

The Assistive Technology Skills, Knowledge, and Professional Development Needs
of Special Educators in Southwestern Virginia

by

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(ABSTRACT)

Assistive technologies can aid in removing many of the barriers that students with disabilities face in today's classroom. This study addressed special educators' perceptions of the facilitators for the successful implementation of assistive technology devices, skills and knowledge, and need for professional development. A self reporting questionnaire was designed to collect data. The questionnaire was mailed to 1164 special educators in southwestern Virginia. Educators reported that funding, time, technical assistance, assistive technology awareness and knowledge, professional development opportunities, and administrative support were highly important facilitators to the successful implementation of assistive technology. Special educators revealed an average level of skills and knowledge and need for professional development on 25 out of 27 assistive technology competencies. Furthermore, educators reported a preference for professional development opportunities in group settings that involved hands-on learning experiences.

Dedication

I dedicate this work to my parents, Harry and Marian Scarborough, whose faith in God, hard work, and belief in the value of education became the basis for my beliefs and choices. They allowed me to follow my dreams and instilled in me the courage to reach for my goals. Mom and Dad, while you may not be here today, I know that you are watching and hope that you are proud.

And I also dedicate this work to the one who has held my hand and walked along beside me during this journey, my best friend and partner, my husband, Jeff.

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CHAPTER 1

Introduction

The face of the American classroom has undergone dramatic changes over the past decade. Today over 75% of students with disabilities spend the majority of their school day in general education classrooms (Boyer & Mainzer, 2003). In the past, these students were relegated to classrooms separate from their peers. The reauthorization of Individuals with Disabilities Education Improvement Act of 2004, 20 U.S.C. § 300 *et seq.*, the No Child Left Behind, 20 U.S.C. §6301 *et seq.* legislation and state educational standards make it essential that both general and special educators adopt a single goal of “achieving equal educational opportunity for all children” (Kochhar & West, 1996, p. 1).

The special educator assumes the major responsibility for providing access to the curriculum for students with disabilities. These educators adapt and modify the curriculum using a variety of strategies and tools. One of the most significant changes in special education is the increased use of technology as a means for accessing the curriculum. Knowledgeable special educators utilize the recent innovations within the fields of educational and assistive technologies to create opportunities for students with disabilities to be taught and assessed along side their non-disabled peers.

For many students with disabilities, the difference between successful and unsuccessful educational and social experiences can be the effective use of assistive technologies. Assistive technologies provide greater independence within and access to a variety of environments. These technologies are created, modified, or adapted to make educational, social, recreational, vocational, and daily living tasks easier.

Most individuals utilize some form of assistive technology daily. When we use a ramp instead of stairs, wear glasses or contact lenses, listen to books on tape, or use remote controls, we are in essence utilizing assistive technologies. While technology provides important tools for making tasks easier for all individuals, assistive technology is a necessity that enables individuals with disabilities to engage in or perform multiple tasks (Office of Special Education & Rehabilitation Services, 1991).

Assistive technologies possess the potential to augment abilities and bypass or compensate for barriers that disabilities create. Special educators play a key role in providing

students with the technology and the needed skills to use the technology. Current legislation emphasizes the importance of students using technology to reach educational goals (Dirr, 2003; Marvin, 2003). Therefore, it becomes essential for special educators to acquire knowledge about these tools and to provide students with disabilities equal access to the curriculum (Lewis, 2000).

Statement of the Problem

For over 6.4 million students with disabilities, The Individuals with Disabilities Education Improvement Act of 2004 legally guarantees the right to a free appropriate public education (FAPE). For many of these students the greatest access to a free, appropriate public education will require the use of assistive technologies (Hauser & Malouf, 1996).

In addition IDEIA of 2004 mandates that the use of assistive technology be considered for all students with disabilities. There is no legislation however that mandates teacher education preparation or professional development in the area of assistive technology. In order for students with disabilities to benefit from the use of assistive technology, it is crucial that special education professionals be knowledgeable about the selection, use, and integration of these tools.

A critical factor in students' use of technology is educator technology skills and knowledge. The National Center for Educational Statistics (NCES) (2001) reported that almost two-thirds of all educators did not feel prepared or only somewhat prepared to use educational technology in their teaching (Beyerbach, Walsh, & Vannatta, 2001; Cole, Simkins, & Penuel, 2002; Cuban, Kirkpatrick, & Peck, 2001). The CEO Forum on Education and Technology (1999) reported that technology could not be effectively or appropriately utilized within the classroom until educators received effective and relevant professional development focused on the use of technology tools.

While there is little research about the use of AT devices or the status of AT services within public schools, several studies examined the importance of teacher knowledge in relationship to the effective integration of AT devices and services (Cronis & Ellis, 2000; Derer, Polsgrove, & Rieth, 1996; Ledger, 1999; McGregor, 1996). Thompson, Siegal, and Kouzoukas (2000) found that only 7% of Illinois special educators felt competent in the knowledge of AT and over 37% felt that they lacked basic AT competence.

In Virginia, students with disabilities comprise over 14.7% of the student population (NCES, 2001). The mandate to include these students in statewide assessments, along with the

accountability issues of The No Child Left Behind Act of 2001, 20 U.S.C. §6301 et seq., resulted in a focused effort to provide these students with “greater access to the general education curriculum in the least restrictive environment and to improve the academic performance” (VDOE, 2003, p. 7). In order to fulfill these legal mandates including the legal mandate of IDEA of 2004 for the provision of assistive technology devices and services for students with disabilities, it becomes essential to determine the extent to which special educators feel prepared to utilize AT effectively.

Purpose

In the Commonwealth of Virginia, several studies were conducted examining AT policies (Behrmann, Morrissette, & McCallen, 1993; Inge, 2003; Morrissette, 1994; Peters, 1999). Each of these studies raised important questions about the need for further research in the area of assistive technology, specifically the assistive technology knowledge and skills of special educators. However, to date there have been no studies which examine the perceived assistive technology knowledge and skills of these special educators.

The purpose of this descriptive study is to determine: (a) the perceived assistive technology knowledge and skills levels of special educators in southwestern Virginia, (b) the AT knowledge and skills areas in which these educators felt that they require more professional development, and (c) the preferred methods of delivery for this professional development.

This research will focus on special educators in southwestern Virginia and will be guided by the following questions:

1. What facilitators do special educators perceive as being important for the successful implementation of assistive technology?
2. What are the assistive technology skill and knowledge levels of special educators?
3. For which assistive technology skills and knowledge competencies do special educators need professional development?
4. How has knowledge about assistive technologies been gained? What are the preferred methods for learning about technology? What are the preferred delivery methods for professional development?

The information gained from this research will be utilized by the Virginia Department of Education (VA DOE) Training and Technical Assistance Center at Virginia Tech and the VA DOE Assistive Technology Priority Project in the development of professional development

opportunities to address the identified AT skills and knowledge needs of special educators in southwestern Virginia.

For the purpose of this study it was important to clarify legal and operational definitions for the following terms:

- (a) An *assistive technology device* means any item, piece of equipment or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of students (or individuals) with disabilities (IDEIA, 2004).
- (b) *Assistive technology services* mean any service that directly assists a student (or individual) with a disability in the selection, acquisition, or use of an assistive technology device. The term includes: (a) evaluation of needs; (b) purchasing, leasing, or otherwise providing for acquisition; (c) selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing; (d) coordinating and using other therapies; (e) training or technical assistance for the student (or individual) and family; and (f) training or technical assistance for professionals, employers or other individuals who provide services (IDEIA, 2004).
- (c) *Augmentative communication* means a system for communicating that may include one or any combination of speech, gestures, symbols, pictures, or some form of voice output device (Virginia Assistive Technology System, n.d.).
- (d) *Free appropriate public education (FAPE)* means that students with disabilities have the same right to a free public education as do their non-disabled peers (IDEIA, 2004).
- (e) *Individual Education Program (IEP)* means a written plan that has been developed specifically for a student with disabilities to meet the student's specialized educational needs.
- (f) *Instructional technology* refers to the tools that are used in the education of a student. These tools can include hardware, software, and instructional techniques.
- (g) *Least Restrictive Environment (LRE)* means that students with disabilities should be educated to the "maximum extent appropriate" with their non-disabled peers (IDEIA, 2004).
- (h) *LEA* refers to the local educational agency or authority, sometimes referred to as the district or county (Virginia Department of Education, 2000).
- (i) *Virginia Department of Education (VDOE) Training and Technical Assistance Center (T/TAC)* are part of a statewide technical assistance program based at university sites across the Commonwealth of Virginia. In response to local, regional, and state needs, the T/TAC

provides training and technical assistance to teachers, administrators, and others requesting assistance for their students in special education.

CHAPTER 2 -LITERATURE REVIEW

This literature review critically examines and discusses (a) the history of assistive technology legislation in the United States, (b) assistive technology devices and services, (c) indicators for the successful implementation of AT practices, (d) policy and planning, (e) funding, (f) educational technology standards, and (g) professional development.

Articles for review were selected from 1993-2006 to provide the most timely information regarding issues focusing on assistive technology, instructional technology, technology standards, special educators, and professional development. Keyword descriptors were generated to maximize the possibility of locating articles related to the research questions. These descriptors include disability, access to the disabled, educational access, assistive technology, teacher practice, special education technology, professional development, instructional technology, staff development, adult education, and technology integration. Resources were obtained from ERIC, Psychological Abstracts, Dissertation Abstracts International, books, and scholarly journals. A summary of articles reviewed can be found in Appendix A.

Historical and Legislative Foundations

Changes in demographics, economic growth, and heightened social consciousness about disability issues during the 20th century resulted in an increased interest in creating environments, products, and technologies that are accessible to all individuals. The United States Congress supported the idea that assistive technologies were beneficial to individuals with disabilities by enacting a variety of legislative and funding initiatives that focus on providing AT devices and services to individuals with disabilities. Since 1986, over \$35 million has been spent on research and development of technology tools for individuals with disabilities (Hauser & Malouf, 1996).

The passage of the Education for Handicapped Children of 1975, 20 U.S.C. §1400 *et seq.*, set the stage for legislation that affected the educational programs and physical environment of public schools for students with disabilities. While the 1975 legislation did not contain references to the selection and use of technology for students with disabilities it did guarantee a “free appropriate education for all children with disabilities”, or FAPE (Wallace, Flipppo, Barcus, & Behrmann, 1995).

Several assistive technology initiatives emerged from this legislation. The Office of Special Education Programs (OSEP) established funding for development and research in the use of technology within special education. OSEP supported the creation of the Center for Special Education Technology at the Council for Exceptional Children, a national professional organization for special educators. This Center was charged with facilitating the collection and exchange of information among professionals involved in the field of special education technology (Office of Special Education & Rehabilitation Services, 1991).

Disability legislation in the 1980's focused on providing individuals with disabilities functional supports and the tools needed to become active members within their communities (Wallace et al., 1995). This ideology was supported by the Technology Related Assistance for Individuals with Disabilities Act of 1998, 29 U. S. C. §2201 et seq., which included a formal definition of assistive technology devices and services. These definitions are upheld in current disability legislation.

Perhaps the most important piece of legislation in regards to special education and technology was the Education for Handicapped Children Education Act Amendment of 1986, 20 U.S.C. §1400 *et seq.* This legislation laid the foundation for early intervention programs for children with disabilities. A mandate for the design, adaptation, and utilization of new technologies and media for educating students with disabilities was a main focus of this amendment (Behrmann, Morrissette, & McCallen, 1993).

In 1990, funding for training of special education personnel in the delivery of AT services and devices became a priority for the Office of Special Education Programs (OSEP). A policy letter from the director of OSEP stated that assistive technologies should be considered within the IEP for each student when determined appropriate. This policy set the tone for legislation supporting amendments to the Education for Handicapped Children Education Act Amendment of 1986 (Wallace et al., 1995).

Sweeping changes to the educational programs of students with disabilities came with the passage of the Individuals with Disabilities Education Amendment Act of 1997, Pub. L. 105-17, 20 USC § 1400 et seq. IDEA (1997) required that students with disabilities be educated to the greatest extent possible within the general education setting. Schools were charged with supplying students with disabilities the needed services, aids, and accommodations to promote their success in the general education environment. For the first time, assistive technology

devices and services were required considerations for each student. If AT was considered necessary for a free appropriate public education then the provision of AT by the school system became a legal mandate.

Few changes to the definition of assistive technology were made in the reauthorization of the Individuals with Disabilities Improvement Act of 2004. This legislation still mandates the consideration of assistive technology for every student with a disability within the Individualized Education Program (IEP) process. The most significant change came focused on medical devices. Medical devices that were surgically implanted or replacement of such devices were excluded from being considered as AT devices (IDEIA, 2004).

Defining Assistive Technology

Many educators experience difficulty distinguishing assistive technology from other forms of technology such as instructional or educational technology . While there are multiple definitions for the term assistive technology the most widely accepted definition in the field of education was first provided in the Technology-Related Assistance for Individuals with Disabilities Act of 1988, and later adopted and integrated within IDEA of 1997. This complex definition defines assistive technology as two separate terms – assistive technology devices and assistive technology services. This definition is viewed as complex and confusing.

Assistive Technology Devices

The “Regulations Governing Special Education Programs for Children with Disabilities in Virginia” (Virginia Department of Education, 2000) utilizes the definition of AT found in IDEA (1997) and the current IDEIA of 2004. This legislation defines assistive technology devices as:

...any item, piece of equipment or product system, whether acquired commercially off the shelf, modified, or customized, that is to increase, maintain, or improve the functional capabilities of students (or individuals) with disabilities (IDEIA, 2004)

By definition an AT device can include a wide range of tools and selection of AT device is made based on individual needs and abilities. For example one solution for a student having difficulty holding a pencil might be a simple plastic pencil grip. For another student unable to use a pencil, a portable word processor might be chosen. Yet for another student a computer with voice recognition software might be chosen to assist with writing.

Acquisition of the required device also allows for broad interpretation. Devices can be (a) purchased from commercial vendors, (b) modified from an existing device (d) customized for an individual, or (c) an original design. For example, a customized device could be a pencil grip created by wrapping masking tape around the end of the pencil or be a plastic slip on sleeve purchased from a vendor.

AT devices are classified based upon their use within one of the following categories: (a) mobility and positioning, (b) oral communication, (c) computer access, (d) leisure and motivational, (e) sensory, (f) environmental controls, and (g) learning and educational (Bryant & Bryant, 2003; Cook & Hussey, 2002; Virginia Assistive Technology System, n.d.). It is important to keep in mind that individuals may use one or more than one device, for multiple functions in a variety of settings. Appendix B provides a description and examples of each category.

Assistive Technology Services

The second term defined by IDEA as part of assistive technology is assistive technology services. The legislation defines AT services as those:

...that directly assists a student (or individual) with a disability in the selection, acquisition, or use of an assistive technology device. The term includes: (a) evaluation of needs, (b) purchasing, leasing, or other wise providing for acquisition; (c) selecting designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing; (d) coordinating and using other therapies, (e) training or technical assistance for the student and family, and (f) training or technical assistance for professionals, employers or other individuals who provide services (IDEIA, 2004).

Assistive technology services are tasks which support the effective and successful use of an assistive technology device for an individual. AT services may be provided by a special educator, general educator, speech pathologist, occupational or physical therapist, or other related service providers that may work with the student. AT services are ongoing and conducted on an individualized basis. The IEP includes plans to provide services that are required to support the student's use of the AT. Appendix C outlines the assistive technology services model used to identify the need for assistive technology for a student with disabilities. AT devices and services are to be selected to support the student's participation in the educational setting. The student's needs are incorporated into the IEP goals and objectives

setting the stage for school systems to provide services (Bryant & Bryant, 2003; Cook & Hussey, 2002; Margolis & Goodman, 1999).

For the purpose of this study, unless specifically stated, the term assistive technology will refer to the devices, strategies, services, and applications used to increase the success of students with disabilities in the educational, vocational, and social environments. This definition forms a framework for the AT knowledge and skills that special educators should possess to successfully implement AT, improve outcomes for students with disabilities, and meet the legal mandate of IDEIA of 2004.

Indicators for Successful Technology Practices

Throughout the literature several themes emerged as essential to the successful adoption and use of both instructional technologies and assistive technologies. The following themes were identified as being essential to the successful adoption, utilization, and implementation of assistive technologies. These factors will guide the discussion in the subsequent sections:

1. Policy and planning includes comprehensive procedures for the selection, maintenance, funding, integration, and training in the use of assistive technologies and is conducted on federal, state, and local levels (Hart, 2000; Hauser & Malouf, 1996; Hutinger, 1994; Puckett, 2002; Reed, 1999; Zabala et al., 2000).
2. Funding initiatives include monies for repairs, maintenance and upgrading equipment, and professional development (Hart, 2000; Hauser & Malouf, 1996; Hutinger, 1994; Puckett, 2002; Reed, 1999).
3. National educator standards and competencies define the technology skills and knowledge levels that educators should possess (Hart, 2000; Hauser & Malouf, 1996; Puckett, 2002; Reed, 1999; Zabala et al., 2000).
4. Ongoing professional development is essential to the successful implementation of assistive technologies (Hart, 2000; Hauser & Malouf, 1996; Puckett, 2002; Reed, 1999; Zabala et al., 2000).

Policy and Planning

Technology policies are developed at state, district and local levels. A comprehensive technology plan provides consistent policies and procedures for: (a) funding, (b) development of educator knowledge and skills, (c) provision of training, professional development; (d) maintenance of technology, and (e) assessment of the successful use of the technology (Hart, 2000; Hauser & Malouf, 1996; Hutingner, 1994; Warger, 1998; Zabala et al., 2000). While IDEA of 2004 mandates the consideration and selection of AT for students with disabilities, there is no formal federal policy or procedure for doing so. Each state is left to develop its own policies guiding the selection and implementation of AT.

Educational technology plans were developed by individual states to address infrastructure needs, computer purchasing, internet connectivity, and professional development. In the majority of these plans, little consideration was given to the technology needs of students with disabilities. District and local school divisions perpetuated this exclusion of AT services within their own technology policies.

The Division of Research and Practice at the Office of Special Education Programs (OSEP) suggested that state special education directors develop AT policies that include: (a) a statement of desired AT outcomes, (b) procedures for delivering AT services, (c) staff development and technical assistance procedures, (d) verification that the technology plan includes research-based practices, (e) mechanisms for interdisciplinary involvement, (f) procedures for purchasing, using, and managing equipment; (g) procedures for obtaining funding, and (h) procedures for communicating AT policies.

An additional resource which can be used to guide the development of AT policies and procedures to improve AT services and educational results for students with disabilities are the Quality Indicators for Assistive Technology Services (QIAT). State and local agencies utilize these indicators in the identification of strengths and weaknesses within current policies (Reed, 1999; Zabala et al., 2000). The following indicators are addressed by QIAT: (a) administration support, (b) consideration of AT, (c) assessment of AT needs, (d) IEP development and documentation, (e) implementation and training, and (f) evaluation.

Bell and Blackhurst (1997) conducted a nationwide study of state departments of education. Findings indicated a lack of fully developed policies for delivering assistive technology at a state level. Even though the majority of existing policies contained AT definitions and regulations as set forth by IDEA of 1997, most state policies did not specify procedures for the assessment, use and maintenance of AT. Over 85% of the reporting state agencies indicated that there was a critical need for the development of AT service delivery models.

Hart (2000) examined five assistive technology projects from across the United States. A major factor identified as contributing to the success of each of the projects was that well-developed policies dealing with the selection, use, and evaluation of AT devices and services were instituted. Each of the projects utilized a “systematic framework ...to build technology policies and practices that support learning for all students, including students with disabilities” (p.18). Additional key factors making these projects successful included: (a) a high level of involvement, support, and commitment by administration staff at district and local levels; (b) state and local technology plans addressing the need for technology for students with disabilities, and (c) availability of educational opportunities and supports for teachers, students, and parents.

The development of state and school divisions policies are complicated by the complexity of issues and diversity of the individuals that are involved in the AT process. Furthermore the lack of formal guidelines spelled out by IDEA of 1997 results in services become fragmented (Zabala, et al., 2000). Puckett (2002) suggested that one possible explanation for special educators limited knowledge of the use of AT comes from the fact that state and local technology policies were not developed to meet the AT consideration requirements of IDEA of 1997.

Assistive Technology Policy in Virginia

The Educational Technology Plan for Virginia: 2003-2009 (Virginia Department of Education, 2003a) was written to provide support for school divisions as they developed educational technology policies. There are five issues identified and addressed within the Virginia technology plan. These include integration, professional development, connectivity, educational applications, and accountability.

Citing the accountability requirements of the No Child Left Behind Act of 2001, to disaggregate student data, the Educational Technology Plan for Virginia noted that assistive technologies were important to provide students with disabilities greater access to the general

education curriculum thus increasing their academic achievement (Virginia Department of Education, 2003b). The plan acknowledged that assistive devices were not readily available in all Virginia schools and that school divisions lacked the technology resources and/or the technology knowledge and strategies to provide for the needs of students with disabilities. The plan failed to offer any additional resources or information about assistive technology. Inge (2003) suggested that the Virginia technology plan “demonstrates a lack of policy understanding related to the value of AT” (p.125) not only for students with disabilities but also for students who are at-risk, and those in adult and vocational education programs. With this limited acknowledgment of AT within the state technology plan, local educational areas were not encouraged to include AT as part of their technology plans and policies.

The current policy for provision and delivery of AT devices and services in the Commonwealth of Virginia is found within The Regulations Governing Special Education Programs for Children with Disabilities in Virginia (Virginia Department of Education, 2000). These regulations utilize the definition for AT found in the IDEIA of 2004. This definition includes the devices, tools, and services as defined in the legislation. Individual local education areas are required to “assure that assistive technology devices or assistive technology services, or both... are made available to a child with disabilities...” (Virginia Department of Education, 2000, p.40). In addition the local educational areas are responsible for creating their own policies to guide the evaluation of AT needs and procurement of AT devices.

Several studies of Virginia special education directors were conducted to examine AT policies and policy implementation (Inge, 2003; Morrissette, 1994; Peters, 1999). Each of the studies recommended that the Virginia Department of Education consider developing and implementing (a) statewide guidelines for assistive technology devices and services; (b) pre-service and in-service training opportunities, (c) linkages to local, state, and national resources, and (d) support for funding resources.

Peters (1999) conducted a mixed methods study utilizing a self reporting questionnaire and interviews, of Virginia special education directors. This was a follow-up to a previous study conducted by Morrissette (1994). Peters found that over 50 % of school divisions lacked a written policy for AT, including procedures for AT referrals or defining responsibilities for implementing AT. Directors agreed that guidelines would be helpful and suggested that a handbook for AT be developed for parents and educators.

Inge (2003) found that only 36.5% of special educators received AT policy, guides, manuals, and technical assistance documents and less than 10% of general educators, parents, and students received these same documents.

Funding for Technology

Since technology is constantly evolving, it is essential that policies include plans for funding professional development and repair, replacement, and/or purchase of hardware and software. While new technologies may improve the performance of students with disabilities, supplemental supports and training for professionals working with the student are also required. However, research shows that a lack of funding is one of the major barriers to the selection, implementation, and integration of assistive technology. (Abner, G. H., 2002; Beggs, 2000; Howell & Malouf, 1996; Thorkildsen, 1994).

In 2000, over \$465 million was spent on the provision of assistive technology devices and services directly to students with disabilities (Education Finance Statistics Center, 2001). The No Child Left Behind Act of 2001, recognized the importance of funding effective integration of technology within the educational environment. Specifically the Enhancing Education Through Technology Act of 2005, allocated more than \$700 million dollars for educational technology funds. Within this legislation no mention is made of funding specifically for assistive technology devices or training.

Funding for AT includes the following items as identified in The Synthesis on the Selection and Use of Assistive Technology Report: (a) the actual cost of the AT device, (b) special costs for provision of the devices – such as furniture and space (c) costs associated with integrating tools, (d) maintenance and repair of device(s), (e) training and staff development needs, and (f) assessment costs. The report emphasized the importance of having well developed AT policies which specifically addressed each of these funding lines (Gruner et al., 2000).

IDEIA of 2004 provides no specific guidelines for funding assistive technologies. States and school divisions are left to resolve this problem on their own. Without specific guidelines, costs are often overlooked. Neglecting to factor in all costs into the funding equation may result in the AT device being abandoned or having limited impact for the student. The lack of policies to guide funding, often leads special educators to solve the funding puzzle on their own.

Assistive Technology Funding in Virginia

Consideration of assistive technology devices and services is mandated for all students with disabilities by IDEA of 2004. This provision of AT may result in a drain on state and local coffers. Data on spending levels for Virginia special education students indicated that 2001 spending was at the highest levels with over \$1,165,805,624 being spent per year on special education services (Virginia Department of Education Division of Special Education & Student Services, 2001). The Virginia Child Count (2001) estimated that at least 162,265 students served by special education programs and special education funding for each student averages \$13,817.00 per year. Funding issues were further complicated by the fact that the number of students with disabilities at each grade level fluctuates from year to year (Inge, 2003).

In Virginia, individual school divisions are responsible for funding AT. Morrisette (1994) found that at least one third of the 134 school systems reported that no funds were budgeted for AT training or devices. Five years later, Peters (1999) reported that at least 50% of special education directors budgeted funds for AT. In recent years these funds were directed towards general education technology initiatives. These initiatives included upgrading computers, connecting to the Internet, teacher training, and meeting the requirements for SOL testing (Peters, 1999). This resulted in the limited availability of funds for the purchasing and supporting assistive technology.

Additional outside funding sources are lacking for AT in Virginia. Virginia Medicaid as well as private and state insurance was limited to the acquisition of communication devices for students (Peters, 1999). Parents were able to apply for low cost loans for AT through the Department of Rehabilitation Services and the Virginia Assistive Technology Loan Fund.

Educational and Assistive Technology Standards

Competencies and standards were developed to ensure quality and provide benchmarks for educator knowledge for educational technology (Edyburn, 2005; Lahm, 2005). These instructional technology standards were implemented for all educators on national and state levels.

The National Educational Technology Standards (NETS) developed by the International Society for Technology Education (ISTE) emphasized the importance of educators not only knowing how to use technology tools to meet and support educational goals (International

Society for Technology in Education NETS for Teachers Project, 2005). These standards are found in Appendix D. The ISTE/NETS standards are structured under six broad headings: (a) Technology Operations and Concepts, (b) Planning and Designing Learning Environments and Experiences, (c) Teaching, Learning and the Curriculum; (d) Assessment and Evaluation, (e) Productivity and Professional Practice, and (f) Social, Ethical, Legal, and Human Issues. The Virginia Technology Standards for Instructional Personnel (TSIP) are based on the ISTE/NETS standards (Virginia Technology Standards for Instructional Personnel Statutory Authority of 1998, § 22.1-16, Code of Virginia). Both the ISTE and TSIPS include standards requiring that educators know how to use technology to support diverse learners. No specific reference is made to “assistive technology” within these standards.

Nickels (1999) developed a comprehensive list of assistive technology competencies for beginning educators, experienced educators and assistive technology specialist. Using a Delphi method, two panels of special education and assistive technology experts ranked a set of assistive technology competencies based on their importance. Following three Delphi rounds, 37 knowledge statements and 167 skills statements were identified. Of these statements, 133 statements were considered essential skills and knowledge for assistive technology specialists, with 47 for beginning educators, and 50 for experienced educators.

Lahm (2003) further refined these standards by again using the Delphi method. The Knowledge and Skills Committee of Council for Exceptional Children validated 49 statements as being essential skills and knowledge for assistive technology specialists. The CEC Standards and Practices Committee utilized a standards based model of competencies developed by The Interstate New Teacher Assessment and Support Consortium (INTASC) to categorize these knowledge and skill statements into 10 standards. These standards formed the foundation for the assistive technology knowledge and skills needed by all professionals working in special education. Individual skills and knowledge competencies are included under each of the following standard headings: (a) Foundations, (b) Development and Characteristics of Learners, (c) Individual Learning Differences, (d) Instructional Strategies Learning Environments and Social Interactions, (e) Language, (f) Instructional Planning, (g) Assessment, h) Professional and Ethical Practice, and (i) Collaboration.

Even though assistive technology standards for special educators were identified, little research exists relating to the use and effectiveness of these standards. Michaels & McDermott (2003) surveyed 356 graduate programs in special education seeking to assess how these special education teacher preparation programs integrated AT into their instruction and curriculum. Using a self-designed survey based on national technology standards researchers sought to assess the level of knowledge and skills achieved by graduate students on 18 standards focusing on the understanding and use of AT and AT decision making. The results indicated a significant difference in the perceived importance of AT competencies and the attainment of standards. The perceived knowledge of the students was lower than the skills and knowledge levels set forth by the standards.

Assistive Technology Skills and Knowledge

In order to meet the mandates of IDEIA of 2004 for the provision of assistive technology devices and services for students with disabilities, special educators require specific knowledge and skills as stated in the CEC standards. Multiple studies reported that one of the major barriers to the successful implementation of assistive technology was the lack of special educator knowledge and skills to effectively implement assistive technology devices and services (Abner & Lahm, 2002; Bauder, 1999; Cronis & Ellis, 2000; Hauser & Malouf, 1996; Lahm & Sizemore, 2002; Ledger, 1999; Thorkildsen, 1994; Vannatta & Fordham, 2004).

The majority of special educators receive one class period (3 hours) devoted to assistive technology within an instructional/educational technology class (Bair & Bair, 1998). In 2003 over 800 institutions of higher learning offered degree programs in special education, but only 17 offered a degree or certification in assistive technology (1998). This lack of preservice AT training opportunities for special educators means that the job often falls to state and local school systems.

Derer, Polsgrove, and Rieth (1996) surveyed 1100 public school special education teachers in Kentucky, Tennessee, and Indiana. Researchers focused on the use, benefits, and barriers of using AT. Lack of AT skills and knowledge and professional development opportunities were listed as prominent barriers to the implementation of AT. Over 41% of special educators surveyed reported that the professional development that they had received was not adequate to assist and support students using AT.

In another study Thompson, Siegal, and Kouzoukas (2000) surveyed over 200 Illinois special educators. Over 60% of these educators indicated that the lack of knowledge about assistive technologies and the amount of time and professional development needed to effectively use assistive technologies were major barriers to the provision of AT services.

Professional Development

Professional development opportunities are essential to support the effective use of technology and provide professionals with the needed skills for teaching and learning. The CEO Forum on Education and Technology (1999) purports that effective professional development influences teachers' instructional methods thus improving student achievement.

Before beginning a discussion of professional development it is important to understand some of the basic principles of adult learning. Requirements and needs for learning are unique for all learners, including adults. Malcolm Knowles developed the pedagogy, "andragogy" an adult learning theory based on the characteristics of adult learners (Crawford, 2005). Knowles identified several characteristics of the adult learner. In general adult learners are self-directed and goal oriented. They prefer for their learning tasks to be applicable to their life experiences. Adult learners also prefer to be in control of their learning choices and be involved in active learning. A positive, respectful learning environment is preferred by adult learners. Each of these characteristics needs to be considered when designing professional development opportunities.

Professional development opportunities are essential to support the effective use of technology. They can be the vehicle for providing professionals with the needed skills for teaching and learning. The National Staff Development Council (2001) suggests that effective professional development influences teachers' instructional methods thus improving student achievement. Based on a study of the literature effective professional development must include the following factors to support the development of technology skills: (a) be based on adult learning principles (CEO Forum on Education and Technology, 1999; Hutinger & Johanson, 2000; Inge, Flippo, & Barcus, 1995; Mouza, 2002); (b) include opportunities for active learning and hands-on activities (Birman, Desimore, Porter, & Garet, 2000; Cole, Simkins, & Penuel, 2002; Inge et al., 1995; Mouza, 2002; NSDC Standards for Staff Development, 2001); (c) provide time for collaboration and communication between educators (Birman, Desimore, Porter, &

Garet, 2000; CEO Forum on Education and Technology, 1999; Cole, 2002; Inge, Flippo, & Barcus, 1995; Mouza, 2002; NSDC, 2001); (d) offer sustained instructional and technical support (Birman, Desimore, Porter, & Garet, 2000; Cole, Simkins, & Penuel, 2002; Inge et al., 1995; Mouza, 2002; NSDC Standards for Staff Development, 2001), and; (e) be related to needs of teacher and students (Birman, Desimore, Porter, & Garet, 2000; Cole, Simkins, & Penuel, 2002; Inge et al., 1995; Mouza, 2002; NSDC Standards for Staff Development, 2001)

One project which focused on professional development's relationship to assistive technology skills was conducted in Tennessee (Puckett, 2002). Project Access, strategically designed an assistive technology program for Tennessee special education teachers in grades k-8. The program included an assistive technology toolkit and provided professional development opportunities for learning about assistive technology. The toolkit contained a variety of "no tech" to "high tech" assistive technology devices and software. A pretest given at the beginning of the study showed that 80% of the educators reported limited knowledge of AT and AT applications. Following 25 hours of professional development sessions which focused on a variety of the use of a variety of AT devices and general curriculum standards, a post test was given. Over 77 % of teachers indicated that they felt proficient in the use of the AT tools found in the kit. Teachers involved in the training demonstrated improvement in their knowledge base about AT and increased confidence and willingness to utilize AT within the instructional program. Results from this study support the importance of sustained, hands-on training opportunities to the development of assistive technology skills.

Technical assistance is often an overlooked component of building AT knowledge and skills for educators (Hart, 2000; Margolis & Goodman, 1999). In general technical assistance is ongoing and should be provided at the district, building and classroom level. The purpose of technical assistance is to assist users in applying what was learned in professional development.

In the examination of five successful assistive technology projects around the United States, Hart (2000) found that technical assistance was essential to the success of students utilizing AT. In each of these projects technical assistance was found to be one essential factor which aided educators in identifying solutions for unique student needs. Technical assistance was viewed as a means for assisting educators with creative problem solving. By providing technical assistance to all stakeholders, attitudinal and skill barriers were reduced and stakeholders reported having increased skill and comfort.

Assistive Technology Professional Development in Virginia

While the numbers of AT professional development opportunities have increased over the past ten years, they still do not appear to be keeping pace with the need. In three separate studies, Virginia special education directors consistently identified the following areas of need for professional development: (a) evaluation of AT devices, (b) writing AT devices and services into the IEP, and (c) operation and maintenance of AT devices (Inge, 2003; Morrissette, 1994; Peters, 1999).

Funding for professional development in the area of assistive technology was limited. Peters (1999) and Inge (2003) reported that only 36% of special education coordinators provided AT training to IEP teams. The special education directors cited that funding was limited for professional development within the local school systems. There was currently no information on the knowledge and skills of members serving on IEP teams or those providing AT services in Virginia according to Inge (2003).

The Virginia Department of Education (VA DOE) makes some provisions for obtaining AT training from higher education institutions, state supported projects, and regional Training and Technical Assistance Centers (TTAC). The TTAC system is supported by the VDOE through federal funding. The TTACs provide professional development, technical, and onsite consultations to professionals working in the public schools and serving students with disabilities for the past 14 years. Assistive technology lending libraries for local education areas are also maintained by the TTAC.

The Virginia Department of Education, Office of Special Education Programs developed and implemented a statewide improvement plan that focused on enabling students with disabilities to meet state standards and performance goals (Virginia Department of Education Division of Special Education & Student Services, 2001). This plan included three strategic initiatives which focused on increasing student achievement, providing personnel development opportunities, and increasing parent-student involvement in the special education process.

The personnel development initiative strives to promote the performance of students with disabilities by enhancing the knowledge, skills and abilities of the professionals that work with them. One initiative created to support the use of assistive technologies with students with disabilities is the Assistive Technology Task Force Project (Virginia Department of Education Division of Special Education & Student Services, 2001). The purpose of this project is to

determine and then coordinate the training and technical assistance needs of parents, teachers, and administrators in using AT to provide students with disabilities greater access to the general education curriculum. The professional development opportunities are to be provided in “multiple formats and locations”.

Even with the increase in training and professional development opportunities over the past few years, evidence was not gathered to determine the effectiveness of these opportunities. The successful selection, implementation, and integration of AT is dependent upon the skills and knowledge of the special educator working with the student. The needed AT professional development opportunities for teachers can greatly impact the success of students with disabilities.

Summary

This literature review examined studies from 1994 to the present that addressed the factors which influence the successful selection, use, and integration of AT devices and services – including policy, funding, professional standards, knowledge and skills, and professional development. The 26 studies included in this review and their descriptions are located in Appendix A. The information in this table includes the author and year, purpose, methodology and sample, and findings.

An analysis of the studies revealed that researchers used a variety of methodological approaches when examining factors that influence the successful selection, implementation and use of assistive technologies. Questionnaires/surveys were the most frequently used methodology (Abner, G. H., & Lahm, E. 2002; Bauder, 1999; Behrman, Morrissette, & McCallen, 1993; Birman et al., 2000; Derer et al., 1996; Morrissette, 1994) other studies used interviews (Lahm & Sizemore, 2002) or case study methodology (Mouza, 2002). Two studies utilized the Delphi methodology (Lahm, 2003; Nickels, 1999), while several others used mixed methods – interviews, surveys and observations (Gruner et al., 2000; Hart, 2000; Hutinger, 1994; Hutinger & Johanson, 2000; C. Inge, 2003; Kanaya et al., 2005; Peters, 1999; Puckett, 2002; Tobis, 1996).

The following conclusions can be drawn from the data reviewed:

1. The provision of AT is legally mandated for all identified students with disabilities.

2. National standards do exist for guiding the development of AT policy and sets AT skills and knowledge standards for educators (Nickels, 1999).
3. Successful selection, use, and integration of AT requires well developed policy, adequate funding, AT knowledge and skills of educators, and professional development opportunities (Abner & Lahm, 2002; Bauder, 1999; Birman et al., 2000; Gruner et al., 2000; Kanaya et al., 2005; Lahm & Sizemore, 2002; Morrissette, 1994; Puckett, 2002; Tobis, 1996).
4. AT policy and procedures are left to individual school districts within Virginia. The formalization of state policies and procedures for the implementation of AT would be beneficial (Inge, 2003; Morrissette, 1993; Peters, 1999).
5. There are no assessments of the AT skills, knowledge, and professional development needs of special educators in southwestern Virginia.

Before plans can be made to implement future statewide, regional and local technical assistance and professional development opportunities, information is needed to determine special educators' perceived AT skills and knowledge as well as their projected professional development needs and preferences. The results from this study will assist the Virginia Department of Education's Training and Technical Assistance Center (TTAC) and local school divisions in determining the next steps for determining how to successfully implement AT practices for students with disabilities within the southwestern Virginia.

CHAPTER 3 – METHODOLOGY

This chapter describes the methods used in this study including the research questions, population, questionnaire development and administration, and data analysis. Data collection for this study was conducted utilizing a self reporting mail questionnaire. Questionnaires are a relatively inexpensive method of data collection that can be used to gather information from a larger population (Dillman & Anderson, 1978; Fowler, 1988).

The purpose of this study was to explore special educator's perceived skills, knowledge, and professional development needs related to assistive technology. The following research questions guided this exploration:

1. What facilitators do special educators perceive as being important for the successful implementation of assistive technology?
2. What are the assistive technology skill and knowledge levels of special educators?
3. For which assistive technology skills and knowledge competencies do special educators perceive a need for professional development?
4. How has knowledge about assistive technologies been gained? What are the preferred methods for learning about technology? What are the preferred delivery methods for professional development?

Population

Special educators in southwestern Virginia were selected as the population for this study. The researcher works with educators who teach in this region and access was available to a mailing list of educators within this region. The mailing list from the Virginia Department of Education's Training and Technical Assistance Center (TTAC) at Virginia Polytechnic Institute and State University was used. This list is comprised of contact information for approximately 5,000 administrators, educators, parents, and other related service providers. From the list over 1,360 were identified as special educators. To narrow the population to include just K-12 special educators, names of preschool special educators, educators from other regions, and those educators not identified by name were excluded. As a result, 1164 special educators were selected. These special educators were identified by name on the mailing list and taught in grades k-12 in southwestern Virginia's Superintendent's Regions 6 and 7.

The Questionnaire

A two part self reporting questionnaire was designed to elicit the respondents perceived assistive technology skills and knowledge levels and professional development needs. This questionnaire also identified the importance that special educators placed on selected facilitators for the successful implementation of AT. Demographic information was collected.

The Virginia Special Educators Assistive Technology Skills and Knowledge Questionnaire is divided into two parts. The first part contains 79 likert type items that were classified according to five domains. These domains were derived from a review of the literature. Individual items were selected for inclusion on the questionnaire based on their relevance to one of these five domains listed below:

Domain 1 - Importance of Facilitators consisted of six items designed to assess the importance that special educators placed on a group of factors identified as having an impact on the successful implementation of AT.

Domain 2 - AT Skills and Knowledge Levels consisted of 27 items designed to assess the assistive technology skills and knowledge level of special educators.

Domain 3 - Professional Development Needs for AT skills and knowledge consisted of 27 items and was designed to determine the assistive technology skills and knowledge areas in which special educators perceived a need for professional development.

Domain 4 - Technology Learning Preferences consisted of eight items designed to assess the preference of special educators for selected methods for learning about technology.

Domain 5 - Professional Development Preferences consisted of eight items designed to assess the preference of special educators for selected methods of professional development.

The second part of the questionnaire collected demographic information and consisted of five items. Respondents were also asked to make comments. Assistive technology acronyms and terms were defined throughout the questionnaire to ensure respondent understanding.

Response format for questionnaire items included checklists, graphic scales and nominal rating scales (Fink & Kosecoff, 1985). One item used a checklist for data gathering. A checklist was selected in order to provide respondents with a series of answers that they might have forgotten or not have thought of without prompting. The Likert type scale used in this questionnaire is sometimes referred to as a graphic scale. A graphic scale provides a visual continuum for the responses (1985). For this reason not all points on the scale are labeled. Each

graphic scale used on the questionnaire contains five points with three points identified – the highest, mid, and lowest. Demographic information was collected using nominal rating scales.

Development of the Questionnaire

As mentioned above, items chosen for inclusion within the questionnaire were grouped into content domains. These domains helped to organize the questionnaire items under meaningful headings and are used to guide the discussion of questionnaire development, and data analysis.

Domain 1 – Facilitators

The first item on the questionnaire collected information on the perceived importance that special educators place on identified facilitators which contribute to the successful implementation of AT. These facilitators were selected based on information found within the review of literature and were: (a) awareness and knowledge, (b) time, (c) professional development, (d) funding, (e) administrative support, and (f) technical assistance. A graphic rating scale, from 4-0, was used for rating the importance of each of the facilitators to the successful implementation of AT. The three identified points were *very important* (4), *average* (2), and *not important* (0).

Domain 2- AT Skills and Knowledge Levels

Items in this domain were adapted from The University of Kentucky Knowledge and Skills Survey (2002). This survey is one component of the University of Kentucky Assistive Technology (UKAT) Toolkit. The Toolkit is the result of 6 years of research and collaboration between the University of Kentucky and Kentucky Public Schools. This self reporting survey was created to guide the development of assistive technology professional development opportunities for teachers, parents, and students in Kentucky schools. The 50 skills and knowledge competencies found on the questionnaire are based on the Technology Competencies for Beginning Special Educators as recommended by the Council for Exceptional Children (CEC). Appendix E lists these competencies. Permission to use the UKAT Survey or any part of the survey was granted for noncommercial purposes.

Questionnaire length was a concern for this researcher. For this reason only 27 skills and knowledge competencies from the UKAT were selected for use on The Virginia Special Educators Assistive Technology Skills and Knowledge Questionnaire. At least two skills and knowledge competencies were chosen from each of the standard headings. The selected

competencies were grouped on the questionnaire but no standard headings were given. Again the graphics scale, 4 - 0, was used. The three identified scale points were *expert skills and knowledge* (4), *average skills and knowledge* (2), and *no skills or knowledge* (0).

Domain 3– Professional Development Needs

The same 27 skills and knowledge competencies identified to collect data on AT skills and knowledge levels were used to collect data on the assistive technology professional development needs of special educators. Respondents rated their perceived need for professional development on each of these competencies. A graphic scale was used with the labels *critical need* for professional development (4), *average need* (2) and indicating *no need* (0).

Domain 4 – Technology Learning Preferences

In order to gather information about how special educators gained knowledge about assistive technology a list of six possible resources for AT training were identified. The literature and professionals in the area of assistive technology were consulted to provide suggestions of resources to be included on this list. An additional option was provided for educators who had received “no training”. These seven items were included in a checklist. Respondents were asked to indicate all of the resources from which AT training was received.

A list of eight frequently used methods, common to both, were identified. Two separate scales were used for this item. First respondents were asked to indicate their learning method preferences on a scale from favorite *method* (4) to *dislike; least preferred* (0).

Domain 5 – Technology Professional Development Preference

The same methods that were selected for determining the technology learning preferences for special educators were also used to gather information on the preferred method of professional development of these educators. Again the graphics scale was used with *favorite method* (4) and *dislike; least preferred* (0).

Demographics and Comments

Demographic data were collected at the end of the questionnaire. Using a nominal rating scale respondents were asked to indicate their educational role, years of teaching experience, grade levels taught, completed level of education, and gender. Respondents were also asked to provide their school division. No open ended questions were included in the questionnaire, however a space for comments was provided. Researcher contact information and a reminder of the due date for return of the questionnaire were placed at the conclusion of the questionnaire.

Validation

Importance of the topic to the respondents and guaranteed anonymity are two factors which are shown to improve validity (Ary, Jacobs, & Razavieh, 1990). The focus of this questionnaire was assistive technology which is an important issue for special educators because of IDEA of 2004 mandates which require the consideration for the provision of AT devices and services for all students with disabilities. Anonymity and confidentiality of respondents were protected in this study. Generally, if anonymity and confidentiality of respondents are protected, respondents tend to be more truthful in answering questions which helps to improve study validity (1990).

In order to establish validity a content analysis was conducted by two Virginia Tech faculty with expertise in questionnaire development and four assistive technology and special education specialists. These professionals examined the questionnaire content to determine if the items used were actually assessing AT skills and knowledge and professional development. They examined the clarity of directions, question wording, and use of vocabulary as well as the physical design and layout of the questionnaire.

Changes and deletions were made based on the feedback from these individuals. The questionnaire length was modified from 92 numbered items to 87 numbered items. The order of the domains on the questionnaire was also changed. The demographics section was moved to the end. Domain 1 – Facilitators was placed as the first item on the questionnaire. It was suggested that this domain would be a non-threatening way to begin the questionnaire. An open comment section was added to the end of the questionnaire. It was recommended that a larger paper size (11"x17") be used to make the questionnaire more readable.

Following these recommendations the questionnaire was modified and submitted for a pilot test. Twelve special education professionals from regions outside the area designated for research were asked to pilot test the questionnaire. They were asked to provide written input regarding the readability and understandability of the items and directions. Using these recommendations, modifications to the questionnaire length, layout and adaptations to several items were made.

The pilot group indicated that several of the skills and knowledge competencies seemed repetitive. Based on this input six of the skills and knowledge competencies were removed. The wording for directions and layout for the Domain 4 –Technology Learning Preferences and

Domain 5 – Professional Development Preferences domains were revised. The two domains were combined to conserve space. Abbreviations had been used in several places in the questionnaire. These were changed to full word explanations. Misspellings and typographical errors were also corrected.

These modifications resulted in a respondent friendly questionnaire - The Virginia Special Educators Assistive Technology Skills and Knowledge Questionnaire. The final questionnaire contained a total of 84 items and was printed on 11”x17” white paper. The evaluation and input from a variety of professionals in the field of education and technology helped to ensure that the directions and questions were understandable and the layout was readable thus increasing the content validity.

Questionnaire Administration

In January, 2006, a packet containing The Virginia Assistive Technology Skills and Knowledge Questionnaire along with a cover letter, prize registration form, and self addressed stamped return envelope was mailed to 1164 special educators from the mailing list of the Virginia Department of Education’s Training and Technical Assistance Center at Virginia Tech. The cover letter was printed on stationary from the TTAC and explained the purpose of the questionnaire. The letter assured receipts of complete confidentiality and offered a copy of study results if requested upon completion of the study. The incentive for returning a completed questionnaire was also discussed. Respondents were offered an incentive for returning completed surveys. By returning a prize form along with their completed questionnaire, their name was entered in a drawing for ten door prizes. These door prizes included digital cameras, professional books, and scholarships to attend several conferences. Personal identifying information was only collected on the prize form. Prize forms were separated from completed questionnaires as soon as they were received to protect respondent anonymity. Copies of each of these documents are found in Appendixes F and G. Two weeks after the initial questionnaire administration, 121 (13%) questionnaires were returned.

Follow-up Communiqués

Dillman’s Tailored Design Method (1978) recommends that at least five contacts be made with the population to help ensure a high response rate. Due to monetary constraints and the large population size (1164) this was not an option for this study. Everyone in the population

was contacted two times, with subsets of the population being contacted four times. Two weeks after the initial questionnaire administration a reminder was mailed to the total population. A copy of the reminder can be seen in Appendix H. After this mailing 80 additional questionnaires were returned resulting in a response rate of 17% ($n=201$).

A third contact was made four weeks following the initial questionnaire administration. Region 7 special education directors were contacted via email and asked to electronically forward the questionnaire to all of their special educator teachers. Directors from this region were selected because the return rate from this region was 22% lower than that from Region 6. Twenty one additional questionnaires were received following this contact. Seven were returned electronically and 14 returned by mail. This resulted in a total of 222 (19%) completed questionnaires.

A fourth contact was made five weeks after the initial questionnaire administration. Based on the response rate from each school district a complete questionnaire packet (like the one sent in the initial questionnaire administration) was sent to the 24 special educators, found on the original mailing list. This contact resulted in the return of 12 additional questionnaires. A total of 234 completed questionnaires were returned for a response rate of 20%.

Eight weeks following the initial questionnaire administration, telephone contacts were made with four special educators. These educators were selected by matching the names on the returned prize forms with the names on the original mailing list. The purpose of this contact was to determine why these educators did not return their questionnaires. When asked why questionnaires were not returned, these educators stated that the questionnaires were not received or they did not recall receiving a questionnaire. However, none of the 1164 original mailings or reminder mailings were returned due to incorrect teacher names or addresses. A complete summary of this information can be found in Appendix I.

Reliability

The reliability of the four domains was estimated using Cronbach's alpha, a measure of internal consistency. The overall alpha reliability for the Assistive Technology Skills and Knowledge Questionnaire was .87, indicating an overall strong reliability of the instrument. The alpha for each of the five identified domains indicated strong internal consistency and is reported in Chapter 4.

Data Analysis

Descriptive research simply identifies a phenomenon with statistics such as percentages, frequencies, and measures of variability. Relationships are examined or comparisons are made (McMillan & Wergin, 2002). This study was designed to collect descriptive data.

Following the administration of the questionnaire, a computer statistical software program, Statistical Package for the Social Sciences, SPSS-PC, 14 (Prentice Hall) was utilized to compile and analyze quantitative data gathered from this descriptive study. Frequency distributions and histograms were examined for each of the 84 continuous variables to determine the distributional shape of the data. Teachers' comments were transcribed and categorized. These are found in Appendix I.

Data cleansing procedures were used to identify errors which occurred during data entry (Fowler, 1988). Each questionnaire was given a number which corresponded to the case number within the SPSS data file. Distributions were run periodically to identify any data entry errors. When errors were found, the case number could be used to locate the original source (questionnaire) and corrections could be made to the data set. The methods for data analysis for each research question follows.

Research Question 1

What facilitators do special educators perceive as being important for the successful implementation of assistive technology?

Data to answer this research question were collected using Domain 1 - Facilitators. Using the graphic scale, respondents were asked to rank the perceived importance of six facilitators on a scale from *very important* (4) to *not important* (0). Frequency, percentages, and number of responses were tabulated.

Research Question 2

What are the perceived assistive technology skills and knowledge levels of special educators?

Domain 2 - Skills and Knowledge collected data to answer this question. Respondents were asked to rank these competencies on a graphic scale from *expert* (4), *average* (2), to *no skills* (0). A Cronbach's alpha, the number of responses, percentages and means were tabulated.

Research Question 3

For which assistive technology skills and knowledge competencies do educators perceive a need for professional development?

Domain 3 - Need for Professional Development was used to collect data to answer this research question. These were the assistive technology skills and knowledge competencies derived from the UKAT Survey. Respondents indicated their perceived need for professional development using a graphical scale from *critical need* (4), *average* (2), and *no need* (0) for professional development. The Cronbach's alpha, frequencies, percentages and means were tabulated.

Research Question 4

How has knowledge about assistive technologies been gained by these special educators? What methods for learning about technology do these educators prefer? What professional development formats do these educators prefer?

A checklist was used to collect this data. Respondents were instructed to select all of the sources from which AT training and/or professional development was obtained. The number of responses and percentages were tabulated.

Domain 4 - Preferred Technology Learning Methods and Domain 5– Preferred Professional Development Methods were used to gather data for this question. Respondents first rated their technology learning preferences from *favorite* (4) to *not all* (0) for each of the 8 methods. Using these same eight methods and scale, respondents then indicated their preference for these methods for professional development delivery. A Cronbach's alpha and frequencies were tabulated for both domains.

Demographic Information

Demographic information was collected in items 25-26 using a nominal scale. Data gathered included educational role, years of experience, completed level of education, grade levels taught, gender, and county in which these educators teach. Frequency, percentages, and number of responses were tabulated. Questionnaire results are summarized and discussed in the next chapter.

CHAPTER 4 – RESULTS

The purpose of this chapter is to provide a summary of the data collected from the Virginia Assistive Technology Skills and Knowledge Questionnaire. Questionnaire data were analyzed using SPSS 14. It should be noted that while 234 questionnaires were returned some respondents did not answer all questions and several questions asked for more than one answer. This explains the differing sample totals across the data analysis and why some results may not total 100%. Frequencies, percentages, and histograms were examined for each of the 84 items to determine the distributional shape of the data.

The estimate of coefficient alpha, Cronbach's alpha, for the Virginia Assistive Technology Skills and Knowledge Questionnaire was .87 indicating an overall, strong reliability of the instrument. These results indicated that the teachers' responses to the items on the questionnaire were consistent and considered reliable representations of their perceived assistive technology skills and knowledge expertise and professional development needs.

Respondent demographics are reported first. This is followed by item level summaries which are grouped and reported to address specific research questions. Finally a summary of the data are provided.

Respondent Characteristics

Of the 1164 questionnaires mailed to special educators in southwestern Virginia. Two hundred and thirty four usable questionnaires were returned for a 20% response rate. Almost three times as many females responded (92%, $n=214$) than males. A majority of the educators (56%, $n=130$) reported ten or more years of teaching experiences. Thirty nine percent of respondents ($n=92$) taught at the elementary level, grades k-5. The degree status of these educators was almost evenly split between educators with Bachelors degrees (46%, $n=107$) and those with Masters Degrees (50%, $n=117$). Table 1 summarizes the demographics.

Table 1

Demographic Frequency Summary (N=234)

Variable	N	%
Gender		
Male	17	7.3
Female	214	91.0
Years of experience		
0-5 years	43	18.4
6-10 years	55	23.5
11-15 years	28	12.0
More than 15 years	102	43.6
Educational level		
BA/BS	107	45.7
MBA/MS	117	50.0
EdD/CAGS	5	2.0
Grade level taught		
Primary (k-2)	35	15.0
Upper elementary (3-5)	57	23.9
Middle (6-8)	63	26.9
High (9-12)	67	28.6
Educational role		
Special educator resource room	46	19.7
Special educator/self-contained	91	38.9
Special educator/collaborating teacher	80	34.2
Special educator/itinerant teacher	8	3.4

Research Question 1

What are the perceived facilitators in meeting the AT needs of students with disabilities?

Six facilitators, which contribute to the successful implementation of AT, were grouped to create Domain 1- Facilitators. Respondents were asked to rate these facilitators on a scale of *very important* (4) to *not important* (0). The internal consistency reliability coefficient was .78 for these six items indicating a strong level of item correlation.

Each facilitator was rated as having some level of importance. Nearly three fourths of the respondents rated funding, time, and technical assistance as *very important*. These same facilitators were ranked as having above average importance by 12-21% of respondents. A summary of these facilitators can be found in Table 2.

Table 2

Domain 1- Frequencies of Facilitators

Facilitators	Frequencies of Teacher Responses				
	4	3	2	1	0
Funding	181 (79.4)	28 (12.3)	10 (4.4)	1 (0.4)	0.0 (0.0)
Time	175 (76.8)	37 (16.2)	6 (2.6)	1 (0.4)	0.0 (0.0)
Technical assistance	162 (71.1)	48 (21.1)	8 (3.5)	1 (0.4)	0.0 (0.0)
AT awareness	160 (68.4)	49 (20.9)	10 (4.3)	2 (0.9)	3 (1.3)
Professional development	144 (63.2)	59 (25.9)	13 (5.7)	1 (0.4)	1 (0.4)
Administrative support	132 (57.9)	53 (23.3)	30 (13.2)	2 (0.9)	1 (0.4)

Note. Responses were made on a 5-point scale (4 = very important, 0 = not important). The values in parentheses under Frequency of Teacher Response represent the teachers' percent of agreement.

Research Question 2

What are the perceived skill and knowledge levels of special educators about assistive technology?

These 27 items were grouped into Domain 2 - AT Skills and Knowledge. The internal consistency reliability coefficient was .94. This indicates that most responses to items classified under this domain were highly correlated with each other.

Respondents were asked to rate their skills and knowledge level on a scale from *expert skills and knowledge* (4) to *no skills or knowledge* (0). Results were clustered under the following professional standard headings: a) foundation knowledge, which includes AT awareness, concepts, legal mandates, and characteristics; b) instructional strategies and learning environments, which includes operation and application of AT devices; c) instructional planning and communication which includes funding, technology standards, and use of electronic communication tools; d) assessment, knowing when and how to use AT for assessment; and e) professional practices and collaboration, which includes identification and participation in professional development and collaboration activities. Means are reported first followed by the frequencies.

On 25 of the 27 items, educators reported to possess skills within the average range. Upon examination of the items with the five highest means, three are in areas that are associated with general technology skills and include the use of “email” and the “Internet” and “possessing skills as required by the Virginia Technology Skills for Instructional Personnel Standards (TSIPS)”. The two other items with the highest means were found under Foundations Knowledge. Respondents reported above average skills for “recognizing the impact of technology” and “identifying characteristics of students which influence the use of AT”.

Upon examination the items with the lowest means were under the standard Instructional Strategies and Environments. The operation of “sensory”, “communication”, and “leisure” AT devices were items with reported means of 1.5. Means for two skills were reported as being below average including “providing AT training” and “locating funds for AT”. Notably “providing AT training” was the item with the lowest reported means within this domain. A summary of item means is found in Table 3.

In order to further understand the skills and knowledge levels of special educators on these competencies an individual item analysis for frequencies was conducted. The skills and

knowledge competencies are grouped under standard headings and frequencies are reported. The rating scale categories were collapsed to provide a simplified overview of the respondents perceived skills and knowledge. Scale categories 4 and 3 were collapsed to indicate responses that were *above average* and categories 1 and 0 were collapsed to report skills and knowledge levels that were *below average*. Items rated as 2 were considered *average*.

Table 3

Domain 2 – AT Skills and Knowledge Means

Skills and Competencies	Descriptive Statistics		
	M	SD	N
Foundations Knowledge			
Recognize impact of technology on students with disabilities	3.2	0.8	233
Identify characteristics of students influencing technology use	2.7	0.8	234
AT terms and concepts	2.1	0.9	234
AT federal and state mandates	2.1	1.0	234
Instructional strategies and environments			
Arrange classroom for the use of AT	2.5	1.0	225
Possesses knowledge of no tech to high tech AT	2.2	1.2	225
Organize computer activities for positive social interaction	2.1	1.1	234
Operate instructional and AT devices			
Learning & Educational Adaptations	2.2	1.1	228
Environmental Adaptations	2.0	1.3	225
Self Help Adaptations	1.9	1.3	227
Mobility & Positioning Adaptations	1.8	1.2	227
Computer Access	1.6	1.2	224
Sensory Adaptations	1.5	1.1	227
Leisure & Motivational Adaptations	1.5	1.2	228
Oral Communication Adaptations	1.5	1.3	228
Instructional planning and communication			
Use email for communication	3.7	0.6	234
Use Internet to support instruction	3.1	0.9	234
Identify curriculum elements for technology integration	2.3	1.0	225
Possess VA Technology Standards for Instructional Personnel	2.6	1.4	221
Identify AT funding resources	1.2	1.2	224
Assessment			
Evaluate AT in meeting student needs	2.0	1.1	22
Use technology for assessment	1.9	1.2	21
Determine need for an AT assessment	1.8	1.1	21
Professional practices and collaboration			
Identify professional development activities	2.3	1.0	230
Collaborate with others for integration of AT	2.2	1.2	225
Participate in technology professional organizations	1.9	1.2	225
Provide training in the use of AT	0.8	1.1	222

Foundation Skills and Knowledge

Foundation skills and knowledge items explored the special educators' perceived knowledge in the areas of understanding terms, concepts, legal mandates, and characteristics of students with disabilities that influence the use of technology. Results indicated that over 90% of respondents reported at least an *average* understanding of "student characteristics that influence the use of technology" and for "recognizing the impact of technology". Only one third reported *above average* skills for understanding AT terms, concepts, and mandates. Data are summarized in Table 4.

Table 4

Skills and Knowledge - Foundations

Skills and Knowledge Competencies	Frequencies		
	Above	Average	Below
Recognize impact of technology on students	196 (83.7)	30 (12.8)	7 (3.0)
Identify characteristics influencing technology use	152 (64.9)	64 (27.4)	18 7.7
AT Federal and state mandates	61 (39.5)	81 (34.6)	62 (26.0)
AT terms and concepts.	85 (36.3)	96 (41.0)	44 (22.6)

Note: Responses were made on a 5 point scale (4= expert; 0 =no skills). The values in parentheses represent the percent.

Instructional Strategies and Learning Environments

Instructional strategies, learning environments, and operation of selected AT devices and adaptations were addressed in these items. Between 46-50 % of respondents indicated *above average skills* in, "operating learning devices" and "arranging classroom environments". A wide range of skills levels are reported for the operation of instructional devices. Nearly 50% of respondents reported *above average* skills in "operating learning adaptations". In contrast nearly

50 % reported below average skills for operating “sensory”, “computer access”, “mobility”, “leisure”, and “oral communication” devices. Data are summarized in Table 5.

Table 5

Skills and Knowledge - Instructional Strategies and Environments

Skills and Knowledge Competencies	Frequencies		
	Above	Average	Below
Arrange classroom for the use of AT	117 (50.0)	75 (32.1)	34 (14.6)
Possess knowledge of no- high-tech AT	103 (44.0)	69 (29.5)	53 (22.7)
Organize computer activities to promote positive social interaction.	59 (25.2)	89 (38)	84 (35.9)
Operate instructional and AT devices:			
Learning & Educational Adaptations	108 (46.2)	64 (27.4)	56 (23.9)
Environmental Adaptations	91 (38.9)	52 (22.2)	81 (34.6)
Self Help Adaptations	89 (38.1)	44 (18.8)	92 (39.3)
Mobility & Positioning Adaptations	78 (33.3)	50 (21.4)	99 (42.3)
Oral Communication Adaptations	65 (27.8)	44 (18.8)	119 (50.8)
Computer Access	63 (26.9)	67 (28.6)	98 (41.9)
Leisure & Motivational Adaptations	55 (23.5)	55 (23.5)	117 (50.0)
Sensory Adaptations	53 (22.6)	64 (27.4)	110 (47.0)

Instructional Planning and Communication

Instructional planning and communication skills and knowledge were assessed by these items. Over 60% of respondents reported having *above average* to *expert* skills in the areas required by the Virginia Technology Standards for Instructional Personnel (TSIP), including the use of email and the Internet. Notably the greatest number of respondents reported having *above average* skill “the use of email”. Only 15% reported to have *above average* skills in the location of funding for AT. Data are summarized in Table 6.

Table 6

Skills and Knowledge - Instructional Planning and Communications

Skills and Knowledge Competencies	Frequencies		
	Above	Average	Below
Use email for communication	225 (96.1)	8 (3.4)	0 (.4)
Use Internet to support instruction	192 (82.0)	30 (12.8)	12 (5.1)
Possess Virginia Technology Standards for Instructional Personnel	141 (60.3)	27 (11.5)	53 (22.7)
Identify curriculum elements appropriate for technology integration	103 (44.0)	77 (32.9)	45 (19.2)
Identify AT funding resources	36 (15.4)	48 (20.5)	140 (59.8)

Note: Responses were made on a 5 point scale (4= expert; 0 =no skills). The values in parentheses represent the percent.

Assessment

The next items focused on assessment. Between 28%-38% of respondents reported *above average* skills for all three assessment items. However, over 40% reported *below average* skills for “determining if an AT assessment was required” and “using technology for assessment.” Data are summarized in Table 7.

Table 7

Skills and Knowledge - Assessment

Skills and Knowledge Competencies	Frequencies		
	Above	Average	<i>Below</i>
Determine need for an AT assessment	65 (28.1)	70 (29.9)	89 (38.0)
Evaluate AT in meeting student needs	88 (37.6)	65 (27.8)	72 (30.8)
Use technology for assessment	79 (33.8)	56 (23.9)	89 (38.1)

Note: Responses were made on a 5 point scale (4= expert; 0 =no skills). The values in parentheses represent the percent.

Professional Practices and Collaboration

These items measured skills and knowledge for professional and ethical practices and collaboration skills. All but one of these item responses clustered around *average* skills and knowledge. Even though close to 80% of respondents reported at least *average* skills and knowledge to “identify professional development activities”, only 59% ($n=139$) indicated that they “participated in technology professional development organizations”. Over one fourth of respondents reported *below average* skills in the area of “collaborating with others about AT”. Notably nearly three fourths of educators indicated that they possessed *no* or *few* skills in the “provision of AT training”. Table 8 summarizes this data.

Table 8

Skills and Knowledge - Professional Practices and Collaboration

Skills and Knowledge Competencies	Frequencies		
	Above	Average	Below
Collaborate with others for integration of AT	99 (42.3)	60 (25.6)	66 (28.2)
Identify professional development activities	97 (41.4)	89 (38.0)	44 (18.8)
Participate in technology professional organizations	80 (34.2)	59 (25.2)	87 (36.7)
Provide training in the use of AT	25 (10.6)	30 (12.8)	44 (71.4)

Note: Responses were made on a 5 point scale (4= expert; 0 =no skills). The values in parentheses represent the percent.

Research Question 3

For which assistive technology skills and knowledge competencies do special educators perceive a need for professional development?

The 27 skills and knowledge items compose Domain 3 – Professional Development Needs. Respondents were asked to rate their perceived need for professional development, from *critical need* (4) to *no need* (0), for each of item. The internal consistency reliability coefficient was .94 indicating that most responses to items classified under this domain were highly correlated with each other. The means and frequencies are reported for this domain.

An *average* level of need for professional development was found for 26 of the 27 skills and knowledge competencies. Means ranged from 1.2 to 2.7. Two items having the highest means, indicating a greater need for professional development, were found under the standard of Foundation Knowledge. Understanding of AT terms, concepts, legal mandates and characteristics of students with disabilities had means above 2.6. Another area in which means indicated a *significant need* for professional development was found for the three skill items listed under the Assessment standard. These means ranged from 2.5 to 2.6. An *above average* need for professional development was also noted for “identifying curriculum appropriate for technology integration”, “identifying AT funding resources”, “arranging the classroom for use of

AT”, and “identifying professional development activities”. A *below average* need for professional development was reported for only one item – “the use of email for communication. These results should be carefully interpreted because of the number of missing values found within this domain. A complete reporting of the means is found in Table 9.

Table 9

Domain 3 - Professional Development Needs Descriptive Statistics

Skills and Knowledge Competencies	<i>Descriptive Statistics</i>		
	M	SD	N
Foundations			
AT terms and concepts.	2.7	0.95	229
AT Federal and state mandates	2.7	1.13	229
Identify characteristics of student influencing technology use	2.6	1.00	227
Recognize impact of technology on students w/ disabilities.	2.4	1.16	229
Instructional strategies and environments			
Arrange classroom for the use of AT	2.5	1.03	225
Possess knowledge of no- high-tech AT	2.2	1.15	225
Organize computer activities for positive social interaction.	2.1	1.08	234
Operate instructional AT devices:			
Oral Communication adaptations	2.4	1.27	224
Learning & educational adaptations	2.4	1.23	223
Computer access	2.3	1.21	225
Sensory adaptations	2.2	1.23	220
Mobility & positioning adaptations	2.0	1.32	220
Leisure & motivational adaptations	2.0	1.32	220
Environmental adaptations	1.9	1.30	219
Self Help adaptations	1.8	1.30	219
Instructional planning and communication			
Identify curriculum appropriate for technology integration	2.6	1.12	219
Identify AT funding resources	2.6	1.24	214
Use Internet to support instruction	2.0	1.27	225
Possess VA Technology Standards for Instructional Personnel	1.9	1.44	215
Use email for communication	1.2	1.3	226
Assessment			
Use technology for assessment	2.6	1.22	218
Determine need for an AT assessment	2.5	1.18	219
Evaluate AT in meeting student needs	2.5	1.14	220
Professional practices and collaboration			
Identify professional development activities	2.5	1.08	223
Provide training in the use of AT	2.3	1.43	213
Collaborate with others for integration of AT	2.3	1.91	217
Participate in technology professional organizations	2.2	1.21	218

Domain 3 – Professional Development Frequencies

As in Domain 2 - Skills and Knowledge, response categories 4 and 3 were collapsed to report *critical/significant* need for professional development. Categories 1 and 0 were also collapsed in order to report *little/no* need for professional development. *Average* was indicated by 2.

Foundation Knowledge

The majority of respondents identified a *significant/critical* need for professional development for each of these items. Understanding terms, concepts and mandates was identified by over 60% as skills areas where a *significant/critical need* for professional development existed. Between 22 and 24% reported *little/no need* for professional development in “understanding the impact of technology on students” or “identifying characteristics of students which influence technology use”. Results are summarized in Table 10.

Table 10

Professional Development – Foundations

Skills and Knowledge Competencies	Frequencies		
	Signif/Critical	Average	Little/No need
AT terms and concepts.	145 (62.0)	58 (24.8)	26 (11.1)
AT Federal and state mandates	141 (60.2)	49 (20.9)	39 (16.7)
Identify characteristics of students influencing technology use	133 (56.8)	61 (26.1)	33 (24.1)
Recognize the impact of technology on students with disabilities.	123 (52.6)	52 (22.2)	51 (21.8)

Note: Responses were made on a 5 point scale (4= expert; 0 =no skills). The values in parentheses represent the percent.

Instructional Strategies and Learning Environments

Close to half of the respondents reported a *significant/critical* need for professional development on “operating computer access and learning devices. Nearly two thirds of respondents indicated that “organizing computer activities to promote positive social interactions” was a skill for which there was a *significant/critical* need for professional development. *Little or no need* for professional development was identified by over one fourth of respondents for operating environmental, self help, sensory, mobility, and leisure devices. Table 11 summarizes the data.

Table 11

Professional Development - Instructional Strategies and Environments

Skills and Knowledge Competencies	Frequencies		
	Signif/Crit	Average	Little/No Need
Organize computer activities to promote positive social interaction.	139 (59.4)	48 (20.5)	41 (17.5)
Possess knowledge of no- high-tech AT	148 (46.2)	59 (25.2)	53 (22.7)
Arrange classroom for the use of AT	93 (39.7)	61 (26.1)	66 (28.2)
Operate instructional AT devices:			
Learning & educational adaptations	116 (49.5)	57 (24.4)	50 (21.4)
Computer access	114 (48.7)	57 (24.4)	54 (23.0)
Oral Communication adaptations	112 (47.9)	56 (23.9)	56 (23.7)
Sensory adaptations	95 (40.6)	64 (27.4)	61 (26.0)
Leisure & motivational adaptations	83 (35.5)	59 (25.2)	78 (33.3)
Environmental adaptations	77 (32.9)	57 (24.4)	86 (36.8)
Mobility & positioning adaptations	73 (31.2)	72 (30.8)	75 (32.0)
Self Help adaptations	50 (29.9)	61 (26.1)	88 (37.6)

Note: Responses were made on a 5 point scale (4= critical ; 0 =no need). The values in parentheses represent the percent.

Instructional Planning and Communication

Over 50% of respondents indicated a *significant/critical* need for professional development in two of these five items. “Locating funding resources for AT” and “identification of elements within the curriculum for which technology applications are appropriate” were identified as *significant/critical* by the majority of respondents. Slightly over one third of respondents indicated a *significant/critical* need for training on the “TSIPS” and the “use of the Internet”. Notably the “use of email” was reported by over half of the respondents as not being a skill for which professional development was needed. Data are summarized in Table 12.

Table 12

Professional Development - Instructional Planning and Communication

Skills and Knowledge Competencies	Frequencies		
	Signif./Critical	Average	Little/No Need
Identify AT funding resources	132 (56.5)	35 (15.0)	47 (20.1)
Identify curriculum elements appropriate for technology integration	128 (54.7)	50 (21.4)	41 (17.5)
Possess Virginia Technology Standards for Instructional Personnel	87 (37.2)	39 (16.7)	89 (38.1)
Use Internet to support instruction	85 (36.3)	52 (22.2)	88 (37.6)
Use email for communication	43 (18.3)	31 (13.2)	152 (42.7)

Note: Responses were made on a 5 point scale (4= critical; 0 =no need). The values in parentheses represent the percent.

Assessment

For these three items, the data revealed there was a *significant/critical* need for professional development indicated by over half of the respondents. The most *significant/critical* need as identified by 56% of respondents was in the “determination of the need for an AT assessment”. Table 13 summarizes this data.

Table 13

Professional Development - Assessment

Skills and Knowledge Competencies	Frequencies		
	Signif/Critical	Average	Little/No Need
Determine need for an AT assessment	131 (56.0)	42 (17.9)	46 (19.6)
Use technology for assessment	126 (53.8)	51 (21.8)	41 (17.5)
Evaluate AT in meeting student needs	122 (52.2)	55 (23.5)	43 (18.4)

Note: Responses were made on a 5 point scale (4= critical; 0 =no need). The values in parentheses represent the percent.

Professional Practices and Collaboration

Close to 50% of respondents indicated an *average* to *significant/critical* need for professional development for these four items. The most *critical* need identified by over half of the educators was in the “identification of professional development activities”. Table 14 summarizes the data from this category.

Table 14

Professional Development – Professional Practices and Collaboration

Skills and Knowledge Competencies	Frequencies		
	Signif/Critical	Average	Little/No Need
Identify professional development activities	127 (54.2)	65 (23.5)	41 (17.5)
Collaborate with others for integration of AT	108 (46.2)	62 (26.5)	47 (20.1)
Participate in technology professional organizations	107 (45.7)	60 (25.6)	51 (21.8)
Provide training in the use of AT	106 (45.3)	45 (26.5)	62 (20.1)

Note: Responses were made on a 5 point scale (4= critical; 0 =no need). The values in parentheses represent the percent.

Research Question 4

How has knowledge about assistive technologies been gained? What professional development formats appeal to educators for learning more about AT?

A checklist was used to collect information about the types of resources drawn upon for assistive technology professional development. Participants were able to indicate more than one training resource. More than 90% of respondents obtained some form of professional development from one of the seven resources listed. At least one half indicated professional development was received from other special education service providers and conference attendance. Less than 50% indicated receiving professional development from building

technology consultants, TTAC consults, university courses, or AT vendors. Only one third reported that professional development was obtained through university or college courses. Table 15 summarizes this data.

Table 15

Professional Development - Professional Development Resources

Resources	Frequencies	
	N	%
Other school professionals (e.g. SLP,OT, PT)	148	63.2
Conference attendance	134	57.3
TTAC consultants	107	45.7
School system technology consultants	105	44.9
University/college courses	78	33.3
AT vendors	37	15.8
No training received	18	7.7

Domain 4 - Technology Learning Preferences

There are eight items included in Domain 4 – Technology Learning Preferences. These are methods that are often utilized when learning to use technology. Respondents were asked to rate these methods as to their *favorite* (4) to *least preferred* (0) method. Based on the data it appears that the majority of respondents prefer learning about technology using methods that require interaction with the technology such as “hands-on-training” and “experimentation with technology”. Less than 11% of the respondents identified “formal courses”, “self-paced tutorials”, “online modules” or “just in time training” as their favorite method for learning about technology. Notably formal courses, such as university offerings, were the *favorite* of only about one third of respondents. Table 16 shows a summary of this data.

Table 16

Domain 4 - Learning Preferences

Learning Methods	Frequencies				
	Favorite 4	3	2	1	Least preferred 0
Hands-on instruction in group setting	114 (48.7)	84 (35.9)	83 (9.8)	4 (1.7)	5 (2.1)
Experimentation with the technology	84 (35.9)	87 (37.2)	38 (16.2)	13 (5.6)	6 (2.6)
One-on-one instruction	78 (33.3)	56 (23.9)	57 (24.4)	27 (11.5)	11 (4.7)
Attending workshops/conferences	71 (30.3)	10 (46.2)	39 (16.7)	13 (5.6)	0.0 (0.0)
Formal courses (university credit)	24 (10.3)	51 (21.8)	64 (27.4)	54 (23.1)	34 (14.5)
Using a self-paced, written tutorial	22 (9.4)	35 (15.0)	62 (26.5)	60 (25.6)	48 (20.5)
Online modules or tutorials	12 (5.1)	46 (19.7)	60 (25.6)	68 (29.1)	39 (16.7)
Receiving “just in time” training	11 (4.7)	42 (17.9)	63 (26.9)	68 (29.1)	42 (17.9)

Note. Responses were made on a 5-point scale (4 = favorite method to 0 =least preferred). The values in parentheses represent the percent.

Domain 5 – Professional Development Preferences

This domain, Professional Development Preferences, contained eight items that were frequently used for the delivery of technology professional development. Respondents were asked to rate their preference for the delivery method using a scale of favorite (4) to *least preferred* (0). Generally data reported for this domain paralleled the data collected about preferred methods for learning about technology. At least one half of the respondents indicated a preference for “hands-on group instruction” with over a third reporting that “attending

workshops”, “experimentation with technology”, and “one-on-one instruction” as their favorites. Nearly 20% reported that professional development methods involving “self paced tutorials”, “online modules” or “just in time training methods” were their least preferred methods. Only about 30% of respondents reported “university courses” as being their favorite professional development method. Professional development preferences are summarized in Table 17.

Table 17

Domain 5 - Professional Development Preferences

Methods for professional development	Frequencies				
	Favorite 4	3	2	1	Least preferred 0
Hands-on instruction in group setting	120 (51.3)	89 (38.0)	13 (5.6)	4 (1.7)	4 (1.7)
Attending workshops or conferences	90 (38.5)	100 (42.7)	28 (12.0)	8 (3.4)	3 (1.3)
Experimentation with the technology	84 (35.9)	85 (36.3)	34 (14.5)	16 (6.8)	7 (3.0)
One-on-one instruction	83 (35.5)	57 (24.4)	52 (22.2)	26 (11.1)	12 (5.1)
Formal courses (i.e., for university credit)	35 (15.0)	54 (23.1)	56 (23.9)	41 (17.5)	44 (18.8)
Using a self-paced, written tutorial	22 (9.4)	45 (19.2)	53 (22.6)	55 (23.5)	52 (22.2)
Receiving “just in time” training	24 (10.3)	56 (23.9)	56 (23.9)	52 (22.2)	39 (16.7)
Online modules or tutorials	18 (7.7)	45 (19.2)	71 (30.3)	50 (21.4)	44 (18.8)

Note. Responses were made on a 5-point scale (4 =prefer; would participate to 0 =least preferred). The values in parentheses represent the percent.

Open Ended Comments

A place for open ended comments was provided for respondents at the end of the survey. Of the 234 respondents, approximately 10% ($n=20$) wrote comments. These comments were not collected as part of the formal data collection process and should not be viewed as being representative of the population. However, because these comments raised additional questions for this research they were transcribed, analyzed, and then grouped by theme. A chart showing this analysis is found in Appendix J.

Summary

Over half of the respondents rated each of the six facilitators - funding, time, professional development, knowledge and skills, technical assistance, and administrative support-as being *very important* for the successful implementation of AT. Nearly 80% identified funding as being *very important*. However “administrative support” was reported as being *very important* by slightly more than half.

Respondents reported to have *average* skill and knowledge level for 25 of the 27 skills and knowledge competencies. Skills and knowledge levels were reported at the highest levels for foundation knowledge and instructional planning and communication. A majority of the respondents reported the lowest skills and knowledge levels in the area of assessment and location of AT funds. Some level of need for professional development was identified for each of the 27 skills and knowledge competencies. The majority of respondents indicated a *significant/critical* need for professional development in 11 of the 27 skills and knowledge areas. The greatest need was identified for foundations knowledge, assessment, locating funding resources, and providing AT training to others.

Over 90% of respondents had received some form of assistive technology training. The most utilized providers were related special education service providers and conference attendance. Respondents reported similar preferences for learning to use technology and professional development delivery methods. Hands-on instruction was preferred by both. Online modules and self paced tutorials were two of the least preferred methods.

CHAPTER 5 – DISCUSSION

Over 75% of students with disabilities spend the majority of their school day in general education classrooms (Boyer & Mainzer, 2003). For many students with disabilities, the difference between experiencing success or failure in the educational setting is the effective use of assistive technologies. In order to provide these students with equal access to the general education curriculum it is necessary for special educators to possess knowledge about assistive technology tools and their use.

The purpose of this study was to gather information about the perceived assistive technology skills, knowledge and professional development needs of special educators. An 84 item self-reporting questionnaire was mailed to 1164 special educators in southwestern Virginia. The research questions addressed special educators' perceptions of the facilitators for the successful implementation of assistive technology, AT skills and knowledge, and professional development needs. Two hundred and thirty four questionnaires were returned. The data were analyzed and the results reported.

This chapter summarizes and discusses the findings of this study. The discussion also seeks to describe the implications and limitations of this research and concludes with recommendations for further research in this area.

Summary of the Findings

The population of this study was 1164 special educators teaching in southwestern Virginia. Of the 234 respondents, over half reported teaching careers of more than 10 years. Approximately one third worked in elementary schools. Close to 60% reported that they taught in a self contained classroom or resource room.

Respondents rated the perceived importance of six facilitators: AT awareness and knowledge, time, funding, technical assistance, administrative support, and professional development opportunities, for the successful implementation of AT. All of these facilitators were identified as being *very important*. Funding, time, and technical assistance were identified as being *very important* by over 70% of the respondent, with funding being rated *very important* the most frequently. At least half of respondents reported knowledge of AT skills, professional development, and administrative support as *very important*. While administrative support was

identified as *very important* by nearly 60% of respondents, it was still the facilitator identified as being very important by the fewest number of respondents (58%, $n=132$).

Special educators in the study were also asked to report their perceived level of skills and knowledge on 27 assistive technology competencies. These competencies were identified by the The Council for Exceptional Children as essential technology skills for beginning special educators. Overall educators reported at least *average* skills ($M=1.5-2.5$) and knowledge on 25 of the 27 competencies. *Below average* means for the skills and knowledge competencies “providing assistive technology training to others” and “locating funding resources for AT” was reported. At least 40% of educators reported *below average* skills and knowledge in “assessment” and “operation of oral communication and leisure activities devices”. Educators reported *above average* skills and knowledge in the use of email, locating Internet resources, and in technology competencies required by the TSIPS (Virginia Technology Standards for Instructional Personnel).

Over 50% of respondents reported at least an *average* need for professional development for each of the 27 items. The lowest need for professional development was identified for using email, locating Internet resources, and having skills and knowledge related to the Virginia TSIPS. While the majority of special educators indicated having *average* skills on understanding AT terms, concepts, and legal mandates, they reported an *above average need* for professional development on these items.

At least 90% of respondents received some type of assistive technology professional development. These professional development opportunities were accessed through a variety of avenues. Related service providers, such as speech pathologists, occupational therapists, and physical therapists were the most frequently identified resource of professional development. Over 57% of respondents indicated conference attendance as a means of professional development. The Training and Technical Assistance Center and other school system technology consultants were identified as a professional development resource by nearly 50% of respondents. University courses were only noted by 33% as a training resource with AT vendors reported as the least accessed training resource.

The most popular methods for learning about technology paralleled the preferred methods for delivery of professional development. Face to face opportunities such as “hands-on training in group settings” and opportunities to “experiment with technology” were identified as

the most preferred methods for both learning about technology and delivery of professional development. Nearly 40% reported the “use of online modules for learning about technology” to be their least preferred method for learning about technology and professional development delivery.

Limitations

Some limitations to this study should be noted. Even though this researcher felt that the topic of implementing AT services for students with disabilities was an important and relevant topic to special educators in southwestern Virginia, there was a low response rate to the questionnaire. This low response rate may point to the fact that special educators may not be interested in the topic. In general individuals responding to self reporting mail questionnaires have a particular interest in the subject matter and are more likely to respond to the questionnaire (Fowler, 1988). Because the data were obtained anonymously, the impact of non-response bias cannot be ascertained (1988).

There is also a possibility that survey length contributed to the low response rate. The questionnaire consisted of 84 items. It was estimated that the survey could be completed in 15-20 minutes. This required a sustained effort for some educators. While the questionnaire was evaluated for readability some of the directions were complex and respondents may have skipped or avoided those items.

This questionnaire was used with special educators in southwestern Virginia, consisting of 34 counties. Because the data were collected from a limited geographical area generalization to other locations should be done with caution.

Discussion of the Findings

Facilitators to the Successful Implementation of Assistive Technology

*We use very little assistive technology for students with disabilities within our building.
I'm still unsure whether it is based on the money, need, or lack of knowledge.*

I would love to be more exposed to the devices out there.

Special educator from southwestern Virginia

AT awareness and knowledge, time, funding, technical assistance, administrative support, and professional development opportunities were consistently identified in the literature as being essential to the successful implementation of AT (Hart, 2000; Hauser & Malouf, 1996; Hutinger, 1994; Puckett, 2002; Reed, 1999; Zabala et al., 2000). Special educators in southwestern Virginia affirmed that these same variables were important to the successful implementation of assistive technology.

Funding was mentioned throughout the literature as a facilitator to the successful implementation of AT (Abner, G. H., 2002; Beggs, 2000; Gruner et al., 2000; Howell & Malouf, 1996; Thorkildsen, 1994). The findings from this study indicate that the issue of funding was of critical importance, with over 80% of respondents reporting it as being a *very important* facilitator to the successful implementation of AT. In fact “funding” proved to be a reoccurring theme throughout the data. Locating funding resources was identified as a skills and knowledge competency in which the majority of respondents reported *below average* skills and being a *critical need* for professional development. Several special educators indicated in the open ended comment section of the questionnaire that they had concerns about funding.

A similar concern about funding was reported in two studies of Virginia special education directors (Inge, 2004; Peters, 1999). In both studies special education directors reported a need for additional funds to provide staff training, leadership development and for purchasing AT devices. Specific information about funding lines was not collected in this study. It would be interesting to determine if special educators in this study reported concerns similar to those of the special education directors.

Peters (2004) and Inge (1999) reported that special education directors identified a need to find “time” for educators to participate in training and collaborative team planning. Seventy seven percent of respondents in this study indicated that “time” was crucial to the successful implementation of AT. One respondent commented, “I teach seven students with multiple

disabilities...Finding technology that is adequate to their needs and time to implement it is very difficult.”

Technical assistance and support were identified throughout the literature as a *very important* facilitator to successful implementation of AT (Hart, 2000; Margolis & Goodman, 1999). In general technical assistance is ongoing and should be provided at the district, building and classroom level. A majority (71%) of respondents reported technical assistance and support as *very important* to the AT implementation process.

Nearly 70% of respondents in this study identified “awareness and knowledge of assistive technology” as a significant facilitator for implementing AT. This facilitator was identified in multiple studies as being a significant factor to providing AT services (Abner & Lahm, 2002; Bauder, 1999; Cronis & Ellis, 2000; Hauser & Malouf, 1996; Lahm & Sizemore, 2002; Ledger, 1999; Thorkildsen, 1994; Vannatta & Fordham, 2004).

Professional development was reported as being a *very important* facilitator by 63% of educators in this study. This mirrors the results of studies found in the literature (Abner & Lahm, 2002; CEO Forum on Education and Technology, 1999; Hutinger & Johanson, 2000; Inge, Flippo, & Barcus, 1995; Mouza, 2002; Puckett, 2002). Earlier studies of Virginia special education directors also cited professional development as being an essential component of AT implementation (Inge, 2004; Peters, 1999).

Administrative support was noted as a *very important* facilitator by 58% of special educators in this study. This was the facilitator identified as *very important* by the fewest respondents. The literature reveals that administrative support is the underlying foundation for all of the other facilitators (Gruner, et al., 2000, Hart, 2000; Zabala, et al., 2000). Administrators influence and guide policy that relates directly to funding initiatives, provision of technical assistance, and provision of time and monies for professional development to increase AT knowledge and skills. Peters (1999) reported that Virginia special education directors who indicated a basic level of AT knowledge reported positive perceptions of the time, technical assistance, financial issues, training, and service delivery issues surrounding the implementation of AT. Given this it would seem logical to think that the role of administrative support would be viewed as having greater importance.

Assistive Technology Skills Knowledge and Professional Development Needs

“We use AT daily in the classroom. Always room to learn more!”

Special educator from southwestern Virginia

It is difficult to discuss the skills and knowledge levels without referring to the level of need for professional development since data were collected for both questions using the same list of 27 competencies. These competencies selected from competencies identified by the Council for Exceptional Children form the foundation for the assistive technology knowledge and skills needed by all professionals working in special education (CEC, 2003).

Multiple studies reported that one of the major barriers to the successful implementation of assistive technology is the lack of special educator knowledge and skills. (Abner & Lahm, 2002; Bauder, 1999; Cronis & Ellis, 2000; Hauser & Malouf, 1996; Lahm & Sizemore, 2002; Ledger, 1999; Thorkildsen, 1994; Vannatta & Fordham, 2004). The findings in this study indicated that special educators reported a knowledge level within the *average* range on 25 of 27 competencies. This was a positive finding. The concern, however, was the fact that over 50% of respondents reported at least an *average* need for professional development for each of these 27 competencies. Several of the educators noted that lack of knowledge was a concern for them. One reported, “I have not had any real training in the areas discussed above...I would very much like to know what is out there and be trained on how to use it.”.

The foundation of assistive technology knowledge is based on an understanding of (a) concepts related to the use of technology in education, (b) terminology and concepts associated with assistive technology and, (c) legal mandates and regulations that guide AT implementation (Lahm, 2005). One notable fact was that while educators reported *above average* knowledge in this area, they also identified a *critical need* for professional development for these skills. These concepts, terms, and mandates form the foundation for all AT services. Without an understanding of the basic terms, concepts, and legal mandates educators can not fulfill the legal mandate of IDEIA of 2004. A comment of one of the respondents reflects this.

“I am writing my first IEP this month for a student requiring AT. I am lost and will need a lot of help. I teach all LD classes and the need for AT hasn’t been there or recognized before. I hope that (school division) will be offering some workshops

“Assessment is the vision that holds the instructional plan together” (Lahm, 2003, p.146).
AT assessment is an essential component of AT services and should be conducted by a team of

knowledgeable personnel. An assessment involves more than identifying a device or adaptation for the student. It also involves utilizing technology for conducting and reporting assessment results (Lahm, 2003).

Considering the importance of assessment within the AT process, it was interesting that special educators in this study again reported only *average* knowledge and skills, but identified a *critical* need for professional development for these competencies. It might be assumed that these special educators are conducting assessments without having the needed skills and knowledge to do so effectively. In fact the competency “determining if an AT assessment was needed” was the one with the most significant need identified. However, the significance of this finding is not clear since it is not known if special educators share in the responsibility for conducting assessments within their individual LEAs. This assumption is further supported by Peters (1999) finding that Virginia special education directors preferred that assessments be conducted by state-supported programs such as the regional TTACs. It would be interesting to examine the roles and responsibilities of special educators within the assessment process.

Educators need an understanding of (a) terms associated with AT, (b) the student characteristics that influence the use of technology, and (c) the basic operation of the device (Lahm, 2003). One third of special educators in this study reported *below average* skills in the operation and instructional use of the eight device categories and only an *average* need for professional development was reported. Additionally at least 40% of special educators reported below average skills in the use of augmentative communication, mobility, leisure, sensory, and computer access devices. Virginia special education directors indicated that less than half of their special education staff possessed adequate skills in the use of these devices (Peters, 1999). One possible explanation for this might be that these special educators do not work with students who use these devices. Several comments by respondents support this idea.

“Current caseload does not necessitate the use of extensive AT”

“I only use AT when a student with these needs is heading my way.”

“My need for AT is not great at this time.”

Another possible explanation is that the related service providers, such as physical and occupational therapists, speech language pathologists, and sensory specialists, are charged with the selection and implementation of many of these AT tools.

The provision of training is another component of AT services (IDEIA, 2004). It is essential for special educators to possess communication and collaboration skills to provide training for parents, students, and other professionals. Findings in this study indicated that these special educators perceived *average* skills in the area of collaboration but a *below average* level of skill and knowledge in the provision of AT training to others. A *critical need* for professional development for provision of AT training was reported for this competency. One possible reason for this might be that these special educators are not comfortable with their own level of skills and knowledge in assistive technology. It is difficult to teach others if you are unsure about your own skills and knowledge. It might also be possible that these special educators are not responsible for providing training and rely on outside resources such as related service providers, TTAC consultants, or workshops for their professional development needs.

Learning and Professional Development Preferences

It was encouraging to find that over 90% of these special educators in this study received some form of professional development in AT from a wide variety of professional development providers. However, nearly 80 % of special educators indicated that they required more assistance in finding professional development activities. Virginia special education directors reported a similar need for locating professional development activities (Peters, 1999). Since educators in this study revealed *above average* skills in the use of email and using the Internet, perhaps an email list serve could be used to disseminate information to individual special educators.

Related special education service providers, such as occupational therapists, speech pathologists, and vision specialists, were reported as professional development resources by a majority of the special educators in this study. Virginia special education directors also reported related service providers as a source utilized for providing AT training (Inge, 2004; Peters, 1999).

A majority of respondents indicated assistive technology training was gained by attending conferences. One respondent reported, "I was able to take part in a grant for the (school division) and attended the Closing the Gap Conference". There are a limited number of assistive technology conferences in Virginia. The Making Connections with AT and Aug Come Conference, The Virginia Educational Technology Leadership Conference and the Virginia Society for Technology Education Conference offer sessions focused on assistive technology.

Respondent comments support this explanation: “We have taken away some of the ideas from your TTAC conferences.” It would be interesting to know which conferences these special educators attended and topics of the assistive technology sessions offered.

Assistive technology training was provided by a regional TTAC special education consultant for nearly 50% of respondents in this study. This was further supported by respondent comments like the following, “Appreciate any and all assistance by TTAC,” and “You guys at TTAC do a great job!” Peters (1999) and Inge (2004) reported that special education directors named regional TTAC’s as a frequently accessed source for the provision of professional development also.

One of the major missions of the TTAC is to provide training and technical assistance to support professionals who work with students with disabilities in the k-12 public schools. During 2004-2005 over 119 individual services focusing on technology were provided within these two regions. Of these services only seventeen were professional development activities (Virginia Department of Education Training and Technical Assistance Center, 2006). Perhaps special educators do not realize the scope of TTAC services but no data was collected to confirm this.

Surprisingly 45% of respondents indicated that training was received from school division technology consultants. It is unclear as to who these technology consultants were or their relationship to the special educators. These consultants could be building, regional, or county consultants. Usually these personnel provide general technology training, for example related to the TSIPS, and not training on assistive technology. This could possibly account for the above average skills that special educators reported for using email, the Internet, and the knowledge of the TSIPS. Unfortunately this study did not collect data on the specific consultants, or topics and nature of the training that they provided. It would be very interesting to explore what additional assistive technology expertise might be found outside of the special education realm in the LEAs.

College courses were identified as one of the least preferred methods for learning about technology and for delivering professional development. Findings in this study indicated that only about one third of respondents received professional development from college courses. One reason for this might be the limited number of college degree programs in assistive technology. In a study that examined 800 institutions of higher learning there were only 17

degree programs in AT certification (Bair & Bair, 1998). George Mason University, a state funded institution, is the closest university to southwestern Virginia that offers a degree in assistive technology. Unless the courses are available online, the geographic location of this university makes accessibility difficult for educators in southwestern Virginia. However, findings for this study revealed that online learning opportunities were one of least preferred methods for professional development.

Learning and professional development preferences of these special educators were also gathered in this study. Special educators revealed a preference for similar methods for both learning about technology and receiving professional development. The majority of respondents preferred face to face methods that involved hands-on opportunities and personal contact. This included experimentation with technology, group settings, conferences and workshops. These findings reinforce information uncovered in the literature regarding the characteristics of effective professional development. Effective professional development provides opportunities for active and hands-on learning as well as time for collaboration and communication among educators (Birman, Desimore, Porter, & Garet, 2000; Cole, Simkins, & Penuel, 2002; Inge et al., 1995; Mouza, 2002; NSDC Standards for Staff Development, 2001). This study did not collect information on why specific methods were preferred over others. This would be a question for future research.

Just in time training was one of the least preferred methods for learning about technology for professional development delivery. It is interesting that, just in time training, is identified throughout the literature as an ineffective means for professional development (Birman, Desimore, Porter, & Garet, 2000; Cole, Simkins, & Penuel, 2002; Inge et al., 1995; Mouza, 2002; NSDC Standards for Staff Development, 2001).

Findings of this study indicated that the use of online modules for learning about technology and as a professional development delivery model was not preferred by special educators. However, these educators reported *above average* skills in the use of email and Internet resources. These findings were in contrast to a similar study of Illinois special educators. Over 50% of Illinois educators preferred professional development delivery through online methods (Thompson, et al., 2000). In my experience, computer access and Internet connectivity is not consistent or reliable in southwestern Virginia schools. This may be one explanation for the negative reaction to this delivery method.

Summary

The findings of this study indicate that special educators in southwestern Virginia possess an average level of skills and knowledge on selected AT skill competencies. Perhaps the most interesting finding is that while these indicate average skills they still report the need for professional development for each competency. The highest level of need for professional development was identified in foundations of AT knowledge and assessment. Over 90% of these special educators obtained skills and knowledge about assistive technology from a variety of resources. A preference was revealed for learning about technology and professional development formats that involve face-to-face environments and using hands-on activities. As a result of these findings the challenge is how to best provide these special educators with the skills and knowledge they require. Professional development methods based on best practices and research provide the means for promoting sustained change, improved practice by educators, and increased student achievement.

Implications for Education

A foundation for sustained change promotes the successful implementation of AT for students with disabilities. To accomplish this a major shift in the way many school systems think about special education and assistive technology is required. School system leaders and educators need to collaborate and develop a shared vision and comprehensive policy for assistive technology services. These policies must provide adequate resources for funding and personnel and provide professional opportunities that will extend and support their current skill and knowledge levels (Walter-Thomas, Korinek, McLaughlin, & Williams, 2000).

Special educators in southwestern Virginia perceived a need for professional development that is focused upon AT skills and knowledge. School systems will need to devise long range plans for this professional development that takes into consideration the preferences for learning and professional development noted by these educators. Additional consideration will also need to be given on how to best manage time, personnel, and most importantly ensure that the professional development meets the needs of teachers and impacts learning (Hassel, 1999). Educators and administrators must work collaboratively to design a plan to address the skills and knowledge needs of the educators and lead to increased student success. The development of a long-term, site-based, intensive plan is necessary to improve practice and

provide sustained change (Abner & Lahm, 2002; CEO Forum on Education and Technology, 1999; Hassel, 1999)

Educators and administrators may want to consider using the Quality Indicators for Assistive Technology Services, QIAT, to guide their professional development planning (Zabala, et al., 2000). One of the six functions addressed by QIAT is AT Professional Development and Training. These descriptors provide support for the development of high quality assistive technology services and include quality indicators describing the factors that should be recognizable in highly effective AT professional development and training. Increasing “educators’ knowledge and skills in a variety of areas” (Zabala, et al, 2000, p. 189) is the main goal of these indicators.

The QIAT for AT Professional Development and Training encompass the features of quality professional development as identified in the research (Birman, Desimore, Porter, & Garet, 2000; CEO Forum on Education and Technology, 1999; Cole, Simkins, & Penuel, 2002; Inge, Flippo, & Barcus, 1995; Kanyaa, Light, & Culp, 2005; Mouza, 2002). These indicators acknowledge the importance of professional development that is “ongoing, well defined, sequential and comprehensive” (Zabala, 2000, p. 189). QIAT stresses the importance of basing professional development opportunities (a) on adult learning principles, (b) being aligned with national, state, and local initiatives, and (c) encompassing a variety of learning formats. The importance of evaluating professional development to measure changes in practice that result in improved student outcomes is another of the QIAT indicators.

Professional developers should also consider the use of identified assistive technology standards to guide the creation of staff development opportunities. National standards can provide consistency in personnel training and be used for teacher licensure. Council for Exception Children in collaboration with NCATE published a set of professional standards to define the assistive technology knowledge base for beginning special educators. Consideration to state technology standards need to be given. Both Kentucky and Illinois specifically address “assistive technology” within their teacher technology competencies. The TSIPS are the professional standards for technology in Virginia. Currently these standards do not require assistive technology skills or knowledge. This is an area, however, that demands more investigation on the possibility of including at least awareness levels of assistive technology for all educators.

One lone special educator can not be expected to keep pace with the rapidly changing developments in AT and the complexities of educating students with disabilities. While this study did not address collaboration, one of the skills and knowledge competencies asked educators to report their skills and professional development need for collaboration for implementing AT. Nearly half of the special educators in this study reported collaborative skills in AT as an area in which professional development was needed. With this in mind, collaborative IEP teams might be an option for some school systems. Collaborative teams share common goals and interests but possess diverse backgrounds and experiences. These teams generate creative solutions for problems. By providing professional development to all members of a collaborative IEP team, the consideration and implementation of AT is not the sole responsibility of the special educator.

Lahm (2005) noted that the consequences of special educators having limited knowledge of AT can be costly. Educators need to acquire AT knowledge prior to having it thrust upon them out of necessity (Miller, Smith, Tilstone, 1998). The importance of professional development opportunities that provide special educators with the assistive technology skills and knowledge cannot be understated.

Implications for Further Research

Upon completion of this study, multiple questions arose which could help clarify the results from this study and extend the investigation for future research.

1. What are the roles and responsibilities of special educators for the delivery of AT services across the state of Virginia? In addition to examining the roles and responsibilities of special educators in the provision of AT services, additional data should be gathered about the number of students that receive AT and the types of devices they use.
2. How is the consideration of AT addressed within the IEP? This would include learning who the members of the IEP team were; their level of AT knowledge; how AT assessments are conducted; and how responsibilities for AT implementation were shared.
3. What are the roles, responsibilities, skills and knowledge levels of other related service providers, general educators, and special education directors involved in the provision of AT services? The consideration and implementation of AT should not be the sole

responsibility of the special educator. Any educator or related service provider working with a student with disabilities needs to possess assistive technology skills and knowledge.

4. How can AT skills and knowledge be provided at a preservice level for special and general education? The provision of AT skills and knowledge can not happen at just the inservice level. To be effective teachers should enter the classroom with the needed skills and knowledge to provide for the successful implementation of AT. The question becomes how to integrate assistive technology into teacher education programs which are already overwhelmed with growing demands on licensure. Teachers need to enter the field with this knowledge in hand.

Conclusion

Despite the relatively limited response rate to this questionnaire, this researcher feels that the data gathered in this study were sufficient to characterize the current AT skill and knowledge levels of special educators in southwestern Virginia. The results provided baseline data on the assistive technology skills, knowledge and professional development needs of these educators and highlighted the need for further research in this area.

In order for assistive technology to be implemented successfully in our schools, educators require awareness and knowledge of assistive technology terms, concepts, and mandates. Special educators need to be able to answer these questions: What are the legal mandates that guide the provision of AT services? How is the need for AT assessed? What devices and services are available? How are these devices obtained? How is the device implemented and integrated into the curriculum? And most importantly, how do assistive technologies improve student outcomes? But many special educators are not prepared for the challenges of AT implementation. Professional development opportunities are how these educators will gain this needed skill and knowledge. Assistive technologies provide a way for *students with disabilities* to become the *students with abilities*. These students will only realize the potential of assistive technologies when special educators possess the knowledge and skills needed to guide the assistive technology process.

References

- Abner, G. H. (2002). Implementation of assistive technology with students who are visually impaired: Teachers' readiness. *Journal of Visual Impairment and Blindness*, 96(2), 98-105.
- Abner, G. H., & Lahm, E.A. (2002). Implementation of assistive technology with students who are visually impaired: Teachers' readiness. *Journal of Visual Impairment and Blindness*, 96(2), 98-105.
- Ary, D., Jacobs, L. C., & Razavieh, A. (1990). Survey Research. *Introduction to Research in Education* (pp. 406-441). Orlando, FL: Holt, Rinehart, & Winston.
- Bair, J. H. & Bair, R. K. (1998) Linkages among top-ranked graduate programs in special education: A brief report. *Mental Retardation*, 36(1), 52-54.
- Bauder, D. K. (1999). *The Use of Assistive Technology and the Assistive Technology Training Needs of Special Education Teachers in Kentucky Schools*. Unpublished doctoral dissertation, University of Kentucky, Louisville.
- Beggs, T. A. (2000). Influences and Barriers to the Adoption of Instructional Technology. Murfreesboro, TN: Proceedings of the Mid South Instructional Technology Conference. (ERIC Document Reproduction Service No. ED446764).
- Behrman, M. M., Morrissette, S. K., & McCallen, M. H. (1993). *Assistive Technology for Virginia Schools*. Richmond, VA: Virginia State Special Education Advisory Committee. (ERIC Document Reproduction Service No. ED370339).
- Bell, J. K., & Blackhurst, A. E. (1997). *National Survey of State Department of Education Assistive Technology Policies*. Lexington, KY: Assistive Technology (UKAT) Project, Department of Special Education and Rehabilitation Counseling.
- Beyerbach, B., Walsh, C., & Vannatta, R. (2001). From teaching technology to using technology to enhance student learning: Preservice teachers' changing perceptions of technology infusion. *Journal of Technology and Teacher Education*, 9(2), 105-222.
- Birman, B. F., Desimore, L., Porter, A. C., & Garet, M. S. (2000). Designing professional development that works. *Educational Leadership*, 57(8), 28-33.
- Bodine, C., & Melonis, M. (2005). Teaming and Assistive Technology in Educational Settings. In D. Edyburn, K. Higgins & R. Boone (Eds.), *Handbook of Special*

Education Technology Research and Practice. Whitefish Bay, WI: Knowledge by Design.

- Boyer, L., & Mainzer, R. (2003). Who's teaching students with disabilities? A profile of characteristics, license status, and feelings of preparedness. *Teaching Exceptional Children*, 35(6), 8-11.
- Bryant, D. P., & Bryant, B. R. (2003). Introduction to assistive technology devices and services. *Assistive Technology for People with Disabilities*. Boston: Allyn and Bacon.
- CEO Forum on Education and Technology. (1999). *Year 2 Report: Professional Development: A link to better learning*. Washington, DC: CEO Forum on Education and Technology.
- Cole, K., Simkins, M., & Penuel, W. R. (2002). Learning to teach with technology: Strategies for inservice professional development. *Journal of Technology and Teacher Education*, 10(3), 431-455.
- Cook, A. M., & Hussey, S. M. (2002). Introduction and overview. *Assistive Technologies Principles and Practice*. St. Louis, MO: Mosby.
- Council for Exceptional Children. (2003). What every special educator should know: The standards for the preparation and licensure of special educators (5th ed.). Reston, VA: Author.
- Crawford, D. L. (2005). The role of aging in adult learning: Implications for institutions in higher education. In *New Horizons for Learning*. Retrieved March 1, 2006, from <http://www.newhorizons.com>.
- Cronis, T. G., & Ellis, D. N. (2000). Issues facing special educators in the new millennium. *Education*, 120(1), 639-649.
- Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms. *American Educational Research Journal*, 38(4), 813-834.
- Derer, K. R., Polsgrove, L., & Rieth, H. J. (1996). A survey of assistive technology applications in schools and recommendations for practice. *Journal of Special Education Technology*, 13, 62-80.
- Dillman, D. A., & Anderson, A. B. (1978). *Mail and Telephone Surveys: The Total Design Model*. New York: Wiley Interscience.

- Dirr, P. (2003). *Measuring the Impact of Technology on Classroom Teaching and Learning*. Alexandria, VA: Appalachian Technology in Education Consortium.
- Education for Handicapped Children Act Amendments of 1986, 20 U.S.C. §1400 *et seq.*
- Education for Handicapped Children Act of 1975, 20 U.S.C. §1400 *et seq.*
- Edyburn, D. L. (2005). Special Education Technology Competencies. *Special Education Technology Practice*, 7(1), 16-26.
- Enhancing Education Through Technology Act of 2005, 20 U.S.C. § 8801 *et seq.*
- Fink, A., & Kosecoff, J. (1985). *How to Conduct Surveys: A Step-by-Step Guide*. Beverly Hills, CA: Sage Publications.
- Fowler, F. J. (1988). *Survey Research Methods*. Newbury Park: Sage Publications.
- Gruner, A., Fleming, E., Carl, B., Diamond, C. M., Ruedel, K. L., Saunders, J., et al. (2000). *Synthesis on the Selection and Use of Assistive Technology*. Washington, DC: US Department of Education, Office of Special Education Programs.
- Hart, D. (2000). *Promising Practices in Technology: Supporting Access to and Progress in the General Curriculum*. Boston: United States Office of Special Education Programs.
- Hassel, E. (1999). Professional Development: Learning from the best. Oak Brook, IL: North Central Regional Educational Laboratory. Retrieved March 1, 2006, from: www.ncrel.org/pd/toolkit/lftd.pdf.
- Hauser, J., & Malouf, D. B. (1996). A federal perspective on special education technology. *Journal of Learning Disabilities*, 26, 504-511.
- Howell, J., & Malouf, D. B. (1996). Technological aids of inclusive classrooms. *Theory into Practice*, 35, 58-65.
- Hutinger, P. L. (1994). State of Practice: How assistive technologies are used in educational programs of children with multiple disabilities. Washington, DC: United States Department of Education. (ERIC Document Reproduction Service No. ED378721).
- Hutinger, P. L., & Johanson, J. (2000). Implementing and maintaining an effective early childhood comprehensive technology system. *Topics in Early Childhood Special Education*, 20(3), 159-173.
- Individuals with Disabilities Education Act Amendments of 1997, 20 USC, § 1400 *et seq.*
- Individuals with Disabilities Education Improvement Act of 2004, 20 U.S.C. § 300 *et seq.*

- Inge, C. (2003). *Assistive Technology in Virginia's Pre K-12 Public Education System: A Policy Study*. Unpublished doctoral dissertation, George Washington University.
- Inge, K. J., Flippo, K. F., & Barcus, J. M. (Eds.). (1995). Staff development for assistive technology personnel. *Assistive Technology: A resource for school, work, and community* (pp. 223-243). Baltimore: Brookes Co.
- International Society for Technology in Education (ISTE) NETS for Teachers Project, ISTE-NETS. (2005). *National Educational Technology Standards for Teachers*. Retrieved October 2, 2005 from http://cnets.iste.org/teachers/t_overview.html.
- Kanyaa, T., Light, D., & Culp, K. M. (2005). Factors influencing outcomes from a technology focused professional development program. *Journal of Research in Technology Education, 37*(3), 313-328.
- Kochhar, C. A., & West, L. L. (1996). *Handbook for Successful Inclusion*. Fredericksburg, MD: Aspen.
- Lahm, E. (2003). Assistive technology specialists: Bringing knowledge of assistive technology to school districts. *Remedial and Special Education, 24*(3), 141-153.
- Lahm, E. (2005). Improving practice using assistive technology knowledge and skills. In D. L. Edyburn, E. L. Higgins & R. Boone (Eds.), *Handbook of Special Education Technology Research and Practice* (pp. 721-746). Whitefish Bay, WI: Knowledge by Design.
- Lahm, E. A., & Nickels, B. L. (1999). Assistive technology competencies for special educators. *Teaching Exceptional Children, 32*(1), 56-64.
- Lahm, E., & Sizemore, L. (2002). Factors that influence assistive technology decision making. *Journal of Special Education Technology, 17*(1), 15-26.
- Ledger, T. (1999). *Teacher Knowledge and Attitudes Towards the Utilization of Assistive Technology in Educational Settings*. Unpublished master's dissertation, Longwood College.

- Lewis, R. (2000). Musings on technology and learning disabilities on the occasion of the new millennium. *Journal of Special Education Technology, 15*(2), 5-12.
- Margolis, L., & Goodman, S. (1999). *Assistive Technology Services for Students: What are these?* Washington, DC: United States Cerebral Palsy Association.
- Marvin, E. D. (2003). *Achieving 21st Century Skills - The Role of Today's Schools*. Alexandria, VA: Appalachian Technology in Education Consortium.
- McGregor, G. P. (1996). Assistive technology in schools: Are teachers ready, able and supported. *Journal of Special Education Technology, 13*, 4-15.
- McMillan, J. H., & Wergin, J. F. (2002). Introduction to Reading Educational Research. *Understanding and Evaluating Educational Research*. Upper Saddle Creek, NJ: Merrill Prentice Hall.
- Michaels, C. A. (2003). Assistive technology integration in special education teacher preparation: Program coordinators' perceptions of current attainment and importance. *Journal of Special Education Technology, 18*(3), 29-41.
- Morrisette, S. K. (1994). *Assistive Technology Issues for Virginia Schools*. Unpublished doctoral dissertation, George Mason University.
- Mouza, C. (2002). Learning to teach with new technology: Implications for professional development. *Journal of Research on Technology in Education, 35*(2), 272-289.
- National Center for Educational Statistics (NCES). (2001). *Teacher Preparation and Professional Development: 2000*. Washington, DC: National Center for Educational Statistics.
- Nickels, B. (1999). *Assistive Technology Competencies for Special Educators: A Delphi Study*. Unpublished doctoral dissertation, University of Kentucky, Louisville.
- No Child Left Behind Act of 2001, 20 U.S.C. §6301 et seq.
- NSDC Standards for Staff Development. (2001). In *National Staff Development Council*. Retrieved September 6, from <http://www.nsd.org/standards/>.

- Office of Special Education & Rehabilitation Services, OSERS. (1991). *Letter to Rose, 18, Individuals with Disabilities Act. L. Reg53*. Washington, DC: Office of Special Education and Rehabilitation Services.
- Peters, S. W. (1999). *Assistive Technology Issues in Virginia Schools: A Five Year Follow-Up Study*. Unpublished doctoral dissertation, George Mason University.
- Puckett, K. S. (2002). *Integrating Assistive Technology with Curriculum Standards*. Paper presented at the meeting of the Mid-South Educational Research Association.
- Reed, P. (1999). *Six Steps to Improved Assistive Technology Services in Schools*. Amherst, WI: Wisconsin Assistive Technology Initiative. (ERIC Document Reproduction Service No. ED467725).
- Technology Related Assistance for Individuals with Disabilities Act of 1988, 29 U. S. C. §2201 et seq.
- Thompson, J. R., Siegal, J., & Kouzoukas, S. (2000). Assistive technology at the dawn of the 21st century. *Special Education Technology Practice*, 2(3), 12-21.
- Thorkildsen, R. (1994). *Research Synthesis on Quality and Availability of Assistive Technology Devices*. Eugene, OR: National Center to Improve the Tools of Educators.
- Tobis, B. J. (1996). Tools for the task: Perspective on assistive technology in educational setting. *Journal of Special Education Technology*, 13, 46-61.
- Vannatta, R., & Fordham, N. (2004). Teacher dispositions as predictors of classroom technology use. *Journal of Research in Technology Education*, 36(3), 253-271.
- Virginia Assistive Technology System (VATS). (n.d). *Virginia Assistive Technology in the Student's Individualized Education Program: A handbook for parents and school personnel*. Richmond, VA: Virginia Assistive Technology System.
- Virginia Department of Education. (2000). *Regulations Governing Special Education Programs for Children with Disabilities*. Richmond, VA: Virginia Department of Education.
- Virginia Department of Education. (2003). *Educational Technology Plan for Virginia 2003-2009*. Richmond, VA: Virginia Department of Education.

- Virginia Department of Education. (2003). *Educational Technology Plan for Virginia 2003-2009*. Virginia Department of Education.
- Virginia Department of Education Division of Special Education & Student Services. (2001). *Virginia's Special Education State Improvement Plan*. Richmond, VA: Virginia Department of Education Division of Instructional Support Services Offices of Special Education and Student Services.
- Virginia Department of Education Division of Special Education & Student Services. (2005). *Guidance Document on the Implementation of IDEIA 2004, Part B Requirements*. Richmond, VA: Virginia Department of Education.
- Virginia Department of Education Training and Technical Assistance at Virginia Tech. (2006). *Distribution of content across services report*. Blacksburg, VA: Author.
- Virginia Technology Standards for Instructional Personnel Statutory Authority of 1998.
- Wallace, J., Flippo, K. F. (Ed.), Barcus, J. M. (Ed.), & Behrmann, M. M. (1995). Legislative foundations of assistive technology policy in the United States. In C. A. Inge (Ed.), *Assistive Technology: A resource for school, work, and community*. Baltimore: Paul H. Brooks.
- Walter-Thomas, C., Korinek, L., McLaughlin, V. L., & Williams, B. T. (2000). *Collaboration for inclusive education*. Needham Heights, MA: Allyn and Bacon.
- Warger, C. L. (1998). *Integrating Assistive Technology into the Standard Curriculum*. Arlington, VA: The Council for Exceptional Children. (ERIC Document Reproduction Service No. ED426517).
- Zabala, J., Blunt, M., Carl, D., Davis, S., Deterding, C., & Floss, T. (2000). Quality indicators for assistive technology services in school settings. *Journal of Special Education Technology*, 15(4), 25-36.

Appendix A

SUMMARY OF LITERATURE				
Author, Date	Title	Purpose	Methodology	Findings
Abner, G. H. Lahm, E.A. 2002	Implementation of Assistive Technology with Students	To identify the current assistive technology students were using and the teachers unmet assistive technology training needs	Used a census survey method; mailed to certified Kentucky teachers of students with visual impairments; 145 surveys mailed – 79 returned- 45% response rate;	Majority of teachers felt that they had access to assistive technologies but did not feel competent enough to use with students; teachers have the ability to use computers but lack training and support; In-service workshops were short term and had limited focus Limitations: small sample and limited to just VI teachers; discrepancy in the number of students represented by teachers
Bauder, D. K. 1999	The Use of Assistive Technology and Assistive Training	To determine the types and frequency of AT used by SWD in Kentucky; the degree to which teachers were addressing federal and state AT mandates; special educators roles and perceived skill levels in identification and implementation of AT and AT training needs	Self-developed, mailed survey consisting of 29 questions; Utilized a random sample of 1,000 Kentucky special education teachers; response rate of 42%. Information was collected regarding the amount and types of prior AT training teachers had; their training needs; and training formats. Additionally, information was gathered regarding the teachers' roles in identifying and using AT within their schools and the extent to which AT was considered by school personnel in determining children's individualized education programs.	Majority of special education teachers: <ul style="list-style-type: none"> • did not feel prepared to provide AT services • had little or no awareness of AT • had not developed competencies to implement AT • felt AT training should be a special education teacher certification requirement. • do not favor distance technology training formats • indicated that hands-on, one-on-one, and CAI methods were their preferred training formats. 54.7% of respondents had never attended assistive technology training; Recommendations were made about topics and priorities for needed AT training. Implications from this research were specified for administrators, AT training planners, and policy makers. Limitations: Low response rate; survey was very lengthy; may not generalize to educators in other states.

Behrmann, M. M. 1995	Assistive Technology Issues in Virginia Schools	To determine responsibilities and issues related to the use of AT in Virginia schools	Mailed survey to Virginia Special educator directors; 70% return rate	<p>Found that there was a significant need for training, funding, development of referral and coordination policies focusing on AT in the state.</p> <p>The following recommendations were made for:</p> <ul style="list-style-type: none"> • The development and dissemination of state guidelines for AT devices and services; • develop and implement statewide pre-service and in-service training in AT; • disseminate information on AT resources; • develop AT funding resources <p>Limitations: Results may not be able to be generalized outside of Virginia; Responses could have been influenced by the fact the results were to be reported to the Department of Education; there was no indication as to whether or not the returned surveys were geographically representative</p>
Birman, B. F. Desimore, L. Porter, A. C. Garet, M. S., 2000	Designing Professional Development that Works	To determine the components of effective professional development	Survey of nationally representative sample of more than 1000 teachers who participated in the Eisenhower Professional Development Program	<p>Findings indicated that professional development activities were more successful when they were longer (not just one shot training), focused on the content being used by the teacher and involved a variety of active learning strategies. Collaborative participation of teachers from the same department, grade level, or subject area contributes to a shared professional culture and leads to develop a common understanding of goals, problems, and solutions</p> <p>Limitations: The teachers who participated in this survey were already involved in professional development sponsored in part by the federal government's Eisenhower Professional Development Program. It focused on developing the knowledge and skills of classroom teachers, mostly in mathematics and science.</p>

<p>Derer, K. R., Polsgrove, L., Reith, H. 1996</p>	<p>A Survey of Assistive Technology in Schools</p>	<p>To determine the applications of AT in schools; the status of AT in educational and related settings; benefits and barriers associated with the use of AT</p>	<p>Mailed survey to schools in 3 states that were known to be utilizing AT; 32% return rate</p>	<p>Barriers to AT identified:</p> <ul style="list-style-type: none"> • Obtaining equipment, time management, expense and funding, teacher knowledge, teacher training. • Money was the most frequently mentioned barrier. • Time, knowledge and training were closely linked <p>Benefits of AT identified: Improvement in communication, independence, self concept; skill improvement; maximized student potential and achievement</p> <p>Limitations: limited return rate; hard to generalize; no method to guard against duplication</p>
<p>Gruner, A. Fleming, E. Carl, B. Diamond, C. M. Ruedel, K. L. Saunders, J. Paulen, C. McInerney, M. 2002</p>	<p>Synthesis on the Selection and Use of Assistive Technology</p>	<p>To identify effective strategies that reduce barriers to selecting and using AT;</p>	<p>Expert panel of 6 that represented the perspectives of the key stakeholders; members of the panel were knowledgeable about the benefits and barriers of selecting and using AT; Collected 2 types of information from 26 projects and from research literature; from this developed an organizational framework for the project. Completed in-depth interview of special education directors and principal investigators of 14 AT projects; Cross project analysis was conducted to identify common principles of success</p>	<p>The following principles were identified as essential to the effective selection and implementation of AT:</p> <ul style="list-style-type: none"> • Provision of leadership • Supporting stakeholders collaboration; • monitoring impact; • building capacity; • reducing fear; • acknowledging diversity; • focusing of student learning <p>Limitations: Each of these programs were maintained through Federal grant monies; may not be able to generalize results to publicly funded school settings</p>

Hart, D. 2000	Promising Practice in Technology: Supporting Access To and Progress In the General Curriculum	Examined 5 field based research projects to determine the technology strategies that were used to improve access to and success in the general curriculum for all students	3 year study by the USDOE Research to Practice Division; Case study format was used for collection, analysis, and reporting data across projects. Information was collected: technology planning, professional development, technology integration, technical assistance; evaluation of technology initiatives; sustaining change, integrating instruction about technology in assistive technology	<p>Resulted in the following conclusions:</p> <ul style="list-style-type: none"> • A systematic framework of technology implementation is a prerequisite for schools • Teachers need time, access, support and training to be successful in technology integration • Ongoing professional development is essential; Evaluation of the technology process is important to assure student needs are being met • Proactive leadership should support technology usage <p>Limitations: The five projects varied in age of students, severity of disabilities, grade levels and types of AT used.</p>
Hutinger, P. L. 1994	State of Practice: How Assistive Technologies are Used in Educational Programs of Children with Multiple Disabilities	Examined how AT was used in educational programs for students with multiple disabilities in early intervention programs	2 year qualitative study utilizing observations, questionnaires, videos, and interviews of 3 groups of students ages 2 years to 10 years old; 14 case studies were developed	<p>Resulted in the following conclusions:</p> <ul style="list-style-type: none"> • The use of AT appeared to have a positive effect on the children's development- including improved social and emotional development. • Parents and professionals perceived improvement in academic skills because of the students use of AT

Hutinger, P. L. & Johanson, J. 2004	Implementing and maintaining an effective early childhood comprehensive technology system	To advance the availability, quality, use, and effectiveness of technology in addressing the practical problem of improving technology access in the Early Childhood Programs	3 year collaborative study involving Macomb Projects at Western Illinois University and Just Kids Early Childhood Center in Middle Island, New York; Utilized mixed methods – quantitative use of pre- and post tests; qualitative use of interviews, observations, videotaping	<p>Identified the following components as being effective in establishing and maintaining computer and assistive technology in preschool programs:</p> <ul style="list-style-type: none"> • in-service training that was ongoing, based on adult learning principles and involving follow-up; • has a team based technology assessment for students; • integrated technology into the classroom curriculum. <p>Where technology was used in situations with these characteristics, students showed positive outcomes in all developmental areas-social, emotional, motor, communication, cognition, and self-help. Teachers were more willing to explore the use of technology because they saw student gains</p> <p>Limitations: limited geographic area and student population makes generalization to other locations and ages difficult</p>
Inge, C. 2003	Assistive Technology in Virginia Prek-12 Public Education System: A Policy Study	To acquire knowledge about AT policy implementation based on facts collected from Virginia special education directors	Utilized Internet survey of 132 school divisions and 16 state operated programs	<p>Identified barriers to the use of AT in Virginia as lack of: time, training, funding, and staffing</p> <p>Need for:</p> <ul style="list-style-type: none"> • AT planning between stand and LEAs • Permanent funding streams • The inclusion of AT within the state educational technology policy • Development of technical assistance guidelines and policies <p>Limitations: Low response rate which might be attributed to: timing of the survey data collection process being late in school year; length of survey; possible connectivity issues</p>

<p>Kanaya, T. Light, D. Culp, K. M. 2005</p>	<p>Factors Influencing Outcomes from a Technology Focused Professional Development Program</p>	<p>To define the relationship between intensity and duration of a technology focused professional development program</p>	<p>Survey of 237 teachers involved in the Intel Teach to the Future program for k-12 teachers; used descriptive statistics</p>	<p>Different personality characteristics of teachers influenced the implementation of new technologies. Prior use of technology was a predictor of future use. There was an increased use of technology by teachers that received training of 45-95 day duration. A greater use was shown by teachers that received training in a compressed length of 0-44 days. Training appeared to be more successful when it was made relevant to teacher/student needs. Limitations: Selection bias- only 237 of 7000 teachers involved were selected</p>
<p>Lahm, E. & Sizemore, L. 2002</p>	<p>Factors that Influence Assistive Technology Decision Making</p>	<p>Focused on the early intervention program in Kentucky; surveyed different professionals to determine the approaches that they take to arrive at decisions about AT and the factors that influence AT decision making by professionals</p>	<p>Used interviews to examine and analyze the differences in experience, philosophy and beliefs about AT decision and implementation process of 15 professionals working in Kentucky's First Step Program Telephone interviews were conducted to determine: the amount of AT training, how AT decisions were made, issues and perceived barriers. 16 service providers across 5 disciplines. Approaches were organized into functional, clinical or other approaches</p>	<p>Participants delivered AT service in a variety of ways; indicated that teaming was essential in the AT implementation process; however frequently teams did not make AT decisions. The level of training and experience was diverse; philosophical differences were evident; team process was valued; recognized importance of family and client in the decision making process. Barriers to this process include: attitude, lack of training, funding, time, and availability of equipment. Limitations: Limited understanding and attitudinal barriers concerning assistive technology, (b) time limitations, (c) paperwork requirements, and (d) a lack of equipment. Focus of study was narrowed to AT assessment. Broader issues and factors in decision making were not examined.</p>

Ledger, T. 1999	Teacher Knowledge and Attitudes Toward the Utilization of Assistive Technology	To determine the knowledge levels, attitudes, and usage of assistive technology	120 Virginia elementary special education teachers nk-5; utilized a convenience sample; 51% response rate and a self developed questionnaire that was mailed	<p>Teachers reported being comfortable with knowledge levels of assistive technology.</p> <p>Identified barriers to AT usage as:</p> <ul style="list-style-type: none"> • school system failing to provide training; • not knowing where to get training, help, or resources; <p>Majority of population indicated that a team approach was not utilized in the selection of AT</p> <p>Limitations: Limited population; no middle or high school teachers; may not generalize to other geographic areas of Virginia</p>
Michaels, M. & McDermott 2003	Assistive technology integration in special education teacher preparation: Program coordinators' perceptions of current attainment and importance	To determine how AT knowledge, skills, and dispositions are currently integrated and how they should be integrated in special education teacher preparation programs	A researcher developed survey was mailed to 356 special education graduate programs across the US.	<p>Based on this study there is a mismatch between what is considered the ideal integration of AT knowledge and skills and the current practice. The use of AT should assume a more central role in special education preparation programs.</p> <p>Barriers to the provision of AT knowledge and skills were identified as limited: funding, time, faculty knowledge; perception of AT as only for students with disabilities.</p> <p>Limitations: Respondents weren't necessarily AT experts; perceptions of special education program candidates were not examined; low response rate at 40%</p>

<p>Milken Exchange on Education Technology</p>	<p>Report to the Commonwealth: An Analysis of the Status of Educational Technology Availability and Usage in the Public Schools of Virginia</p>	<p>An assessment of the progress schools were making with educational technology including the extent of technology use by teachers and students; availability of technology support; inclusion of technology into the curriculum; barriers to the use of technology; funding and leadership issues pertaining to technology; and availability of professional development opportunities</p>	<p>Collection, analysis, and correlation of data from 4 sources: survey data from principals; statewide survey of teachers; onsite visits of schools; focus groups and phone interviews. Findings were cross tabulated to verify results and triangulation of data</p> <p>Results would be difficult to generalize outside of the Commonwealth of Virginia</p>	<p>Study did find disparity in student technology access across divisions within the state; educators were not using technology effectively to improve student learning; Commonwealth lacks the essential conditions for effective use of technology in schools including: support for proactive leaderships; high quality professional development; access to model projects; links between state and local technology plans and school improvement plans; technical assistance for schools; funding availability</p> <p>Identified the following barriers to the use of educational technology: inadequate quality and quantity of equipment; lack of adequate technical assistance; lack of time for teachers to participate in training; too little professional development; equipment failure; equipment difficult to access</p> <p>Virginia educators need vision leadership, support, prototypes and resources from the state to make the use of educational technologies useful in the improvement of student achievement</p> <p>Limitations: Can not be generalized outside Virginia</p>
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Morrissette 1993	Assistive technology issues for Virginia schools	To investigate AT service and use in Virginia	Used 119 question survey to 134 special education directors in Virginia about AT policies, use, and services	<p>Need for:</p> <ul style="list-style-type: none"> • additional state level policies needed for the implementation of AT use ; • development and dissemination of state AT guidelines; • provision of additional professional development opportunities; • provision of funding <p>Limitations: A low response rate was reported.</p>
Mouza, C. 2002-2003	Learning to teach with new technology: Implications for professional development	To determine how the Eiffel Project, a k-12 educator professional development program, funded by the USDOE, affected teacher technology competence and how teachers involved in the project utilized technology and what factors influenced their use.	An interpretive case study design was used. Data were collected from 15 teachers involved in the Eiffel Project. Field Notes, observations, formal and informal interviews and analysis of materials were used.	<p>Found that the following influenced teacher use of technology:</p> <ul style="list-style-type: none"> • Support by school administration; student population and needs; • time for collaboration with other teachers; • Availability of resources. <p>The following implications for professional development were derived. Professional development should:</p> <ul style="list-style-type: none"> • Be provided using a variety of activities; • Allow time should be provided for practice and follow-up; • be aligned with curriculum content <p>Limitations: The small number of case studies would make this study difficult to generalize over a larger population.</p>

Nickels, B. L. 1999	AT Competencies for Special Education: A Delphi Study	To determine the competencies that experts in the field of AT felt that beginning teachers, inservice teachers, and AT specialists should possess	Used a Delphi study; Expert panel consisted of 15 experts on AT that were nominated by the Technology Media Division of CEC	<p>Results indicated:</p> <ul style="list-style-type: none"> • All educators need certain AT skill and competencies • AT specialist is expected to be the most knowledgeable • 133 competencies rated essential for AT specialist ; only 47 for beginning teachers; 50 for in-service teachers <p>Limitations: List of skills and competencies were compiled from only 4 sources – only 2 of which were related to educators; only 15 experts on the panel; Experts had no method for giving immediate feedback</p>
Peters 1999	Assistive Technology Issues in Virginia Schools: A Five-Year Follow-up Study	The purpose of this study was to investigate the changes in AT use and service delivery in VA schools over a five-year period from 1993 to 1998. The study was conducted to gain insight into the complex issues facing VA special education directors delivering AT in education environments.	Subjects of this study were the special education directors who participated in a 1992&93 study conducted through George Mason University (Morrissette, 1994) The present study added qualitative interviews to perspectives of directors dealing with assistive technology issues.	<p>Findings suggest that the original study's four broad-based recommendations to the State Special Education Advisory Board have not been implemented on local levels. Reasons for the lack of implementation over a five-year period appear complex and specific to the administrative culture and size</p> <p>In the last five years in Virginia, the availability of knowledgeable personnel within school systems, the increased use of resources in school communities, and increased funding have been positive changes for assistive technology outcomes.</p> <p>As school personnel worked with successful users of assistive technology, they assumed a strong advocacy role for students with special needs.</p>

Puckett, K. S. 2002	Integrating Assistive Technology with Curriculum Standards	To determine the outcomes of providing teachers with a strategically developed AT kit and providing support and training on how to use	Used qualitative and quantitative measures; pre- and post tested teacher AT knowledge and skills in using AT to address state curriculum; additional used open ended survey questions; analyzed these question evaluating 3 areas of training effectiveness- hands-on, access to software, ability to collaborate with others	Results indicated that following participation teachers reported a greater potential for the use of AT within the classroom Limitations: Generalization to states other than Tennessee
Russell, Bebell, O'Dwyer, O'Connor	Examining Teach Tech	To examine the extent to which technology is used by teachers in and out of the classroom	Survey collected from 2, 894 teachers in 22 Massachusetts school districts	Identified 6 categories of instructional technology use; Teachers generally used technology for preparation and communication; new teachers reported higher levels of comfort with technology and use it more for preparation, more experienced teachers report using technology more often in the classroom when delivering instruction or having students engage in learning activities. limited use of technology for instruction
Schlosser, R. W., McGhie-Richmond, D., Blackstein-Adler, S. 2000	Training a school team to integrate technology meaningfully into the curriculum; effects on student participation	To evaluate the effectiveness of training a school team in using the Participation Assessment Framework and other technologies via adult learning strategies.	A multidisciplinary team worked with a 10 year old with cerebral palsy in Math. Conducted in 4 phases:(a) needs assessment and focus group, (b) data gathered on student performance (c) training and support (d) focus group and questionnaire. Training consisted workshops, modeling, practice in real life and simulated situations, feedback, and coaching.	Study suggests that this systematic training was useful in increasing participation, and was perceived as useful and effective by the participants. Limitations: Limited to one case study; may not generalize to other situations with students of different ages and different disabilities

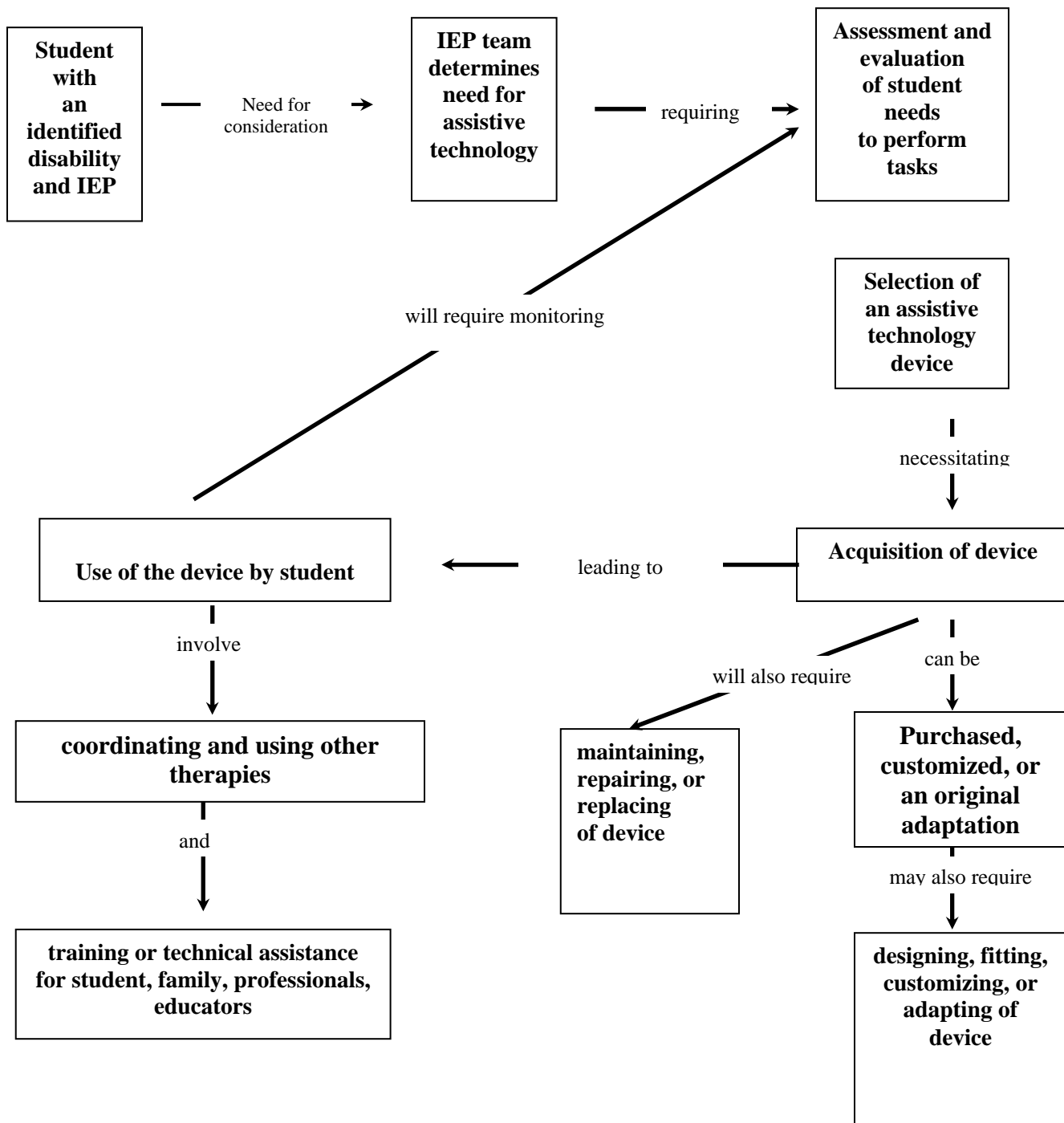
<p>Thompson, J. R. & Kouzoukas, S. 2000</p>	<p>Assistive Technology at the Dawn of the 21st Century: Teacher Perceptions</p>	<p>An AT program was started at the University of Illinois to increase preservice and in-service educators. A survey was utilized to plan in the development of this program and AT Center.</p>	<p>This survey was designed to assess educator perceptions that their students had unmet needs for AT; the educators perceived need for AT training and their competencies or lack there of; features of the AT center; and preferences for the provision of AT training. Findings can't really be generalized to a larger population.</p>	<p>Majority of the educators feel that there is a need to learn more about AT and that students can benefit from AT. Educators indicated that courses offered for free and offering graduate credit were the most appealing.</p> <p>Limitations: Small sampling; not generalizable to other states or programs</p>
<p>Tobis, B. J. 1996</p>	<p>Tools for the Task</p>	<p>Designed to determine the complexities associated with the introduction of assistive technology to students with disabilities and why this technology may fail to produce desired outcomes</p>	<p>2 year qualitative study of 13 students; utilized observations of students; interviews with students, professionals, peers, and service providers</p>	<p>Found that factors in situations where AT met students educational and social needs had the following characteristics: student and family goals were the basis for educational program; acquisition of AT tied directly to student academic goals; student, parents, and professionals worked as a team; communication between parents and professionals was consistent; problems were solved systematically as a team; outgrown and broken devices were replaced promptly. Teams brought divergent perspectives, knowledge and attitudes.</p>

Appendix B
Assistive Technology Devices

Device	Description	Examples
Mobility and Positioning Aids	These are tools that can be used to find the most comfortable and effective solution for sitting, standing, resting, or moving for an individual.	wheelchair, walker, stander, cushions
Sensory Aids	Sensory aids are assistive technology tools for people who are blind, visually impaired, or hearing impaired.	hearing aids, FM systems, auditory trainers, eyeglasses, low vision aids, reading devices, and telecommunication devices for the deaf.
Daily Living Aids	These tools are used to increase independence and assist an individual in performing functional living skills or self-help activities such as cooking, eating, bathing, toileting, dressing, and home maintenance.	adapted eating utensils, buttoner
Computer Access	Tools that assist people with using the computer.	adapted keyboards, mice and switches
Environmental Aids	These tools allow a person to manipulate his or her environment for daily living, working, schooling, playing.	electronic systems which control access to lights, home appliances, television, computers, and security systems
Motivational Devices	These are tools that promote participation in cultural events and leisure time activities for individuals with disabilities.	guide rails in bowling alleys, special prosthetic devices, and audio descriptions of movies, sporting, and cultural events, and games in large print or Braille.
Instructional Aids	These tools are used to assist in the education and instruction of an individual.	audiotape players, multimedia software and tools, internet technology, computer software and hardware.

Appendix C

Assistive Technology Services Model



Appendix D

Educational Technology Standards and Performance Indicators for All Teachers ISTE National Educational Technology Standards for Teachers

http://cnets.iste.org/teachers/t_stands.html

Building on the NETS for Students, the ISTE NETS for Teachers (NETS•T), which focus on preservice teacher education, define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings. All candidates seeking certification or endorsements in teacher preparation should meet these educational technology standards. It is the responsibility of faculty across the university and at cooperating schools to provide opportunities for teacher candidates to meet these standards.

The six standards areas with performance indicators listed below are designed to be general enough to be customized to fit state, university, or district guidelines and yet specific enough to define the scope of the topic. Performance indicators for each standard provide specific outcomes to be measured when developing a set of assessment tools. The standards and the performance indicators also provide guidelines for teachers currently in the classroom.

1 TECHNOLOGY OPERATIONS AND CONCEPTS.

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

- demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students)
- demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

2 PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES.

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

- design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
- apply current research on teaching and learning with technology when planning learning environments and experiences.
- identify and locate technology resources and evaluate them for accuracy and suitability.
- plan for the management of technology resources within the context of learning activities.
- plan strategies to manage student learning in a technology-enhanced environment.

3 TEACHING, LEARNING, AND THE CURRICULUM.

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

- facilitate technology-enhanced experiences that address content standards and student technology standards.
- use technology to support learner-centered strategies that address the diverse needs of students.
- apply technology to develop students' higher order skills and creativity.

- manage student learning activities in a technology-enhanced environment.

4 ASSESSMENT AND EVALUATION.

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

- apply technology in assessing student learning of subject matter using a variety of assessment techniques.
- use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
- apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

5 PRODUCTIVITY AND PROFESSIONAL PRACTICE.

Teachers use technology to enhance their productivity and professional practice. Teachers:

- use technology resources to engage in ongoing professional development and lifelong learning.
- continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
- apply technology to increase productivity.
- use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

6 SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES.

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice. Teachers:

- model and teach legal and ethical practice related to technology use.
- apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
- identify and use technology resources that affirm diversity
- promote safe and healthy use of technology resources.
- facilitate equitable access to technology resources for all students.

International Society for Technology in Education (ISTE) NETS for Teachers Project, ISTE-NETS. (2005)

Appendix E Technology Standards for Beginning Special Educators

The Council for Exceptional Children's (CEC) Technology and Media Division developed 51 statements that describe the essential knowledge and skill competencies needed by teachers to successfully integrate assistive technology into their curriculum.

Philosophical, Historical, and Legal Foundations of Special Education

Knowledge

1. Legislation and regulations related to technology and the implications for special education.

Skills

2. Articulate a philosophy and goals for using technology in special education.
3. Use technology-related terminology appropriately in written and oral communications.

Characteristics of Learners

Knowledge

4. Characteristics of exceptional learners that influences the use of technology.
5. Impact of technology on exceptional learners.
6. Impact of technology on exceptional learners with moderate disabilities.

Skills

7. Identify the academic and physical demands placed on the student by computer software and related technology materials.

Assessment, Diagnosis, and Evaluation

Skills

8. Analyze, summarize, and report student performance data to aid instructional decision-making regarding technology.
9. Identify functional needs, screen for functional limitations, and identify if the need for a comprehensive assistive technology evaluation exists.
10. Refer for additional evaluation regarding technology if adequate data are not available for plan development.
11. Recognize the need for further evaluation regarding technology, and refer to other professionals when appropriate.
12. Recognize poor outcomes regarding technology needs, and reevaluate and reinstate the process as needed.
13. Work with assistive technology team members to identify assistive technologies, both hardware and software, that can help individuals meet the demands placed upon them in their environments.
14. Define measurable objectives to monitor progress toward achieving stated goals regarding to technology.
15. Observe and measure consumer's performance with the assistive technology after a period of initial use.
16. Compare actual performance with anticipated performance and the goals stated in the intervention plan.

17. Interview the consumer, the family, and caregivers to determine if the technology solution meets their present and future needs.

Instructional Content and Practice

Knowledge

18. Procedures for evaluating computer software and other technology materials for their potential application in special education programs.

Skills

19. Identify elements of the special education curriculum for which technology applications are appropriate and ways they can be implemented.

20. Design, deliver, and assess student learning activities that integrate computers/technology for a variety of student populations.

21. Design student learning activities that foster equitable, ethical, and legal use of technology by students.

22. Identify and operate software that meets educational objectives for students in multiple educational environments.

23. Use computers to support various stages of the learning process and to facilitate student reporting of educational achievements.

24. Use technology to compensate for learning and performance barriers.

25. Identify and use assistive technologies that can provide access to educational materials that are otherwise inaccessible to some individuals.

26. Use computer-based productivity tools to develop classroom materials.

27. Teach special education students to use productivity software programs to perform tasks such as word processing, database management, graphics production and telecommunications.

28. Teach special education students to operate equipment and run associated educational programs.

29. Use productivity tools for word processing, database management, and spreadsheet applications.

30. Solicit accurate feedback from end-users and others having experience with technology.

31. Understand proper mechanical and electrical safety practices, or direct their use in the assembly and integration of the technology at a defensible level of competence.

Planning and Managing the Teaching and Learning Environment

Skills

32. Demonstrate the proper care of technology systems and related software; use simple diagnostics to determine problems that arise, and perform routine maintenance.

33. Arrange and manage the classroom environment to facilitate the use of technology.

Managing Student Behavior and Social Interaction Skills

Skills

34. Organize computer activities to promote positive social interactions.

Communication and Collaborative Partnerships

Knowledge

35. Roles that related services personnel assume in providing technology services to special education students.

Skills

36. Recognize the need (how, when, where) to refer a consumer to another professional regarding technology.
37. Identify assistive technology team members and their roles.
38. Design and implement integrated technology classroom activities that involve teaming and/or small group collaboration.
39. Collaborate with consumer and other team members in planning and implementing the use of assistive and adaptive devices.
40. Participate in collaborative projects and activities involving technology.
41. Demonstrate effective group process skills.
42. Communicate effectively including listening, speaking, and writing on technology issues.
43. Use electronic mail and Web browser applications for communication and for research to support instruction.
44. Advise general education teachers about the use of technology systems with special education students who are mainstreamed into their classes.

Professional and Ethical Practices*Knowledge*

45. Confidentiality of information.
46. Limits of expertise - recognize and seek outside expertise.

Skills

47. Recognize own skills and knowledge regarding technology and limit individual practice accordingly.
48. Maintain a professional development program to ensure the acquisition of knowledge and skills about new developments in technology as they become available.
49. Identify activities and resources to support professional growth related to technology.
50. Demonstrate knowledge of equity, ethical, legal, and human issues related to technology use in special education.
51. Adhere to copyright laws about duplication and distribution of software and other copyrighted technology materials.

(Lahm & Nickels, 1999)

Appendix F Cover Letter

Date:

Dear Special Educator,

The selection, use, and integration of assistive technology are a major area of interest and concern for Virginia special education teachers. This is especially true in light of the federal legislation such as No Child Left Behind and additional pressures arising from mandated participation of students with disabilities in state wide assessments.

Therefore, I am conducting my doctoral dissertation research on the assistive technology knowledge, skills and professional development needs of special education teachers in southwestern Virginia.

You are being asked to participate in this very important study. It is estimated that the questionnaire can be completed in 10-15 minutes. Your participation is voluntary and you may choose not to complete and return this questionnaire. You may also omit any items on the questionnaire(s) you prefer not to answer. All information will be kept confidential and only reviewed by the researcher. No names or other identifying information about participants will be shared in any reporting.

If you agree to voluntarily participate in this research project as described, please indicate your agreement by completing and returning the attached questionnaire. Please retain this consent cover form for your reference.

Your responses will be invaluable as we attempt to design training programs to meet the needs of special education teachers in southwestern Virginia.

By returning the questionnaire and enclosed postcard, you will be entered into a drawing for 20 door prizes. Notification will be sent to winners by March 1, 2006

Please take a few minutes to complete the "Virginia Special Educators' Assistive Technology Knowledge and Skills Questionnaire" and return it in the enclosed, postage paid envelope by January 31, 2006. If you would like to receive a copy of the final results of this study please indicate this on the last page of the questionnaire. Any questions regarding this questionnaire can be directed to me at 540-231-3836 or at gsgustaf@vt.edu.

Sincerely,

Glenna Gustafson

Appendix G

Virginia Teachers' Assistive Technology Skills and Knowledge Questionnaire

The purpose of this questionnaire is to develop a summary of the assistive technology skills and knowledge of special educators in southwestern Virginia and their assistive technology professional development interests and needs. The acronym AT is used to refer to ASSISTIVE TECHNOLOGY throughout the survey. All survey responses will remain confidential. **Please complete and return this questionnaire by January 27, 2006.**

1. How important do you consider each of these factors to be in order to successfully implement the use of assistive technology?

not important → very important

0 = not important to 4 = very important

	0	1	2	3	4
Funding	0	1	2	3	4
Technical assistance and support	0	1	2	3	4
Administrative support	0	1	2	3	4
Time	0	1	2	3	4
Professional development opportunities	0	1	2	3	4
Awareness and knowledge about AT	0	1	2	3	4

2. Please select **all** of the sources from which you have received training and professional development in the area of AT:
- _____ 0 - None
- _____ 1 - From other school professionals working with students with disabilities (e.g. Speech Language Pathologist, Occupational or Physical Therapist)
- _____ 2 - From the technology consultant from school or school system
- _____ 3 - By attending conference(s)
- _____ 4 - By attending a class at a university/college
- _____ 5 - From an AT vendor
- _____ 6 - From a TTAC consultant

3. Please check the **one** that best indicates the extent you believe you are prepared to provide AT services to your students.
- _____ 0- Not at all prepared
- _____ 1- Poorly prepared
- _____ 2- Somewhat prepared
- _____ 3- Adequately prepared
- _____ 4 - Extremely well prepared

4. Thinking about your own learning style and needs please indicate your: Preference for learning about technology. and Preference for professional development..	My preferred method for learning about technology is:					My preference for this form of professional development is:				
	0	1	2	3	4	0	1	2	3	4
	dislike				favorite	dislike; would not participate				favorite; would be most likely to participate
One-on-One individualized instruction	0	1	2	3	4	0	1	2	3	4
Using a self-paced, written tutorial	0	1	2	3	4	0	1	2	3	4
Attending workshops or conference sessions	0	1	2	3	4	0	1	2	3	4
Experimentation with the technology	0	1	2	3	4	0	1	2	3	4
Hands-on instruction in group setting	0	1	2	3	4	0	1	2	3	4
Online modules or tutorials	0	1	2	3	4	0	1	2	3	4
Receiving “just in time” training or “as needed”	0	1	2	3	4	0	1	2	3	4
Formalized courses (i.e., for university credit)	0	1	2	3	4	0	1	2	3	4

On a scale from 0-4, please rate your level of expertise AND your need for professional development for each area.	My level of expertise in this area is:					My need for professional development in this area is:				
	0	1	2	3	4	0	1	2	3	4
	no skills		average		expert skills	no need		average		critical need
	Skills/Knowledge Level					Professional Development Need				
5. I possess knowledge about AT terms and concepts.	0	1	2	3	4	0	1	2	3	4
6. I possess knowledge of the federal and state mandates that require AT services for students with disabilities.	0	1	2	3	4	0	1	2	3	4
7. I recognize the impact of the use of technology with students with disabilities.	0	1	2	3	4	0	1	2	3	4

8. I can identify characteristics of students with disabilities that influence the use of technology.	0	1	2	3	4	0	1	2	3	4
9. I can organize computer activities to promote positive social interaction.	0	1	2	3	4	0	1	2	3	4
10. I can identify activities and resources to support professional growth related to technology.	0	1	2	3	4	0	1	2	3	4
11. I can use the Internet to locate information to support instructional activities.	0	1	2	3	4	0	1	2	3	4
12. I can use email for communication.	0	1	2	3	4	0	1	2	3	4
13. I can operate the following instructional and assistive technology hardware, software, and peripherals.										
a. Oral Communication Adaptations (e.g. communication boards, augmentative and alternative communication devices – <i>Sequencer, One Step, Cheap Talk</i>)	0	1	2	3	4	0	1	2	3	4
b. Computer Access Adaptations (e.g. adapted keyboards, adapted mouse, switch access, built in computer features)	0	1	2	3	4	0	1	2	3	4
c. Environmental Adaptations (e.g. grabbers, enlarged door knobs)	0	1	2	3	4	0	1	2	3	4
d. Self Help Adaptations (e.g. eating utensils, adapted toileting tools, pencil)	0	1	2	3	4	0	1	2	3	4

e.	Sensory Adaptations (e.g. Braille, magnification, auditory listening devices, hearing aids, amplification devices)	0	1	2	3	4	0	1	2	3	4
f.	Mobility & Positioning Adaptations (e.g. special lifts, walkers, crutches, splints, standers)	0	1	2	3	4	0	1	2	3	4
g.	Leisure, Recreation & Motivational Adaptations (e.g. beeper balls, adapted skis, switch toys)	0	1	2	3	4	0	1	2	3	4
h.	Learning & Educational Adaptations (e.g. Franklin spellers, talking word processors, educational software programs, calculators)	0	1	2	3	4	0	1	2	3	4
14.	I can arrange the classroom environment to facilitate the use of assistive technology.	0	1	2	3	4	0	1	2	3	4
15.	I can identify elements of the curriculum for which technology applications are appropriate and ways in which they can be implemented.	0	1	2	3	4	0	1	2	3	4
16.	I possess the technology skills as required by the Virginia Technology Standards for Instructional Personnel (TSIP).	0	1	2	3	4	0	1	2	3	4
17.	I can identify funding resources for the purchase of AT devices and equipment.	0	1	2	3	4	0	1	2	3	4
18.	I can determine whether a comprehensive AT assessment is needed.	0	1	2	3	4	0	1	2	3	4
19.	I use technology in the assessment of students with disabilities.	0	1	2	3	4	0	1	2	3	4

20. I can evaluate whether AT is effective in meeting student needs.	0	1	2	3	4	0	1	2	3	4
21. I possess knowledge of the range of AT options from no-tech solutions (i.e., pencil grips, highlighters) to high-tech solutions (i.e., computers, environmental controls).	0	1	2	3	4	0	1	2	3	4
22. I participate in activities of professional organizations relevant to the field of technology.	0	1	2	3	4	0	1	2	3	4
23. I collaborate with other team members in the integration of assistive devices.	0	1	2	3	4	0	1	2	3	4
24. I provide training in the use of assistive technologies	0	1	2	3	4	0	1	2	3	4

25. Please check the one that best indicates your:

- a. educational role: Special Educator/Resource Room Special Educator / Self-Contained Classroom Special Educator/ Collaborating Teacher (in at least 1 class) Special Educator/ Itinerant Teacher
- b. years of teaching experience: 0-5 6-10 11-15 more than 15
- c. grade levels that you currently teach: Primary (K-2) Upper Elementary (3-5) Middle (6-8) High (9-12)
- d. completed level of education: BS/BA MS/MA EdS/CAGS EdD/PhD
- e. gender: male female

26. Please indicate the school division you teach in. _____

Please feel free to add any comments here:

Please return this questionnaire and your prize registration form in the self addressed stamped envelope by January 27, 2006.

Thank you for your time!

**Glenna Gustafson
112 Lane Hall, 0254
Blacksburg, VA 24061 gsgustaf@vt.edu**

Appendix H Follow-Up to Questionnaire Mailing



Virginia Department of Education's
Training and Technical Assistance Center (T/TAC)
for Professionals Serving Students with Disabilities
College of Liberal Arts and Human Sciences
222 Lane Hall, Blacksburg, Virginia 24061-0254

January 21, 2006

Dear Special Educator,

About two weeks ago you received a questionnaire focusing on the assistive technology knowledge, skills, and professional development needs of educators in southwestern Virginia.

I would like to thank all of you that have returned your questionnaires. You have been entered in the drawing for prizes.

If you still haven't completed the questionnaire, please take the time to do it now. It should only take 10-15 minutes to complete and your input is important to us. Remember the results from the questionnaire will be used to help plan future professional development opportunities to better meet your needs so that you can help your students meet reach their maximum potential.

If you have lost or misplaced your survey, please let me know and I will be happy to send you another one. Please feel free to contact me if you have any concerns, 540-231-3839 or gsgustaf@t.edu .

Thanks for your help,

Glenna Gustafson

Appendix I Protocol for Phone Interviews

Hi, my name is Glenna Gustafson, from the TTAC. I won't take much of your time. Do you have time to answer a few questions about assistive technology for me?

About 2 months ago I sent a questionnaire out that asked some questions about assistive technology. Did you get that survey or do you remember getting that survey?

Well, since you didn't get/complete the survey, can you answer just a few questions?

Do you work with students that use AT?

How well prepared do you feel to use assistive technologies with your students? For example if you had to rate yourself on a scale from 0 having no skills to 4 having expert skills, where would you say that you are?

OK, how have you learned about assistive technologies? Have you taken courses, learned from others, gone to conferences?

Thank you so much for your time. I hope that we will see you at our annual technology conference – Making Connections, June 22-23, 2006. It's in Blacksburg this year. Take care. Good-bye.

Summary of Phone Interviews

Question 1: *About 2 months ago you should have received a questionnaire from me. Did you receive it or do you recall receiving it?*

Response 1: You know I don't remember receiving it and I'm pretty good about returning things like that.

Response 2: No, I didn't get a survey. A lot of things come here with a different teacher's name on them – the teacher's name that I replaced, but I don't remember a survey.

Response 3: No, I don't remember getting a survey, but I might have misplaced it.

Response 4: No, I didn't receive a survey.

Question 2: *Do you use assistive technology with your students?*

Response 1: Yes, but not a lot.

Response 2: Yes, with a few of my students.

Response 3: Yes, mostly the computer.

Response 4: Yes, with several of my students.

Question 3: *How well prepared do you feel to use assistive technologies? For example if you had to rate yourself on a scale from 0 having no skills to 4 having expert skills, where would you say that you are?*

Response 1: Really, I feel very prepared. I had worked in the room as an aide for 2 years prior to getting my teaching job so I knew all about all the devices these kids were using.

Response 2: I'd say about a 2. I haven't been using AT a lot lately so I'm kind of rusty with it.

Response 3: I guess about average. I know mainly about the computer.

Response 4: I would say about average. I know that I need to learn more.

Question 4: *How have you learned about assistive technology?*

Response 1: Most of my training came from working in the room with the students as an aide.

Response 2: About four years ago took a graduate class at GMU and was a member of the AT team at our school. I guess I've gotten a little training here and there too.

Response 3: I've gone to some conferences.

Response 4: I usually just ask the other teachers I work with when I need help.

Appendix J
Open Ended Responses

Theme	Comments
Funding	<ul style="list-style-type: none"> • We use very little assistive technology for students with disabilities within our building. I'm still unsure whether it is based on the money, need, or lack of knowledge. • In order to maintain and enhance any students in the area of technology with or without adaptations more funding is necessary to stay up to date with technology advancements.
Time	<ul style="list-style-type: none"> • I teach 7 students with multiple of severe disabilities. I have access to good technology but much of it I do not have instructional manuals that tell me how to use the technology. These students need to be bed, have their diapers changed, have very little communication without AT and have behaviors that require intervention. Finding technology that is adequate to their needs and time to implement it is very difficult.
Need	<ul style="list-style-type: none"> • I answered the items according to the caseload I have this year. Things do change from year to year and I don't know who my clientele will be next year. • Current caseload does not necessitate the use of extensive AT. • Use AT daily in the classroom. Always room to learn more. Some things such as Braille not used at this time. • I only use AT when a student with these needs is heading my way. My need for AT is not great at this time but being able to recognize who would benefit and the items that are available would be helpful. • Great need! Am sure your dissertation will be great and helpful to many.
Professional Development	<ul style="list-style-type: none"> • I was able to take part in a grant for the Lexington City Schools and attended the Closing the Gap Conference. I was also very involved in the state training of AT teams at GMU. • I hope Roanoke City will be offering some workshops. • I have been to your conference, but I have not had any real training in the areas discussed above. • I have only had students who needed AT and Aug Com one year, and that was a learn as you go situation. • I would very much like to know what is out there and be trained on how to use it.

Skills and
Knowledge

- We need training on AT in this county; it would be very helpful! Appreciate any and all assistance from TTAC.
- I am writing my first IEP this month for a student requiring AT. I am lost and will need a lot of help. I teach all LD classes and the need hasn't been there or recognized before I would love to be more exposed to the device out there.
- I am always ready to learn new things.
- This isn't my area of expertise and I mainly work with students with mild moderate disabilities.
- I am the building AT coordinator but do not feel comfortable in this position.
- I am well acquainted with strategies to increase cognitive learning. I am not well acquainted with many of the AT devices listed above.
- I am a new teacher. I have worked with the state of Virginia in rehab of children and adults for 15 years, but it is my first year teaching.
- I would be willing to learn more about assistive technology. I do feel that funding is very important. We recently have gotten more students that would benefit from assistive technology. We have taken away some of your ideas from conferences.

Glenna S. Gustafson

117 Evans St.
Christiansburg, VA 24073
(540) 382-5489
gsgustaf@vt.edu

112 Lane Hall
Blacksburg, VA 24061
(540) 231-5167
gsgustaf@vt.edu

EDUCATION

EdD Curriculum and Instruction, Curriculum and Instruction, May, 2006

Virginia Polytechnic Institute and State University, Blacksburg, VA

Dissertation: The Assistive Technology Skills, Knowledge, and Professional Development Needs of Special Educators in Southwestern Virginia

Chair: Dr. Susan Asselin

M. Ed. Curriculum and Instruction, Instructional Technology, May, 2000

Virginia Polytechnic Institute and State University, Blacksburg, VA

B.S. Elementary Education, (nK-7), August, 1978

Radford University, Radford, VA

Virginia Professional Teaching Certificate

Instructional Technology Certificate, May, 1998

University of Virginia Charlottesville, VA

New River Community College Dublin, VA

American Sign Language (6 hrs.) August, 1997

Using Computers in Science (3 hrs.) May, 1995

Using Computers in Social Studies (3hrs.) May, 1992

RESEARCH INTERESTS

Universal Design for Learning

Integration of educational and assistive/adaptive technology tools

Collaboration of educational professionals at the post secondary level

TEACHING INTERESTS

Instruction of pre-service educators

Integration of computer applications

Assistive/adaptive technologies and for all populations

Professional development for in-service educators

CERTIFICATION

Virginia Teaching License, grades nk-7

TEACHING and PROFESSIONAL EXPERIENCE**Training and Technical Assistance Center, 1999-Present**

Technology Coordinator – Virginia Polytechnic Institute & State University

Provide professional development and assistance for public school faculty, staff, and other professionals that work with students with disabilities; design and develop trainings and presentations on the use and integration of a variety of educational and assistive technologies, collaboration, and instructional strategies; facilitate team planning with school teams, special education coordinators, teachers, specialists, and instructional assistants; serve on state Academic Review Teams for schools not meeting accreditation standards; design and develop online modules; attend conferences and workshops to keep up to date on current technologies; monitor and assist the Assistive Technology Teams in our service areas; participate on statewide assistive technology taskforces; raise the awareness of assistive/adaptive and educational technology tools that provides students with greater access to the curriculum

Guest Lecturer. Virginia Tech University, Blacksburg, VA , 2006

An Overview of Assistive Technologies Used in Elementary School Settings

Guest Lecturer: Radford University, Radford, VA, 2006

Assistive Technology and Literacy
Intellikeys in the Classroom

Guest Lecturer. Virginia Tech University, Blacksburg, VA , 2005

Removing Barriers with AT and Aug Com
Universal Design for Learning

Guest Lecturer: Radford University, Radford, VA, 2005

Removing Barriers with AT and Aug Com
AT and Aug Com Continuum
The AT Toolbox

Guest Lecturer. Virginia Tech University, Blacksburg, VA, 2004

What is Assistive Technology and Augmentative Communication

Guest Lecturer. Roanoke College, Roanoke, VA, 2003

An Overview of Assistive Technologies Used in Elementary School Settings
What is Assistive Technology and Augmentative Communication

Guest Lecturer. Virginia Tech University, Blacksburg, VA, 2002

What is Assistive Technology and Augmentative Communication

Guest Lecturer. Roanoke College, Roanoke, VA, 2001

An Overview of Assistive Technologies Used in Elementary School Setting

Guest Lecturer. Roanoke College, Roanoke, VA, 2000*An Overview of Assistive Technologies Used in Elementary School Settings***Guest Lecturer. Virginia Tech University, Blacksburg, VA, 2000***What is Assistive Technology and Augmentative Communication***Guest Lecturer. Radford University, Radford, VA, 2000***An Overview of Assistive Technologies Used in Elementary School Settings***Guest Lecturer. Roanoke College, Roanoke, VA, 1999***An Overview of Assistive Technologies Used in Elementary School Settings***Montgomery County Public Schools, Christiansburg, VA - August, 1985 – August, 1998**

Inclusive classroom teacher, grade 5, grade 3, grade 2; Building technology coordinator and trainer; County technology representative

Darlington County Public Schools, Darlington, SC - August, 1979 - June, 1985Washington Street Elementary – Transitional classroom teacher, grades 2-3
Cain Elementary – Transitional classroom teacher, grades 1-2; classroom teacher, grade 1;
Chapter 1 Reading Specialist**Buchanan County Public Schools, Grundy, VA - August, 1978**

Garden Creek Elementary, classroom teacher, grade 4

AFFILIATIONS/HONORS

Phi Delta Phi

Phi Delta Kappa

Virginia Society for Technology Education (VSTE)

International Society for Technology Education (ISTE)

Virginia Assistive Technology Task Force

Virginia Assistive Technology Systems Southwest Consortium

New River Valley Reading Association

Master Technology Teacher for Montgomery County Public Schools (1997-98)

Pee Dee Council Reading Teacher of the Year, Darlington, SC (1980)

South Carolina Reading Teacher of the Year (1980)

GRANTS**STAR Grants**

(1999)"EPIC – "Electronic Portfolios in the Classroom"; "Webquests"; "Our Appalachian Heritage"

(1998) "Light, Color, Action"; "SWAT – Student Workers Assisting with Technology";
"Putting the Pieces Together"

(1996)– "Talking Hands"

Virginia Commission of the Arts Grant

"Paste Batik"(1999)

"Mosaics in Time"(1998)

"The Technology Puzzle"(1997)

PUBLICATIONS

Training and Technical Assistance Center Bulletin, 1999-present

Bits and Bytes

Virginia Society of Technology Education Journal, Winter, 2004

Planning for the Successful Implementation of Assistive Technologies

Training and Technical Assistance Center Bulletin, Fall, 2004

Universal Design for Learning

Virginia Society of Technology Education Journal, Winter, 2004

Universal Design for Learning

Virginia Society of Technology Education Journal, Winter, 2003

Using the Power of PowerPoint

CONFERENCE AND WORKSHOP PRESENTATIONS

2006

Virginia Society for Technology Education

An AT Toolbox

Autism Spectrum Disorders Piecing Together the Puzzle

Creating Visual Supports

Using Symbol Writing Software

2005

Virginia Educational Technology Leadership Conference

Accessibility and Portable Technologies

Autism Spectrum Disorders Piecing Together the Puzzle

Graphic Organizers to Support Learning

Collaborative Teaching Series, Buchanan County Public Schools, VA; Botetourt County

Public Schools, VA; Danville City Schools, VA; Roanoke City Schools, VA

Power of 2 – Collaboration and Co-teaching Models

Roanoke City Public Schools, Roanoke, VA

Assistive Technology Team Development Series

Radford University Student Technology Workshop, Radford, VA

What's in Your Technology Toolbox

Radford University Faculty Training, Radford, VA

The Dana

CSUN Conference, Los Angeles, CA

Accessibility and Portable Technologies

2004

Virginia Educational Technology Leadership Conference, Roanoke, VA

The Dana, A Big Technology in a Small Package

NCLB Summer Institute, Richlands, VA

Graphic Organizers for Reading

Franklin County Technology Institute, Rocky Mount, VA

Active Learning Strategies in the Classroom

Summer History Institute, Rocky Mount, VA

Universal Design and the Brain

Autism Spectrum Disorders: Putting the pieces together, Abington, VA

A Picture for Your Thoughts: Using Graphic Organizers

2003

Hotel Roanoke and Conference Center, Roanoke, VA.

T/TAC Technology – AT & AUG COM: Making the Connections

Roanoke Higher Education Center, Roanoke, VA.

The Power of Two

Galax City Schools, VA

Active Learning Strategies

Roanoke Higher Education Center, Roanoke, VA.

Roanoke County AT Team Training

Virginia Society for Technology Education, Norfolk, VA

If You Give A Student the Tools

Abington Higher Ed Center

Everything's A Dollar

2002

State Literacy Conference - Hotel Roanoke and Conference Center, Roanoke, VA

Literacy and Middle School

Roanoke Higher Education Center, Roanoke, VA.

All in a Digital Day

Regional Autism Conference, Roanoke, VA

Integrating AT and Aug Com Tools

Virginia SHAV, Charlottesville, VA

Literacy for Middle School Students

2001

Pittsylvania Vocational Center, Chatham, VA

Technology Tools for Learning

Floyd County High School, Floyd, VA

Using the Internet in the Secondary Classroom

Floyd County High School, Floyd, VA

Kurzweil 3000 – A Tool for Learning,

Virginia Society for Technology Education, Norfolk, VA

We have the Hardware, We have the Software, What's Next?

New Horizons Early Childhood Conference, Abington, VA

Enriching the Curriculum with Assistive Technology and Augmentative Communication

Virginia Council for Learning Disabilities, Roanoke, VA

I Can Read With My Eyes Shut

Pulaski County High School, Pulaski, VA

An Overview of High Tech Assistive Technology Devices

2000**Virginia Technology Leadership Conference, Roanoke, VA***Universal Design –It's the Right Thing To Do***Southwest Higher Education Center, Abington, VA***Accessing the General Curriculum with Assistive Technology and Augmentative Communication,***T/TAC Computer Loan, Blacksburg, VA***The Ins and Outs of Using a Mac***T/TAC, Blacksburg, VA***What's new in Assistive Technologies***1999****Virginia Technology Leadership Conference, Roanoke, VA***Creating Webquests for the Classroom***Virginia Gifted Association Conference, Christiansburg, VA***"SOL + Technology"***1998****Virginia Society for Technology Education, Roanoke, VA***Making Calculators Work for You***1996****Virginia Learning Disabilities Conference, Fairfax, VA***Inclusion Can Work!***SERVICES**

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