education and deaf education groups that have participated in more uniform technology training sessions.

4. Explore the reasons that the deaf educators who were deaf appeared to integrate technology at a higher level than deaf educators who were hearing. Identify group demographics that may contribute to the phenomena.

5. Administer the LoTi survey questionnaire in American Sign Language (ASL) to deaf educators, who are deaf and more comfortable communicating in their primary versus secondary language.

By investigating technology use among deaf educators through quantitative measures, it is hoped that patterns will start to emerge so that research can be directed towards discovering and sharing best practices. If the unique attributes of deaf educators who are deaf can be captured, then perhaps they can serve as models for other sub-groups. Perhaps also, time and financial resources can be allocated in a more effective way so as to optimize limited funds and training occasions. It is the responsibility and opportunity of current researchers to move
the field of educational technology beyond the mere appearance of technology to true integration; deaf education may hold a key to that process.
APPENDIX A

LEVELS OF TECHNOLOGY IMPLEMENTATION
Level of Technology Implementation (LoTi) Framework

- **Level 0 - Nonuse:** Nonuse implies there is a perceived lack of access to technology-based tools (e.g., computers) or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (e.g., ditto sheets, chalkboard, overhead projector).

- **Level 1 - Awareness:** Awareness implies that the use of technology-based tools is either (1) one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs); (2) used almost exclusively by the classroom teacher for classroom and/or curriculum management tasks (e.g., taking attendance, using grade book programs, accessing email, retrieving lesson plans from a curriculum management system or the Internet) and/or (3) used to establish or enhance teacher-directed lessons or lectures (e.g., multimedia presentations).

- **Level 2 - Exploration:** Exploration implies that technology-based tools supplement the existing instructional program (e.g., tutorials, educational games, basic skill applications) or complement selected multimedia and/or web-based projects (e.g., Internet-based research papers, informational multimedia presentations) at the knowledge/comprehension level. The electronic technology is employed either as extension activities, enrichment exercises, or technology-based tools and generally reinforces lower cognitive skill development relating to the content under investigation.

- **Level 3 - Infusion:** Infusion implies that technology-based tools including databases, spreadsheet and graphing packages, multimedia, and desktop publishing applications, and Internet use complement selected instructional events (e.g., field investigation using spreadsheets/graphs to analyze results from local water quality samples) or multimedia/web-based projects at the analysis, synthesis, and evaluation level. Thus, the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making, reflective thinking, experimentation, scientific inquiry).

- **Level 4a - Integration (Mechanical):** Integration (Mechanical) implies that technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on packaged materials and/or outside resources (e.g., assistance from other colleagues), and interventions (e.g., professional development workshops) that aid the teacher in the daily management of their operational curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems as perceived by the students relating to an overall theme/concept. Emphasis is placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.

- **Level 4b - Integration (Routine):** Integration (Routine) implies that technology-based tools are integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. At this level, teachers can readily design and implement learning experiences (e.g., units of instruction) that empower students to identify and solve authentic problems relating to an overall theme/concept using the available technology (e.g., multimedia applications, Internet databases, spreadsheets, word processing) with little or no outside assistance. Emphasis is again placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.

- **Level 5 - Expansion:** Expansion implies that technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from other schools, business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via Internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme/concept. The complexity and sophistication of the technology-based tools used in the learning environment are now commensurate with (1) the diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and (2) the student's level of complex thinking (e.g., analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.

- **Level 6 - Refinement:** Refinement implies that technology is perceived as a process, product (e.g., invention, patent, new software design), and/or tool for students to find solutions related to an identified "real-world" problem or issue of significance to them. At this level, there is no longer a division between instruction and technology use in the classroom. Technology provides a seamless medium for information quest, problem-solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task at school. The instructional curriculum is entirely learner-based. The content emerges based on the needs of the learner according to his/her interests, needs, and/or aspirations and is supported by unlimited access to the most current computer applications and infrastructure available.
APPENDIX B

PERSONAL COMPUTER USE INTENSITY LEVELS
Personal Computer Use (PCU) Framework

- **PCU Intensity Level 0**: A PCU Intensity Level 0 indicates that the participant does not feel comfortable or have the skill level to use computers for personal use. Participants at Intensity Level 0 rely more on the use of overhead projectors, chalkboards, and/or traditional paper/pencil activities than using computers for conveying information or classroom management tasks.

- **PCU Intensity Level 1**: A PCU Intensity Level 1 indicates that the participant demonstrates little skill level with using computers for personal use. Participants at Intensity Level 1 may have a general awareness of various technology-related tools such as word processors, spreadsheets, or the Internet, but generally are not using them.

- **PCU Intensity Level 2**: A PCU Intensity Level 2 indicates that the participant demonstrates little to moderate skill level with using computers for personal use. Participants at Intensity Level 2 may occasionally browse the Internet, use email, or use a word processor program; yet, may not have the confidence or feel comfortable troubleshooting simple "technology" problems or glitches as they arise. At school, their use of computers may be limited to a grade book or attendance program.

- **PCU Intensity Level 3**: A PCU Intensity Level 3 indicates that the participant demonstrates moderate skill level with using computers for personal use. Participants at Intensity Level 3 may begin to become "regular" users of selected applications such as Internet browsers, email, or a word processor program. They may also feel comfortable troubleshooting simple "technology" problems such as rebooting a machine or hitting the "Back" button on an Internet browser, but mostly rely on technology support staff or others to assist them with any troubleshooting issues.

- **PCU Intensity Level 4**: A PCU Intensity Level 4 indicates that the participant demonstrates moderate to high skill level with using computers for personal use. Participants at Intensity Level 4 commonly use a broader range of software applications including multimedia (e.g., Microsoft PowerPoint), spreadsheets, and simple database applications. They typically have the confidence and are able to troubleshoot simple hardware, software, and/or peripheral problems without assistance from technology support staff.

- **PCU Intensity Level 5**: A PCU Intensity Level 5 indicates that the participant demonstrates high skill level with using computers for personal use. Participants at Intensity Level 5 are commonly able to use the computer to create their own web pages, produce sophisticated multimedia products, and/or effortlessly use common productivity applications (e.g., Microsoft Excel, FileMaker Pro), desktop publishing software, and web-based tools. They are also able to independently troubleshoot most hardware, software, and/or peripheral problems without assistance from technology support staff.

- **PCU Intensity Level 6**: A PCU Intensity Level 6 indicates that the participant demonstrates high to extremely high skill level with using computers for personal use. Participants at Intensity Level 6 are sophisticated in the use of most, if not all, multimedia, productivity, desktop publishing, and web-based applications. They typically serve as "troubleshooters" for others in need of assistance and sometimes seek certification for achieving selected technology-related skills.

- **PCU Intensity Level 7**: A PCU Intensity Level 7 indicates that the participant demonstrates extremely high skill level with using computers for personal use. Participants at Intensity Level 7 are expert computer users, troubleshooters, and/or technology mentors. They typically are involved in training others on any technology-related tasks and are usually involved in selected support groups from around the world that allow them access to answers for all technology-based inquiries they may have.
APPENDIX C

USE OF HUMAN SUBJECTS CONSENT FORM
October 11, 2005

Becky Sue Parton
Department of Technology and Cognition
University of North Texas

RE: Human Subjects Application No. 05-290

Dear Ms. Parton:

Your proposal titled “Technology Adoption and Integration Levels: A Comparison Study Between Technology-minded Educators and Technology-minded Deaf Educators” has been approved by the Institutional Review Board and is exempt from further review under 45 CFR 46.101. Federal policy 45 CFR 46.109(c) stipulates that IRB approval is for one year only.

Enclosed is the consent document with stamped IRB approval. Please copy and use this form only for your study subjects.

It is your responsibility according to U.S. Department of Health and Human Services regulations to submit annual and terminal progress reports to the IRB for this project. Please mark your calendar accordingly. The IRB must also review this project prior to any modifications.

Please contact Shelia Bours, Compliance Administrator, ext. 3940 or Boyd Herndon, Director of Research Compliance, ext. 3941, if you wish to make such changes or need additional information.

Sincerely,

Scott Simpkins, Ph.D.
Chair
Institutional Review Board

SS: sb
APPENDIX D

LETTER OF CONSENT TO USE THE LOTI SURVEY INSTRUMENT
From: Chris Moersch <chris@learning-quest.com>
To: "Becky Parton" <Parton@cc.admin.unt.edu>
Date: 7/17/2005 8:37:39 AM
Subject: Re: LOTI - PhD dissertation use

Becky,

We would be happy to lend a hand. Contact Dennee Saunders at
dennee@learning-quest.com to set up your study. We will require an
executive summary of your results at the conclusion.

Chris Moersch
858/245-3746

>Dr. Moersch,
>
>My name is Becky Sue Parton, and I am a doc student at the
>University of North Texas in the Educational Computing department.
>I am at the dissertation stage of the program and have decided on a
>topic. My research focus has been on the Deaf community throughout
>my coursework, and I plan to continue that theme for the
>dissertation.
>
>My proposed title is "Technology Adoption and Integration Levels: A
>Comparison Study Between Deaf Education Leaders and Regular
>Education Leaders." I am working with Dr. Beverly Rodgers (the
>evaluator for the STAR Schools project), Dr. Jean Andrews (a leader
>in Deaf education at Lamar University), and several professors here
>at UNT. I will be doing a small quantitative study involving 50+
>regular educators and 50+ comparable Deaf educators.
>
>Believe that the best tool for this study is your LOTI
>instrument. (I have not decided on a version yet.) Therefore, I am
>writing to you for permission to use the instrument free of charge
>for this study. I would be happy to share the results with you, and
>at the appropriate national conference, upon completion of the
>research paper. Paige Worrell, another doc student in the same
>program, is also using the LOTI and explained to me that I would
>need to work with you to setup an account for the surveys to be
>taken online. I would need the raw data results when the surveys
>were completed, instead of just the reports that are generated and
>want to verify the availability of that data.
>
>Thank you very much for your willingness to consider my request for
>use of the LOTI instrument. I look forward to hearing from you.
>
>Becky Sue
>
>Becky Sue Parton
>Programmer / PhD Student
>University of North Texas
>
>*"Adoption is the Best Option - www.casadecritics.com"
REFERENCES


