ABSTRACT

Title of Document: AN EXPLORATORY STUDY OF THE ASSISTIVE TECHNOLOGY KNOWLEDGE, SKILLS, AND NEEDS AMONG SPECIAL EDUCATION TEACHERS AND RELATED SERVICE PERSONNEL

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Federal legislation, professional standards, and school district initiatives mandate or support the consideration and application of assistive technology (AT) devices and services for students with disabilities. It is not known if practitioners in the field have the knowledge and skills required to successfully implement AT and AT services as intended. This was an exploratory study to describe and compare the level of AT knowledge among special education professionals and related service providers, identify AT training needs, and determine staff perceptions of the availability and effectiveness of AT technical assistance and support within a school system that serves a large number of parents serving in the military. The study was implemented with descriptive and inferential statistical techniques employed through a self-administered web-based questionnaire. Of the 87 professionals randomly selected, 42 participated. Special education professionals indicated a lack of essential skills and knowledge on selected AT knowledge and skill measures and current AT practices do not meet established AT quality indicators. Each professional had AT knowledge specific to their profession, but

the quality and depth of the AT knowledge was similarly limited. The findings question the current effectiveness of existing AT training, policy, and supports across professional disciplines. Results suggested this is in part due to a lack of operational device knowledge and skills compounded by uncertainty of district AT procedures and policy for low and high assistive technology. Timely technical support and professional access to AT Lending Libraries were identified as interventions currently working. The results support a growing body of research in the field of AT regarding the lack of knowledge and skills of special education and related service providers. These results have implications for pre-service AT preparation programs, in-service trainings, and district policy and infrastructure support.

AN EXPLORATORY STUDY OF THE ASSISTIVE TECHNOLOGY KNOWLEDGE, SKILLS, AND NEEDS AMONG SPECIAL EDUCATION TEACHERS AND RELATED SERVICE PERSONNEL

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DEDICATION

I dedicate this work to my wife and two daughters whose support, love, and patience have given me the strength and fortitude to reach my goals.

I also dedicate this work to my parents and grandparents, whose belief in hard work and the value of education forged my belief system and understanding that anything is possible.

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Chapter 1 Introduction

Context and Statement of the Problem

Assistive technology (AT) has improved social, academic, and functional skills for a variety of individuals with disabilities. Similarly, such life-changing AT effects have prompted increasing awareness, funding, availability, and use of assistive technology. As AT grows in terms of the number of available devices and services, and as the number of individuals and organizations benefiting from technological advances multiplies, the need for competent and highly skilled professionals who have the knowledge and skills of AT also increases. The knowledge of special education practitioners and related service personnel within a school system that serves a large number of students whose parents were serving in the military who can effectively implement AT and AT services is currently unknown. The primary objective of this study was to explore the level of AT knowledge among the school system special education professionals and related service providers about their perceptions of the availability and effectiveness of AT technical assistance and support and to identify AT training needs within the school system.

The importance and relevance of AT legislation, how AT is currently supported by school system directives and initiatives, and current AT professional standards and quality indicators are reviewed in detail. In this chapter the problem, purpose, research questions, significance, and limitations of the study are discussed. The final section includes the definitions of frequently used terms in the study for clarification.

Federal Legislation

AT has seen significant growth in its importance, use, and legislative requirements since 1992. The estimated use of AT by children has risen approximately 60% since 1992 (Brady, Long, Richards, & Vallin, 2008). In 1988, the United States (U.S.) Congress made several findings that helped shape the first major AT legislation. Congress determined that all individuals would benefit from recent technological advances and AT could reduce the cost of disabilities by enabling individuals with disabilities increased engagement or performance of tasks at home, school, or in the community. Congress also determined that many individuals with disabilities do not have access or funds to pay for AT or AT services (Bailey, 1999). From these Congressional findings came the Technology-Related Assistance for Individuals with Disabilities Act (Tech Act) of 1988, (P.L.100-407). This act increased public awareness of the use of AT to improve functioning of individuals with disabilities (Alper & Raharinirina, 2006). The Tech Act made AT available for individuals with disabilities on an as-needed or as-requested basis and established a common language for AT by defining AT devices and services at the legislative level (Bausch & Hasselbring, 2004; Bell & Blackhurst, 1996).

The Tech Act has been amended three times since its inception: in 1994 (P.L. 103-218), in 1998 (P.L. 105-394), and in 2004 (P.L. 108-364). Each amendment has continued to clarify and extend the terms, definitions, and services of the original Tech Act of 1988 while increasing accountability of funding and program effectiveness. Amendments from 2004 shifted the focus from providing support to states to develop AT infrastructure to increasing direct aid programs for individuals with disabilities through

the creation of AT demonstration programs, reutilization programs, loan programs, and alternative financing (Boehner, 2004).

The role, consideration, and definition of AT was expanded with its inclusion in the Individuals with Disability Education Act Amendments (IDEA) of 1997 (P.L. 105-17). The 1997 IDEA mandated that all students receiving special education services be considered for AT and AT services. This legal requirement necessitated individualized education program (IEP) teams annually assess, identify, provide, and evaluate AT and AT related services for individual students. In the 2004 IDEA amendments (P.L.08-446), minor changes were made to the definition of AT while keeping the requirement of yearly IEP AT considerations the same. Both sets of legislation emphasized increased access by children with disabilities to the general education classroom, with AT as one of the primary considerations to meet this goal.

School System AT Policy and Directives

As of 2007, the participating school system operated 220 public schools in 16 districts located in 7 states, Puerto Rico, Guam, and 13 foreign countries. The primary role of the school system is to educate the children of military service members and Department of Defense civilian employees. Approximately 89,943 students are enrolled in the school system schools, with approximately 64,505 students in overseas schools, and approximately 25,438 students in the stateside schools. The overseas school branch of the system has approximately 12,140 employees, and stateside branch, approximately 5,333 employees (2007). The overseas system is separated into a European branch, which consists of five districts spanning England, Germany, Belgium, Netherlands, Italy,

Turkey, and Spain. The second branch is located in the Pacific, which consists of four districts spanning Guam, Japan, Okinawa, and Korea.

Children of military enlisted personnel represent 91% of the total enrollment in the participating school system schools. Military duty assignments often result in frequent moves, resulting in a mobility rate of 31%. Among the military dependents, approximately 35% of students have parents/guardians in the Army and 31% have parents/guardians in the Air Force (2007).

School system special education policy. Schools follow procedures that define special education policy. This instruction establishes (a) the right to a free appropriate public education (FAPE) (b) early intervention services for infants and toddlers birth through age 2 years, (c) a National Advisory Panel (NAP) on Education for Children with Disabilities and a DoD Inter-Component Coordinating Council (ICC) on Early Intervention, and (d) a DoD Coordinating Committee (DoD-CC) on Early Intervention, Special Education and Medically Related Services (NRS) (Department of Defense, 2005). Current school system special education procedural guidance specifies the Case Study Committee (CSC) shall consider AT as a special factor when developing the IEP.

Military medical departments through Educational and Developmental Intervention Services (EDIS) provide related services such as physical therapy or occupational therapy to students attending school system schools. Also, EDIS is responsible for the provision of Early Intervention Services (EIS) for children, ages birth through two at all school system locations. Since AT is a required special consideration, occupational and physical therapists working through EDIS are often part of the IEP assistive technology consideration process.

The school system Special Education Procedural Guide specifies how the CSC should consider AT services for a student. The manual specifies that the AT consideration is a brief process leading to the determination of the student's need for AT and the level of support required. The guide supports four possible AT conclusions (a) interventions are working and AT is not needed, (b) AT is already being used and it is successful, meaning AT will be added to the special factors portion of the IEP and AT can be written into the IEP goals and objectives, (c) the IEP team believes AT should be tried and identifies the variables to make an appropriate AT determination, and (d) the IEP team lacks information and knowledge to make a AT decision and is instructed to contact a person knowledgeable about AT or research AT online. Specifics in the guide note a lack of AT knowledge at the IEP meeting may indicate formal AT assessments are needed and suggest using an AT checklist to consider the full range of AT options. Using the Wisconsin Assistive Technology Initiative (WATI) as an online resource to assist in making appropriate AT considerations is also noted in the guide.

Special education initiative. In 2002, the school system conducted a system wide review of its special education services. Resources, curricula, related services, and facilities were the primary focus of the study. The results led to the Special Education Initiative (SEI), a detailed plan to improve special education services. Funding of $56.5 million was allocated by a joint agreement of the armed services to support the 6 year initiative starting school year 2003-2004.

In 2005 as part of the SEI, an online survey was e-mailed to pre-K-12 school system special education professionals and paraprofessionals asking them to describe the impact of the SEI and to gather information to help guide further allocation of resources

and support. The survey achieved a 91% return among the 1,400 special education personnel. Respondents identified how helpful the SEI AT resources were in assisting students achieve academic standards. Of the respondents, 68% felt AT helped students meet academic standards and 95% of the respondents indicated AT was very helpful or helpful. Nearly 60% of the respondents indicated the AT lending libraries were helping students meet the academic standard, with 92% of the respondents indicating they felt the libraries were very helpful or helpful.

While the SEI survey described the perceptions of school system special education personnel regarding the helpfulness of AT, the level of AT knowledge among school system special education teachers and related service providers is unknown. Further, it is unknown if IEP teams can readily obtain assistance and useful information when making AT decisions as required as one of the options in the special education procedural guidance support manual.

Professional Standards for Assistive Technology

Edyburn (2008) reported current general education teacher certification standards for most states involve completing a three-credit course in educational technology that may or may not include AT. A large majority of special education certification programs offer AT as an elective, but not as a requirement (Edyburn, 2008). The Council for Exceptional Children (CEC) developed research-based professional standards for beginning special education teachers. The minimum CEC special education proficiency standards indicate special educators are (a) familiar with augmentative, alternative, and assistive technologies to support and enhance communication of individuals with exceptional needs, (b) comfortable using appropriate technologies to support instructional

planning and individualized instruction, and (c) using appropriate technologies to support their assessments (Council for Exceptional Children, 2004).

AT standards can also be found within the Quality Indicators for Assistive Technology (QIAT). A consortium of professionals created the QIAT descriptors to act as broad guidelines for quality AT services in 1998 with revisions in 2004 (QIAT, 2006). The consortium consisted of hundreds of individuals who provided input into the process of identifying, disseminating, and implementing a set of widely applicable quality indicators for assistive technology services (The QIAT Consortium, 2008), work that is ongoing at the present time. The focus of the QIAT consortium is finding and creating resources to help school districts improve their AT services. At least eight states are currently using the quality indicators for AT for state, district, or school training and assessment needs (The QIAT Consortium, 2008).

The quality indicators address the following eight areas: (a) consideration of the need for AT during the IEP meeting; (b) assessment of the need for AT (c) including AT in the IEP; (d) implementing the use of AT; (e) evaluating the effectiveness of AT use; (f) transitioning with AT; (g) administrative support for AT services; and (h) professional development and training in AT (The QIAT Consortium, 2008). These quality indicators act as standards for AT best practice for schools, districts, states, as well as pre-service training institutions.

Statement of Problem

Although federal legislation, professional standards and school system initiatives mandate or support the consideration and application of AT devices and services, it is not known if practitioners in the field have the knowledge and skills required to successfully

implement AT and AT services as intended. As noted earlier, the level of AT knowledge among school system special education teachers and related service providers is currently unknown. Further, it is unknown if IEP teams can readily obtain assistance and useful information when making AT decisions for students who need this service.

Statement of Purpose

The importance and benefit of AT is widely recognized. As AT use increased so has the need for competent and highly skilled professionals who have the knowledge and skills of AT. The knowledge of special education practitioners and related service personnel within the school system who can effectively implement AT and AT services is currently unknown. The purpose of the research study was to describe the level of AT knowledge among the European branch of the participating school system special education professionals and related service providers, to determine staff perceptions of the availability and effectiveness of AT technical assistance and support, and to identify AT training needs within the European branch of the school system.

Research Questions

The following research questions were designed to address the identified problem in the study.

1. What assistive technology knowledge and skills do the European branch of the participating school system special education teachers and related services personnel report to possess? Do differences in knowledge and skills exist among special educator subgroups and related service personnel?
2. To what degree does the level of knowledge and skills of special education teachers and related services personnel in the European branch of the

participating school system report to match AT professional guidelines recommended by the Quality Indicators for Assistive Technology (QIAT)? Do differences in knowledge and skills that match the QIAT standards exist among special educator subgroups and related service personnel?

3. How do the European branch of the participating school system special education teachers and related services personnel perceive the availability and usefulness of the AT technical assistance and support offered by the school system? Do special educator subgroups and related service personnel have different perceptions regarding the availability and usefulness of AT technical assistance and support?
4. What AT trainings or AT supports do the European branch of the participating school system special education teachers and related service personnel identify as needed, and what trainings or supports in their view have had an impact?

Significance of the Study

Several descriptive studies have been conducted in the last 7 years describing special education personnel skills and knowledge regarding the implementation of AT (Ashton et al., 2005; Ashton & Wahl, 2004; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006). The studies have been conducted in local geographic areas and have had low response rates that make generalizing the findings difficult. Further research is needed to expand the existing knowledge base and to describe the specific AT knowledge, skills, and needs of school system special educators and related service personnel within Europe.

Describing current AT knowledge, skills, needs, and assistance within the school system is especially significant due to the Special Education Initiative (SEI) study completed in 2002. The SEI created or upgraded district level AT lending libraries to provide local access to current AT devices, software, and materials. The lending libraries are to provide AT devices or specialized software used on a trial basis for students with special needs to enable them to better access the curriculum. The SEI also included funding to purchase AT software, devices, and materials for preschool classrooms and programs for students with moderate to severe disabilities. The SEI provided a vast amount of AT resources within the school system.

The present study was intended to enable school system personnel to better understand special educators' and related service personnel's knowledge regarding AT, what they identify as training needs, and how they perceive the availability and usefulness of AT tech support. The data may prove useful when (a) making area office or district decisions regarding funding for AT devices and services, training, and AT technology support, (b) revising school system AT policy, and (c) describing if current IEP teams have the knowledge, skills, tools, and support to make appropriate AT considerations as required by school system policy and federal law.

Definition of Terms

Assistive Technology (AT)

For the purpose of the dissertation, the definition of AT is 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 a child with a disability. The term does not include a medical device that is surgically implanted or the replacement of such device. [34 CFR §300.5]

Low-tech Assistive Technology

Low-tech items are usually low cost and non-electronic. Adapted furniture, tools, or utensils, raised-line, colored, or grid paper, correction tape or pens, highlighter tape or pens, Velcro, manual communication boards, large print books, magnifiers, line guides, and pencil grips are low-tech examples.

Mid-tech Assistive Technology

Mid-tech devices are usually moderately priced and easy to operate electronic devices. Some examples of mid-tech devices are tape or digital recorders, electronic dictionaries or organizers, audio books, special lighting or acoustical treatments, adapted keyboards and audible word scanning devices.

High-tech Assistive Technology

High- tech items are expensive devices that contain microcomputer components for storage and retrieval of information. An example of high-tech items are talking calculators or word processors, word prediction software, graphic organizer or flowchart software, scanners, and static and dynamic screen computer communication boards.

AT Service

Assistive technology service is defined as any service that directly assists a child with a disability in the selection, acquisition, or use of an AT device. The term includes (a) the evaluation of the needs of a child with a disability, including a functional evaluation of the child in the child's customary environment, (b) purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices for children with disabilities, (c) selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing assistive technology devices, (d) coordinating and using other therapies, interventions, or services with assistive technology devices, such as those associated with existing education and rehabilitation plans and programs, (e) Training or technical assistance for a child with a disability or, if appropriate, that child's family; (f) training or technical assistance for professionals (including individuals providing education or rehabilitation services), employers, or other individuals who provide services to, employ, or are otherwise substantially involved in the major life functions of that child, and (g) services consisting of expanding the availability of access to technology, including electronic and information technology, to individuals with disabilities. [34 CFR §300.5]

Case Study Committee

Decisions and considerations made regarding Special Education students are made by the school's Case Study Committee (CSC), which includes parents, teachers, specialists, and administrators.

Education Developmental Intervention Services (EDIS)

The Military Medical Departments through their Educational and Developmental Intervention Services (EDIS) provide related services (e.g., physical and occupational therapy, clinical psychology) in school system schools located overseas. EDIS also provides Early Intervention Services (EIS) for children ages birth through two, at all school system locations (2008).

Quality Indicators of Assistive Technology Consortium

The QIAT consortium consists of hundreds of individuals who provide input into the ongoing process of identifying, disseminating, and implementing a set of widely applicable quality indicators for assistive technology services (The QIAT Consortium, 2008). The focus of the QIAT consortium is finding and creating resources to help school districts improve their assistive technology services.

Quality Indicators of Assistive Technology

The quality indicators address the following eight areas: (a) consideration of the need for assistive technology during the IEP meeting; (b) assessment of the need for assistive technology (c) including assistive technology in the IEP; (d) implementing the use of assistive technology; (e) evaluating the effectiveness of assistive technology use; (f) transitioning with assistive technology; (g) administrative support for assistive technology services; (h) professional development and training in assistive technology (The QIAT Consortium, 2008). These quality indicators act as professional standards of AT best practice for schools, districts, states, and pre-service training institutions to follow in providing quality AT services within the educational environment.

Related Services

Related services are those services necessary for the student to benefit from their special education program and may include psychological and counseling services, language, speech, and hearing, transportation, assistive technology, physical and occupational therapy, and medical services required for diagnostic or evaluation purposes (Participating School System Special Education Procedural Guide, 2007). For the purpose of the present study, related service personnel will be referenced as Speech Language Pathologists, Occupational Therapists, and Physical Therapists.

Special Education Initiative

A detailed plan created in 2002 to improve school system special education services. Funding for $56.5 million was allocated by a joint agreement of the armed services to support the six-year initiative starting school year 2003-2004 (2008).

Chapter 2 Literature Review

Context

Assistive Technology is a vehicle to assist individuals with disabilities. Tasks and activities once difficult for individuals with disabilities have become possible with the development and implementation of AT (Alper & Raharinirina, 2006; Duhaney & Duhaney, 2000; Participating School System Special Education Procedural Guide, 2007). AT is a relatively new development in education and refers to devices used to increase, maintain, or improve functional capabilities of individuals with disabilities. The term comes from the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (P.L.100-407) that made AT available for individuals with disabilities on an as-needed or as-requested basis, and at the same time established a common language by defining AT devices and services at the legislative level (Bausch & Hasselbring, 2004; Bell & Blackhurst, 1996). The role, consideration, and definition of AT was expanded with inclusion into the Individuals with Disability Education Act Amendments (IDEA) of 1997 (Public Law 105-17) that mandated all students receiving special education services must be considered for AT and AT services. This legal requirement necessitated the need for individualized education plan (IEP) teams who can assess, identify, provide, and evaluate AT and AT related services. In 2004 IDEA (Public Law 108-446) was amended as the Individuals with Disabilities Education Improvement Act, making minor changes to the definition of AT while preserving the requirement of yearly IEP assistive technology considerations.

For the nation to meet the requirements of IDEA, an estimated 6 million school age children must be annually considered for AT during the IEP process (Bausch &

Hasselbring, 2004). A rapid advancement and availability of commercial assistive technologies has occurred (Alper & Raharinirina, 2006; Bausch & Hasselbring, 2004). These factors have strained states, districts, and educational institutions to keep up with AT knowledge and technologies to meet the directives of IDEA (Bausch & Hasselbring, 2004; Lahm, 2003). The Participating School System Special Education procedural guidance supports the IDEA requirements with respect to AT (2007). The guidance document was an effort to instruct school system educators, who recognize a lack of AT knowledge when making IEP considerations, to locate individuals knowledgeable about AT, or to research and conduct AT assessments with which to make informed AT considerations. AT support was provided in 2002 with the implementation of the participating school system special education initiative (SEI) that provided a portion of $56.5 million to increase access to AT (2008). However, the implementation of the IDEA requirements, school system procedures, and the utilization of the SEI resources required professionals developing IEPs to have sufficient knowledge about AT. Currently, the level of AT knowledge among school system special education teachers and related service providers is unknown. Further, it is unknown if IEP teams can readily obtain assistance and useful information when making AT decisions for students who need this service.

AT is a critical component to support individuals with disabilities. Federal legislation, organizational support, and professional standards for AT are available, but actual knowledge, perceptions, needs, and AT implementation by special education professionals remain unknown. As a result of these factors, the purpose of this literature review is to examine the body of knowledge related to AT implementation and AT

training by reviewing research on current perceptions, attitudes, skill levels, barriers, and needs of practitioners in the field.

Documentation

To gather information related to AT, electronic searches of relevant research between the years 1998 and 2008 were conducted. The electronic search included using the EBSCO online database of journal articles that offered access to Master FILE Premier, ERIC, and PsycINFO. The web search engine Google was also used for expanded search results. Keywords used in generating a list of references for the purpose of the review included "assistive technology" "services," "pre-service," "in-service," "needs," "training," survey," "policy," "special education," and "research." Search results were reviewed to explore titles and abstracts and narrow the focus to succinct articles for the purpose of the review pertinent to the gap in the knowledge identified previously. Additional results were located by reviewing current research reports and articles pertaining to assistive technology with consideration placed on locating cited references from other authors. Each article underwent a final review and analysis to determine its relevancy to the current topic and questions of the review.

The review included an examination of 10 research studies related to the implementation or training of AT. Two studies encompassed an analysis and description of AT policy and standards (Bell & Blackhurst, 1996; Lahm, 2003). Four studies encompassed AT perspectives (Ashton, et al. 2005; Ashton & Wahl, 2004; Wilcox, Dugan, Campbell, &Guimond, 2006; Wilcox, Guimond, Campbell, Weintraub Moore, 2006), and four studies encompassed AT training at the in-service and pre-service levels

(Brady, et al. 2008; Gitlow & Sanford, 2003; Long & Perry, 2008; Smith & Kelly, 2007). An overview of the studies is provided in Appendix A.

Ten Succinct Research Studies

The ten research studies were efforts encompassing descriptive designs methodologies. Two studies were record reviews (Lahm, 2003; Wilcox, Dugan, Campbell, & Guimond, 2006). Ashton and Wahl (2004), Gitlow and Sanford (2003), and Long and Perry (2008) used random participant sampling. The remaining five research efforts consisted of nonrandom samples or sampling procedures were not specified (Ashton, Lee, & Vega, 2005; Bell & Blackhurst, 1996; Brady, Long, Richards, & Vallin, 2008; Long & Perry, 2008; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006).

The ten descriptive research studies described various components of AT knowledge, skills, perceptions, and needs at the pre-service level (Bausch & Hasselbring, 2004; Brady, Long, Richards, & Vallin, 2008; Smith & Kelley, 2007), at the early intervention level (Gitlow & Sanford, 2003; Long & Perry, 2008; Wilcox, Dugan, Campbell, & Guimond, 2006), school level (Ashton & Wahl, 2004; Ashton, Lee, & Vega, 2005), state level (Bell & Blackhurst, 1996), and national level (Lahm, 2003).

Participant Samples

Nine studies utilized data collected through survey methodologies. The majority of the researchers used data collected from special educators, speech language pathologists, occupational therapists, and physical therapists (Ashton, Lee, & Vega, 2005; Ashton & Wahl, 2004; Gitlow & Sanford, 2003, Long & Perry, 2008; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006). One study was an analysis of previously collected data from parents or guardians of children with disabilities receiving

early intervention special education services (Wilcox, Dugan, Campbell, & Guimond, 2006). Two studies included faculty members from major universities (Brady, Long, Richards, & Vallin, 2008; Smith & Kelley, 2007). The final study included state directors of special education (Bell & Blackhurst, 1996).

Lahm (2003) used 154 professional AT competencies compiled from professional organizations within the field of AT. Three studies had between 300-600 participants working in the field of special education either as a teacher, speech language pathologist, physical therapist, occupational therapist, or special education administrator (Ashton, Lee, & Vega, 2005; Ashton & Wahl, 2004; Gitlow & Sanford, 2003) with researchers' efforts drawing sample populations from only one state. One study used state directors of special education from each state, including the District of Columbia (Bell & Blackhurst, 1996). Two studies surveyed 30-150 faculty members of universities providing pre-service training of special education, physical therapy, occupational therapy, and speech language pathology (Brady, Long, Richards, & Vallin, 2008; Smith & Kelley, 2007). One study identified over 17,000 early intervention providers from a national representation of states, but struggled to achieve a significant return rate (Wilcox, Guimond, Campbell, & Weintraub Moore, 2006). Wilcox, Dugan, Campbell, and Guimond (2006) analyzed data collected from 924 family members of children receiving early intervention services from 33 states. The final study used a random sampling of 1,000 physical therapists who were members of the Pediatrics of the American Physical Therapy Association (Long & Perry, 2008).

Methods and Instruments

The majority of the researchers used self-administered mailed surveys to collect data (Ashton, Lee, & Vega, 2003; Ashton & Wahl, 2004; Bell & Blackhurst, 1996; Gitlow & Sanford, 2003; Long & Perry, 2008). Two researchers used online surveys (Brady, Long, Richards, & Vallin, 2008; Smith & Kelley, 2007). One study consisted of computer assisted telephone interviews (Wilcox, Guimond, Campbell, & Weintraub Moore, 2006), while Wilcox, Dugan, Campbell, and Guimond (2006) used archived data gathered through computer assisted telephone interviews. Lahm (2003) collected data by reviewing records.

Four of the researchers did not disclose how instrument protocols were developed (Ashton & Wahl, 2004; Bell & Blackhurst, 1996; Smith & Kelley, 2007;Wilcox, Dugan, Campbell, & Guimond, 2006). Three researchers used pilot testing during instrument development (Brady, Long, Richards, & Vallin, 2008; Long & Perry, 2008; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006). Gitlow and Sanford (2003) used a preexisting survey, and Ashton, Lee, and Vega (2005) developed the survey instrument using professional competencies from the CEC.

Data Analyses and Results

Only two of the eight survey studies resulted in a return rate higher than 50%: Bell and Blackhurst (1996) at 100% and Smith and Kelley (2007) at 79%. The remaining six studies had low response rates that significantly questioned the generalizability and the validity of the findings: Ashton, Lee, and Vega (2005) at 25%; Ashton and Wahl, (2004) at 49%; Brady, Longs, Richards, and Vallin (2008) at 15%; Gitlow and Sanford

(2003) at 19%; Long and Perry (2008) at 38%; and Wilcox, Guimond, Campbell, and Weintraub Moore (2006) at 5%.

Most researchers used descriptive statistics to arrive at findings (Ashton, Lee, & Vega, 2005; Ashton & Wahl, 2004; Bell & Blackhurst, 1996; Brady, Longs, Richards, & Vallin, 2008; Gitlow & Sanford, 2003; Smith & Kelley, 2007; Wilcox, Dugan, Campbell, & Guimond, 2006). Among these studies, frequencies, percentages, and the chi-square test were the most common analysis technique. Lahm (2003) conducted a Delphi validation method to analyze the data. Long and Perry (2008) conducted a multivariate analysis using descriptive statistics, Kruskal-Wallis tests with post-hoc comparisons, nonparametric equivalent analysis of variance, and phenomenological qualitative analysis. The final study (Wilcox, Guimond, Campbell, & Weintraub Moore, 2006) was an analysis of variance with omnibus chi-square test and follow up pair wise comparison.

Primary Findings in the Literature

The analyses conducted in this body of literature revealed numerous significant findings associated with assistive technology knowledge, skills, needs, and perceptions of special education professionals in the field.

AT, Policy, and Professional Standards

The Individuals with Disabilities Education Act (IDEA) states educational agencies are required to provide or pay for services related to AT devices and services to ensure a free, appropriate, public education to children with disabilities. State education agencies have some freedom as how to implement the law. Bell and Blackhurst (1996) used a descriptive survey to examine the perceptions of state directors of special education in all 50 states and the District of Columbia regarding the need for assistive

technology policies in local school districts and (b) conduct an analysis of existing AT policies. Bell and Blackhurst attempted to determine the extent special education leadership personnel in state departments of education perceived a need for policies to guide the delivery of AT services in local education agencies, the State Departments of Education that have developed AT policies, awareness of State Department of Education officials about the availability of AT policies of local education agencies within their jurisdiction, and the topics addressed in current State Department of Education assistive technology policies. Results and comments from the respondents indicated policies should address staff development, identification of/access to resources, fiscal implications, integrated service delivery, transfer of technology across settings, and interagency cooperation**.** Bell and Blackhurst noted training alone would be insufficient and AT policy would alleviate concern and confusion about AT and AT services. The respondents who did not see a need for local policies, felt current law was policy and the IEP process and team were adequate to determine AT devices and services. Bell and Blackhurst reported two thirds of the states would have AT policy statements, advisories, or technical assistance information available by the end of 1997. Nearly one-third of the states did not provide, or were not planning to provide, assistive technology policies or technical assistance resources to local school districts.

The content analysis of the AT policy related documents resulted in the identification of 14 topical areas state and local education agency personnel should consider as they developed AT policy or technical assistance guidelines. The most frequently addressed topic was the definition of AT devices and services (96%), followed by eligibility requirements for AT services (88%), AT screening and assessment (88%),

equipment management, use, and maintenance (84%), AT staff development (84%), AT funding (84%), and planning for AT services (80%). Further study will be required to delineate the critical components to local policy to make sure the most important components are included. Bell and Blackhurst (1996) supported the need for improvements in implementing the mandates of IDEA, with the majority of special education state leaders supporting additional policy, guidance, and resources to improve AT considerations for children with disabilities. The results supported the need for increased local AT policy in addition to identifying topics local AT policy should address. Results may not be relevant today, due to changes in AT legislation, AT requirements, and technological advances since the publication of the findings.

With the complexity of AT and its broad scope of educational and functional applications, it is important to specify what knowledge and skills are critical for professionals (Lahm, 2003). Lahm analyzed competencies from the Rehabilitation Engineering and Assistive Technology Society of North American (RESNA), the International Society for Technology in Education (ISTE), University of Kentucky and the American Occupational Therapy Association (AOTA) to determine what technology related skills teachers should possess. The validated knowledge and skills were used to create AT standards determined by the Council for Exceptional Children (CEC).

The results were organized into 10 standards outlining the technology specialist's essential knowledge and skills. The first standard specifies AT specialists must have a strong foundation in AT law, understanding of technology in education and society, knowledge of AT terminology, and share personal views and goals of AT in education. The second standard states an AT specialist must demonstrate understanding of the

impact of technology at all stages development on individuals with disabilities. The third addresses issues of diversity by using technology. The fourth standard expects AT specialists to use, choose, support, and train individuals to effectively use assistive technology in a variety of settings. The fifth standard specifies the AT specialist will have the skills to assist teachers in engineering physical and emotional environments to promote positive school success. The sixth standard focuses on the specialists understanding of AT and its role in the development of language and communication skills. The seventh standard specifies the AT specialist will make appropriate long and short-term instruction plans to meet diverse needs of students. The eighth standard states an AT expert will be able to assess the needs and progress of a student and to use the results to plan instruction. The ninth standard addresses the AT specialist's ability to make ethical decisions on the use of technology while providing best practice instruction. The final standard covers the ability to collaborate, problem solve, and train peers, parents, and students in the planning and use of AT.

Lahm (2003) discussed that AT consideration can only take place if IEP members are aware of AT. Recommendations were made to improve training at both the in-service and pre-service levels with increased focus on graduate programs that specialize in AT. The creation of national AT standards would serve as guidelines for college courses, serve as an administrator's measure when hiring an AT specialist, and serve as a professional development plan for educators expanding their knowledge of AT.

Professional Knowledge Perspectives and Needs

While Lahm (2003) described what educators using AT should know, the following studies included descriptions of what educators do know. Ashton and Wahl

(2004) conducted a survey study to determine what special education personnel know and what they use in the way of AT. Specifically, the researchers' purpose was to determine what special educators know about AT, how they use AT, what preferred methods of staff development are used for increased training in AT, and how AT awareness differs among different professions within special education. Results indicated speech language pathologists showed the highest awareness of AT, along with the greatest access to AT devices. Nearly half the resource teachers showed awareness of AT, but only 10% had access to AT devices. More professionals were knowledgeable about and had used low-tech items with their students. Respondents did not indicate a great need for additional access to AT. The AT requested was evenly split between high and low-tech items.

A significant interest in continued AT education existed. Each professional group picked items specific to their area of instruction, as observed with speech language pathologists wanting more training in augmentative communication devices and special education teachers requesting writing, reading, and math technologies. The majority of the professionals requested a combination of online and hands-on training for improved use of AT. The self-contained special education teachers felt at least 80% of students could benefit from AT and 50% were currently using at least one device. Resource teachers felt almost 70% of students should be using AT, with 40% using one or more devices. Speech language pathologists felt nearly 40% of students should be using AT, with 14% currently using a device. In all instances, the majority of the devices used were low tech. With respondents indicating little need for additional access to AT, coupled with a significant portion of students not receiving necessary AT services, substantial concern in meeting the requirements of AT consideration in IDEA are raised.

Ashton and Wahl (2004) determined that hands-on and distance learning opportunities for educators are needed to improve AT knowledge and implementation. Further research needs to be completed after the application of AT training and the inclusion of AT specialists working and teaching within the district. The need for staff training, reviewing eligibility requirements for AT, and AT funding were policy concerns seen at the state level in the Bell and Blackhurst (1996) study that were mirrored in the field by practioners in the Ashton and Wahl (2004) study.

Ashton, Lee, and Vega (2005) conducted a survey to assess perceived knowledge, attitudes, and challenges of AT use by special education teachers in California since the mandate of IDEA'97. The purpose was to determine special educators' attitudes toward AT, how educators' perceived AT knowledge and skills, challenges, and barriers related to AT, and overall satisfaction with teacher preparation college courses. Results indicated more than half of the respondents were comfortable using AT in the classroom. Respondents who had over 40 hours of training felt AT was essential to students' daily routine and felt comfortable in identifying and using AT to ensure educational access. Respondents without AT training felt AT was not important to students' daily activities, and they were not confident in identifying and using AT. There were no statistical differences between the trained and untrained group when observing overall comfort level of using AT in the classroom.

Respondents were more comfortable using academic software rather than AT for sensory or physical disabilities. Over 40% of the respondents indicated they had limited computer access in their classrooms, which is consistent with Ashton and Wahl (2004) results. The majority of the respondents were not aware of community AT resources.

While both groups indicated similar comfort levels with AT, it is important to note the disparity of attitudes toward implementing and choosing AT based on the amount of AT training received.

Ashton et al. (2005) identified many barriers to AT use; the largest was lack of knowledge and learning how to use the devices, which supported the findings of the Ashton and Wahl (2004). Keeping aware of emerging technologies and how to apply those technologies in various settings were other areas of concern. Respondents also indicated lack of resources and materials hindered AT use. The last significant barrier noted was lack of time to learn, setup, and plan for AT use. The barriers identified by Ashton et al. (2005) were local policy recommendations made by Bell and Blackhurst (1996).

Twelve percent of the respondents indicated they learned about AT through in-services, workshops, and training. Only a quarter of the respondents felt teacher preparation programs adequately trained them for implementing AT successfully. Nearly 90% of the respondents felt preparation programs did not adequately emphasize AT use. This finding supports the question about how qualified IEP teams are making informed AT considerations and decisions while staying within compliance of IDEA. Results indicated a need for increased training and support for teachers using AT. The researchers suggested a collaborative training model between school districts and universities using online resources and in-services would better prepare current teachers on the effective use of AT.

Wilcox, Guimond, Campbell, and Weintraub Moore (2006) conducted a study to examine providers' perspectives on issues thought to be influential or important to the

selection and use of AT in early intervention. The purpose of the research was to determine early intervention (EI) providers' perspectives about AT use in early intervention practices, particularly early intervention providers views of AT and the extent of children being served and assessed for AT. The researchers also analyzed specific beliefs and factors that might influence EI provider's decision-making processes about AT, EI provider's perceptions of AT access, and differences in findings regarding the previous statements in terms of specific disciplines, or the amount of AT training with infants and toddlers with disabilities that providers report receiving.

Results indicated that about half of the sample group had some AT training specialized in EI. More respondents were familiar with low tech rather than high tech AT, a finding consistent with Ashton and Wahl (2004). Nearly 45% of the respondents indicated children who needed AT services were not receiving AT interventions, which is also consistent to the Ashton and Wahl (2004) study. Only 18% of the respondents indicated they had received extensive AT training, which is similar to findings by Ashton et al. (2005). Individuals with less training were more likely discouraged by AT availability, funding, and technical support.

Family Knowledge, Perspectives, and Needs

Wilcox, Dugan, Campbell, and Guimond (2006) explored parent and family perspectives of their experiences with AT for their infants and toddlers who were receiving early intervention services and a general exploration of the frequency of AT use during early intervention services for children with disabilities, how AT decisions are made, and the success rate of the AT being used. Results indicated families often take the lead in choosing and paying for AT devices for their children. Professionals played a

limited consulting role in the AT process despite the indication that AT is being used by over 90% of the children prior to turning 2 years of age. Although there was widespread AT use, the overall findings indicated a less than 50% success rate for the AT devices. Results showed the importance of professionals who can collaborate and make appropriate considerations for AT as mandated by law.

Ashton and Wahl (2004), Ashton et al. (2005), Wilcox et al. (2006a) and Wilcox et al. (2006b) illustrated several themes related to knowledge, skills, needs, and AT. Results indicated that professionals considering AT for an IEP or IFSP did not feel confident in making informed decisions due to lack of experience, training, and knowledge, resulting in many students not having AT needs met. Results indicated professionals with a strong AT knowledge base used the technology more and considered it an important consideration for students with disabilities (Ashton & Wahl, 2004; Wilcox, et al., 2006a), while those without training did not place as much importance on the value of AT (Ashton & Wahl, 2004). Professionals in the field have some basic AT knowledge, specifically low-tech items, and technology that directly relates to the individuals they serve. Increased opportunities for device training and implementation (Ashton, et al. 2005; Ashton & Wahl, 2004; Wilcox, Guimond, et al., 2006a), funding, resources, and time (Ashton & Wahl, 2004) were identified as considerable needs. Further, these needs correlate to the recommendations of the local policy study conducted by Bell and Blackhurst (1996) and the professional standards identified in by Lahm's (2003) professional standards analysis.

Current In-Service Training Status and Preference

AT is a constantly evolving and developing field with technological innovations occurring at an exponential pace. As previous studies indicate, the majority of respondents did not feel confident using AT. This may be due to the frequent AT advances, inadequate in-service training for professionals long in the field who may have missed the recent legislative push for AT training at the pre-service level or inadequate pre-service programs. Professionals are finding themselves in situations where they are required to make AT decisions while lacking key information. The following paragraphs are an examination of training interest, content, and delivery preferences deemed important for in-service instruction.

Gitlow and Sanford (2003) conducted a survey to determine the interest, content, and delivery preferences of AT instruction to a variety of allied health professionals in Maine. The authors' purpose was to determine the number of practitioners interested in attending an AT certification course, the characteristics of the practitioners who would like to receive AT training, the level of AT skills and knowledge they would like to obtain, and how practitioners in Maine would like to have AT training provided. Results indicated more than two thirds of the respondents had nonexistent or only foundational knowledge in most areas of AT. More than half of the respondents indicated a moderate to significant need for additional training in AT. Both claims support previous findings of current professional knowledge in the Ashton et al. (2005), Ashton and Wahl (2004), and Wilcox, Guimond, Campbell, and Weintraub Moore (2006) studies. AT funding and specific AT for individuals with visual and auditory needs were highly requested topics for training. Respondents reported most confidence with AT that improved independence

with self-care. Respondents demonstrated more comfort and awareness of AT devices specific to their field of study, which is commensurate with studies from Ashton et al. (2005) and Wilcox et al. (2006).

No clear method of AT training was widely supported by the respondents. Classroom instruction was considered the least attractive way to increase AT knowledge with the majority of the respondents indicating they would not drive more than an hour from home to take AT classes. Increased access to AT equipment and positive word of mouth was recognized as effective incentives for increased participation AT training. The researchers concluded even though all the professionals who responded demonstrated some knowledge of AT, there are significant gaps of knowledge within the area. Training preferences with flexible options are important when considering AT in-service training programs. Improvements to the survey instrument and process were recommended for future studies.

Long and Perry (2008) conducted a survey to determine perceived adequacy of previous AT training, specific training needs, preferred methods of training, and the confidence level of pediatric physical therapists in providing AT. The survey was broken into four components: AT training and information regarding AT, confidence levels in providing AT services, populations of persons with disabilities the respondents serve, and basic demographic information of the respondents. The results indicated pediatric physical therapists had insufficient training in AT and a lack of confidence in delivering AT services, which remains consistent with the previous studies (Ashton, et al. 2005; Ashton & Wahl, 2004; Gitlow & Stanford, 2003; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006). Interest was noted in attending local, affordable training

focused on funding and delivering AT, along with increased knowledge of specific AT devices, assessment, and evaluation methods. The authors concluded there is an increased need for providers of AT services to have pre-service training along with ongoing professional training once in the field. The researchers discussed that, as part of interdisciplinary team responsible for the identification and implementation of AT services, pediatric physical therapists are in critical positions to support and promote AT and AT services. Results may have been limited due to the small response rate.

The results of the Gitlow and Sanford (2003), Long and Perry (2008) and the training component of the Ashton and Wahl (2003) studies revealed several key components for in-service training. Training of devices should focus on each professional's area of need and interest (Ashton & Wahl, 2004). Training should not only focus on using devices for individuals with disabilities, but on how to fund and choose AT and AT services (Long & Perry, 2008). Preferred methods for in-service instruction vary greatly between hands on classroom instruction, lecture, and web based distance learning. Key components of in-service training plans were flexability of instruction, creative incentive programs to promote attendence, and ease of access.

Pre-Service AT Training, Attitudes, and Curriculum

The previously reviewed research suggests professionals in the field are not adequately trained to follow the AT directives of IDEA (Ashton, et al. 2005; Ashton & Wahl, 2004; Gitlow & Stanford, 2003; Long & Perry, 2008; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006). The following studies focused on what training occurs at the pre-service level.

Brady, Long, Richards, and Vallin (2008) conducted a survey to determine the extent AT and AT services were included in the curricula of occupational therapy, physical therapy, speech language pathology, and special education pre-service education programs. The primary research question of the study inquired if the professional preparation programs were meeting the challenge of preparing service providers, such as those in occupational therapy, physical therapy, special education, and speech language pathology to provide competent AT services.

Results indicated all respondents (a) offered AT services in their curriculum, (b) used similarly qualified staff that followed similar teaching method patterns, and (c) were satisfied with the amount of time teaching AT subjects. There was variance for time each university spent teaching AT and the specific AT devices taught. Specific differences were noted when covering the impact of culture and AT and addressing AT during IEP meetings. Most programs considered information on working with children using AT, information on specific AT devices, and working with families as important parts of the academic program. Overall, most respondents indicated satisfaction with the amount of AT training offered to pre-service professionals.

Brady et al. (2008) cautioned that new professionals might have a myopic understanding of AT and AT services due to the narrow focus of their education program. University AT training programs are encouraged to expand the scope and sequence of their AT offerings to better prepare pre-service professionals with a comprehensive set of AT skills. Smith and Kelly (2007) conducted a study to survey universities that have teacher education preparation programs for teaching students with visual impairments and deaf-blindness to determine how assistive technology training is integrated into their

program's curriculum. The survey questions inquired if AT was embedded into existing courses or was taught in a specific course, what content areas are discussed in the courses, and what extent specific assistive technologies are being addressed throughout the program. Results indicated 18 of the 30 universities had specific AT courses. Three of the 18 universities offered generic instruction covering a spectrum of disabilities with 15 of the universities offering AT specific instruction to teachers of individuals with visual impairments. The remaining 12 universities integrated AT instruction into other courses. Half of those universities showed no interest in developing specific AT courses in the future. The researchers indicated the large number of specific courses for AT were indicative of the increased importance of AT instruction in preparation of teacher of students with visual impairments.

All responding universities indicated the competencies they teach focus on general knowledge of AT and services, barriers and benefits of AT, and how AT relates to the IEP process. Results indicated that less focus was placed on knowledge of state and federal policy regarding AT, the ability to conduct assessments to determine AT needs, effectiveness, progress, and the ability to procure funding for AT services. The final section of the survey inquired about specific skill knowledge of AT devices. Responses primarily ranged from fundamental awareness to advanced knowledge in the areas of low tech, Braille, curriculum access, and independent living devices. The Braille devices elicited the highest number of advanced users with the other areas showing even distribution. There was a large amount of scatter between the universities on what they considered important technology to teach, indicating a lack of agreement on the most beneficial AT devices to focus instruction on. The researchers concluded professional

competencies for educators working in the area of visual impairments need to be developed. These competencies should help focus and guide universities to include AT into teacher education programs and reduce the level of disparity between AT topics and intensity of instruction.

In summary, all of these studies indicated pre-service AT training is occurring across professional training programs. The studies showed increased content standards are needed to ensure professionals entering the field will have similar high quality knowledge and background of various AT devices, assessment, methods, and services. An area of concern was the majority of the universities felt AT training was adequate (Brady, et al. 2008). This finding is not supported by the previous studies, indicating a widespread lack of confidence and knowledge of AT (Ashton, et al. 2005; Ashton & Wahl, 2004; Gitlow & Stanford, 2003; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006).

Summary of Findings

The review of the current research identified several findings pertinent to further AT consideration. Practitioners continue to lack the knowledge, skills, and confidence to utilize AT despite the existence of professional AT standards, along with 20 years of federal laws and policies (Bell & Blackhurst, 1996; Lahm, 2003). As a result, multidisciplinary IEP teams are placed in situations where untrained personnel are expected to make AT considerations without having the knowledge to make informed decisions (Ashton, et al. 2005; Ashton & Wahl, 2004; Edyburn, 2008; Gitlow & Sanford, 2003; Long & Perry, 2008; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006). More studies describing what AT encompasses in terms of devices, instruction, support,

and success for students who have been considered for AT during an IEP meeting, are needed to further understand the impact of the IDEA legislation requiring AT consideration. Also unknown are the correlations between AT pre-service training, AT policy, AT resources, AT support, AT staff knowledge, and the effects on AT outcomes for students. The location of AT instruction and use, along with the quality of the AT instruction and use, are also unknown.

Poor response rates and limited geographic areas considerably diminished the strength of the current research findings describing AT knowledge and needs of professionals. An increased number of respondents with significantly improved response rates would offer more validity to the AT knowledge and skill levels of practitioners in the field. Because of research flaws, further studies that use rigorous research methods are needed to expand and verify the existing AT knowledge base of professionals in the field.

Universities express satisfaction with the scope of their AT instruction, but individuals across professions express dissatisfaction with their AT preparation and their ability to make appropriate AT considerations (Ashton et al., 2005). Research is needed to bridge the disconnect between what is taught and what is practiced and to establish a uniform scope and sequence of structure, content, and time for AT instruction at the university level. Increased knowledge of current professional knowledge will further assist in understanding what is currently known, what training is working, and what additional training is needed.

A lack of knowledge is not an acceptable reason for failing to pursue AT (Lahm, 2003). Ashton et al. (2005) demonstrated that consideration and utilization of AT occurs

more when individuals possess appropriate training. School districts need to devote appropriate resources to bolster current AT knowledge among staff. In-service trainings hold promise if the logistics of time, methods, and curriculum are improved (Ashton, et al., 2005; Ashton & Wahl, 2004; Gitlow & Sanford, 2003; Long & Perry, 2008; Wilcox, Guimond, Campbell, & Weintraub Moore, 2006).

The increased prominence of AT in legislation reflects its potential to affect positive results for individuals with disabilities. Improved efforts by professionals, universities, states, and school districts are needed to meet the mandate of IDEA and achieve the goal of increased student achievement and function in school, home, and community. The participating school system has devoted extensive money to special education resources through the SEI. Research is needed to describe the knowledge and needs of professionals within the school system to enhance existing research and to describe AT knowledge of professionals who have received funds for AT devices and trainings.

Chapter 3 Methodology

This study was designed to describe and compare the level of AT knowledge among the European branch of the participating school system special education professionals and related service providers, identify AT training needs, and determine staff perceptions of the availability and effectiveness of AT technical assistance and support. A web based survey instrument was used to collect data for this study. The methodology employed to test the research questions is presented in this chapter.

Research Questions

Based on the review of literature and finding a gap in the body of knowledge of AT within the European branch of the participating school system, the following research questions were designed to guide the construct of the present study.

1. What assistive technology knowledge and skills do the European branch of the participating school system special education teachers and related services personnel report to possess? Do differences in knowledge and skills exist among special educator subgroups and related service personnel?
2. To what degree does the level of knowledge and skills of special education teachers and related services personnel in the European branch of the participating school system report to match AT professional guidelines recommended by the Quality Indicators for Assistive Technology (QIAT)? Do differences in knowledge and skills that match the QIAT standards exist among special educator subgroups and related service personnel?
3. How do the European branch of the participating school system special education teachers and related services personnel perceive the availability and

usefulness of the AT technical assistance and support offered by the school system? Do special educator subgroups and related service personnel have different perceptions regarding the availability and usefulness of AT technical assistance and support?

4. What AT trainings or AT supports do the European branch of the participating school system special education teachers and related service personnel identify as needed, and what trainings or supports in their view have had an impact?

Design of the Study

The study was primarily descriptive, using descriptive and inferential statistical techniques to employed through a self-administered web-based questionnaire. Inferential statistics were used to infer differences among groups thus allowing a more rigorous and complete view of the research questions.

Selection of Participants

Participants were randomly selected from the European branch of the participating school system. As an educational agency, the school system operates 192 fully accredited schools pre-kindergarten through 12th grade in 14 districts located in 12 foreign countries, 7 states, Guam, and Puerto Rico. Approximately 8,700 educators serve more than 84,000 school system students (2008) with 55,000 students enrolled within the European branch and Pacific branch. There are 81 schools, 36,000 students, and 5,200 employees in the European branch with 46 schools, 23,000 students, and 3,096 employees in the Pacific branch. The participating school system follows a curriculum similar to schools found in the states with an average graduation rate of 99% (2008).

Early intervention and related medical services such as physical therapy, occupational therapy, and clinical psychology are provided through EDIS. EDIS acts as a sister agency working in cooperation with the participating school system while receiving oversite and direction from the Surgeons General of the Military Departments and the Secretaries of the Military Departments. Procedural guidance and directives from the participating school system are followed by EDIS (2005).

The target population for this study during the 2009 to 2010 school year, was preschool, elementary, middle, and secondary (grades pre-K-12) special education teachers of students with (a) mild to moderate learning impairments to include Autism, Asperger's, dyscalculia, dysgraphia, and dyslexia (b) moderate to severe learning impairments to include mental disabilities, Autism, Down Syndrome, etc., (c) emotional impairments, (d) visual impairments, and (e) hearing impairments. In addition, the target population included speech language pathologists who serve students with speech and language impairments, occupational therapists, and physical therapists who also served the above mentioned special education students. A total of 296 special education personnel and 35 related service providers were estimated to be identified or work in the Europe branch of the participating school system and Education Developmental Intervention Services (EDIS) labor documents.

A stratified random sample was used to select participants. For the purpose of the study, five distinct strata were created (Tables 1 and 2). Preschool and special education teachers of students with moderate to severe disabilities were assigned a stratum. Special education teachers of students with emotional impairments and special educators of students with mild to moderate disabilities were assigned to a stratum. Speech language

pathologists were assigned a stratum. The fourth stratum consisted of occupational and physical therapists. The final stratum consisted of special educators of students with hearing and vision disabilities. This final stratum was not used for statistical comparison due to the small size of the group (n=7). Twenty individuals were randomly selected from the first four strata. All seven of the individuals in the fifth stratum were included in the sample. This sample of 87 individuals represented 26% of the direct and related special education service providers within the European branch of the participating school system in 7 countries, 3 districts, and 81 schools.

To randomly select the 20 individuals per stratum, each position was numbered and randomly selected without replacement using a table of random numbers to reach 20 individuals. Each position selected was given a unique identifier, which included a district code and teaching position. All special educators of students with hearing and vision disabilities were included for the fifth stratum due to the small total number of educators in this field.

Table 1

School System European Branch Sample of Special Education Teachers

	SE EI	SE MM	SE MSD	PSCD	SE HI	SE VI
District 1	2	26	4.5	7.5	1	0
District 2	1	28	8	7	0	1
District 3	2	24.5	4.5	4.5	1	0
District 4	1	39	8	9	2	1
District 5	1	20.5	4	6	1	0
Total (N=)	7	138	29	34	5	2
Total (N=) Stratums	145		63		7	

Notes. SE M*SD* = Special education teachers of students with moderate to severe disabilities; SE EI = Special education teachers of students with emotional impairments; SE MM = Special education teachers of students with and mild to moderate disabilities; PSCD = Preschool teachers of children with disabilities; SE VI = Special education teachers of students with vision impairments; SE HI = Special education teachers of students with hearing impairments.

Table 2

School System European Branch Sample of Service Providers

	Occupational Therapists	Physical Therapists	Speech Language Pathologists
District 1	4	2	14
District 2	3	2	15.5
District 3	3	2	12
District 4	5	3	16.5
District 5	2	2	11
Total (N=)	17	11	69
Total (N=) Stratum	28		69

Instrumentation

A web-based forced choice survey consisting of several sections was used to obtain the information. The survey was broken into four distinct parts: (1) demographics; (2) questions related knowledge and use of AT computer applications and devices; (3) questions related to satisfaction and effectiveness of AT; and (4) questions related to AT training and supports. Refer to Appendix F for the survey.

The definition used in the survey of low and high tech AT was taken from the participating school system Special Education Procedural Guide (2007). Additional device examples were taken from the recommended software and devices section of the school system European branch resource directory for special educators (Special Education Webmaster, 2009) and a preexisting survey developed by University of Tennessee to evaluate knowledge of AT devices and applications (Puckett, Project

ACCESS, 2003). Items about participant satisfaction and effectiveness of AT were developed in part from the professional guidelines recommended by the Consortium of Quality Indicators for Assistive Technology (QIAT: Quality Indicators for Assistive Technology Services, 2006; Zabala et al., 2000).

The first section used nominal level multiple choice questions to request the following demographic information from the special education and related service personnel surveyed: (a) professional education level; (b) current teaching assignment and district location; (c) populations of students the professional is currently serving; (d) professional AT training received in hours over the last two years; (e) professional AT certifications held; and (f) collaboration methods in the field of AT. A ratio level question was used to request the amount of years working in special education. Two unstructured qualitative type-in-the blank questions were used to survey specific AT trainings or certifications and specific methods of AT collaboration. Skip questioning was used to eliminate the type in the blank questions for certifications and collaboration if, "no" was indicated on the corresponding multiple choice items. The qualitative AT training and collaboration data were reviewed and categorized prior to data analysis.

The second section consisted of multiple choice interval level five point Likert scale questions measuring two variables, AT knowledge, and use. Participants answered 14 questions that listed examples of specific AT computer applications and 21 questions that listed specific examples of AT devices. Composite average scores were computed for (1) knowledge of AT computer applications, (2) knowledge of AT devices, (3) use of AT computer applications, and (4) use of AT devices. Individual scores for each item were added and divided by the total number of items in that section to maintain the

original scale of measurement. High Likert scores, with a composite average of four or higher, indicated promising AT practices in accordance to the QIAT standards occurring within each specific area.

The third section of the survey probed satisfaction and effectiveness of AT while grouping assistive technologies into two distinct low and high tech categories. Participants were asked six interval-level, multiple choice, single variable, five point Likert scale questions. Individual scores were computed to (a) make informed AT decisions, (b) include AT in the IEP, (c) evaluate AT effectiveness, (d) assess AT knowledge of the CSC team, (e) assess ability to use AT in the general education setting, and (f) assess ability to use AT in the special education setting. Participants were asked the same set of six questions, while considering satisfaction of high tech AT. High Likert scores, with an average of four or higher, indicated promising AT practices in accordance to the QIAT standards occurring within each specific area.

The low and high tech responses were then combined to form a new set of dependent variables related to the overall perceptions of the satisfaction and effectiveness of low and high tech AT offered by the European branch of the school system. The combined scores were formed by summing the responses to each respective set of items and dividing by the number of items within each set. High Likert scores, with a composite average of four or higher, indicated promising AT practices in accordance to the QIAT standards occurring within each specific area.

Individual scores of participant satisfaction of AT policy and procedures were measured using four interval-level, multiple choice, five point Likert scale questions that address low and high tech AT. Two nominal level, dichotomous, multiple choice skip

questions followed by a multiple choice five point Likert scale measured if AT technical support has been needed, was the support received, and if so, the overall satisfaction of the support. High Likert scores, with an average of four or higher indicated promising AT practices in the area of AT policy and procedures are occurring.

The fourth and final section of the survey inquired about AT training and support to improve AT use and AT training and supports that are currently working. Improving AT use was measured using two individually scored, nominal level forced choice questions directing participants to select up to three of the most important items from a field of nine. Current satisfaction of existing trainings and support was measured using the same forced choice three item selection for both low and high tech AT.

There were 68 questions within the survey instrument consisting of 11 demographic questions and 57 assistive technology content related questions. There were four skip questions, possibly eliminating one to four questions from the survey instrument. The total range of questions for the survey is 63 to 67. The survey is provided in Appendix F.

The survey was field tested by 10 respondents similar to those chosen to participate in the survey and experts in the field of AT (e.g., university professors, technical assistant program personnel, QIAT listserv. members). The pretesting data were used to identify instrument deficiencies and make improvements to the questions and survey design.

Data Collection Ethics and Procedures

The survey was distributed utilizing electronic mail and web-based technology via Qualtrics Survey Software. Based on the total number of special education teachers,

Speech Language Pathologists, Occupational Therapists, and Physical Therapists in the European branch of the participating school system, 20 individuals per stratum were listed by name and coded so a name could be coded with each survey allowing identification of the survey and their names would be kept separately from the survey coding to protect anonymity. There was no penalty for choosing not to respond. Two weeks after surveys were received and data recorded, names and codes were destroyed. At no time was any information from the survey linked to an individual or specific school. Only trends and patterns in the data were attributed to grade levels, districts, and areas/regions.

A multiple contact strategy was employed to ensure the highest participant response rate. A personalized pre-notice email invitation was sent to all individuals in the sample (Appendix B). The pre-notice addressed the participant by name and provided a brief statement informing of the purpose and importance of the study while notifying of the opportunity to win a prize for participating. Three days after the pre-notice mailing, a personalized email letter of invitation was sent that addressed the participant by name and included a description of the study, consent, and hyperlink to the web survey (Appendix C). The second contact also included a hyperlink to all participants to request a paper copy of the survey if they wished to respond anonymously. A short reminder and thank you e-mail was sent one week after the second contact to thank those who responded and serve as a friendly reminder for those who had not completed the survey. This e-mail included the hyperlink to the web survey and stressed the potential value of the survey (Appendix D). A final personalized e-mail that addressed the participant by name was sent two weeks after the second contact only to

non-respondents. The importance of the study and their participation was stressed again and included one last appeal to complete the web survey (Appendix E). The survey questionnaire was accessed by willing participants through hyperlinks within the e-mail invitations and reminders (Appendix F).

Per the participating school system ethics policy, employees were not eligible for monetary gifts over $50 dollars, but schools were eligible for donations not exceeding $500 dollars. To support the highest possible return rate, individuals who completed the survey request were eligible to participate in two $200 school supply vouchers determined by random drawings for their schools. Winning employees were able to use the school donation to purchase educational items for their specific classroom or program. The drawing for the two monetary prizes was made at the conclusion of the survey collection (Gortiz, 2006).

IRB and the Participating School System

All procedures and requirements established by the University of Maryland Internal Review Board (IRB) were followed and approval granted before initiating school system and EDIS research approval. Once the IRB was approved, school system and EDIS research approval was sought. The research guidelines from the school system's administrative instruction were followed to ensure the study maintained appropriate compliance with school system regulations. All required paperwork, timelines, and ethical considerations were followed as directed. Participants identified remained confidential and will never be linked to the findings of this study.

Data Analysis Procedure

The web based survey with forced choice responses was designed to minimize incomplete or incorrect survey data, thus all submitted surveys were able to be used. Following review of the data computer-based analysis using SPSS 15 for Windows and web based survey software Qualtrics was used to conduct all statistical calculations.

Demographic Information

Descriptive statistics for each of the four groups of service providers were calculated using mean, standard deviation, and range to describe and present the basic features of the data for research questions one, two, three, and four. A Chi square was used to compute statistical differences between service providers and the amount of AT training hours received. Frequency and percentages were calculated for each of the demographic variable items. Summary tables were used to display the results for the individual scores.

Research Question 1: Assistive Technology Knowledge and Skills

Descriptive statistics for each of the four groups of service providers were calculated using mean and standard deviation to describe and present the basic features of the data for research question number one. Group responses to individual level dependent variables were analyzed followed by the creation and analysis of composite scores which combined multiple dependent variables related to AT knowledge and skills into four separate dependent variables: knowledge of AT devices, knowledge of computer applications, skill using AT devices, and skill using AT applications. The composite scores were formed by summing the responses to each respective set of items and dividing by the number of items within each set. Possible scores ranged from 1 to 5,

with higher scores indicating more knowledge or more skill. Cronbach's alpha reliability coefficients were computed to ensure the four composite scores had internal consistency and adequate reliability.

Inferential analysis was conducted to determine if there were differences for the independent variable that consisted of four groups of service providers and the four dependent variables created from the composite scores related to AT knowledge and skills. First, a Pearson r correlation was used to examine a correlation between the composite scores to help determine whether a MANOVA or an ANOVA with a correction factor should be used. If a moderate correlation was present between the composite scores, a MANOVA was used to assess whether the mean differences between professional groups on the four dependent variables created from the composite scores were likely to have occurred by chance. The MANOVA was chosen primarily to protect against Type 1 errors associated with running multiple ANOVAs; specifically the MANOVA was run to protect against an increase in the probability of finding significant results based on chance alone.

Research Question 2: AT Professional Guidelines and Best Practice

Descriptive statistics for each of the four groups of service providers were calculated using mean and standard deviation to describe and present the basic features of the data for research question number two. Group responses to individual level dependent variables for low and high tech AT best practices were analyzed. The low and high tech responses were then combined to form a new set of dependent variables related to the overall perceptions of the satisfaction and effectiveness of low and high tech AT skills offered by the European branch of the school system. The combined scores were

formed by summing the responses to each respective set of items and dividing by the number of items within each set. Possible scores ranged from 1 to 5, with higher scores indicating greater perceptions of AT best practices occurring within the European branch of the school system.

Inferential analysis was conducted to determine if there were differences for the independent variable that consisted of four groups of service providers and the six dependent variables created from the combined low and high teach responses related to AT best practice. The data were assessed to determine whether they met the assumptions for multivariate analysis. First, a Pearson r correlation was used to examine a correlation between the dependent variables to help determine whether a MANOVA or an ANOVA with a correction factor should be used. If significant correlations between dependent variables were identified the highest correlating variables were removed to address multicollinearity and reduce the number of dependent variables to no more than five. If a moderate correlation was present between the dependent variables, a MANOVA was used to assess whether the mean differences between professional groups on the dependent variables were likely to have occurred by chance. The MANOVA was chosen primarily to protect against Type 1 errors associated with running multiple ANOVAs; specifically the MANOVA was run to protect against an increase in the probability of finding significant results based on chance alone.

Research Question 3: Availability and Usefulness of AT Tech Support

Descriptive statistics for each of the four groups of service providers were calculated using frequencies, percentages, mean, and standard deviations to describe and present the basic features of the data for research question number three. Two chi-square

tests were performed comparing the four professional groups in terms of their responses to these two items related to needing and receiving AT assistance.

Inferential analysis were conducted to determine if there were differences for the independent variable that consisted of four groups of service providers and the five dependent variables related to needing and receiving AT assistance. The data were assessed to determine whether they met the assumptions for multivariate analysis. First, a Pearson r correlation was used to examine a correlation between the five dependent variables to help determine whether a MANOVA or an ANOVA with a correction factor should be used. If significant correlations between dependent variables were identified, the highest correlating variables were removed to address multicollinearity. If a moderate correlation was present between the composite scores, a one way MANOVA was used to assess whether the mean differences between professional groups on the dependent variables were likely to have occurred by chance. The MANOVA was chosen primarily to protect against Type 1 errors associated with running multiple ANOVAs; specifically the MANOVA was run to protect against an increase in the probability of finding significant results based on chance alone.

Research Question 4: AT Training Needs and Feedback

Descriptive statistics for each of the four groups of service providers were calculated using frequencies and percentages to describe and present the basic features of the data for research question number four. The descriptive statistics for the fourth research question are separated by low and high tech AT categories and by what AT supports are currently working and what AT supports are needed.

Summary of the Methodology

This study was designed to describe and compare the level of AT knowledge among the European branch of the participating school system special education professionals and related service providers, identify AT training needs, and determine staff perceptions of the availability and effectiveness of AT technical assistance and support. The study was implemented with descriptive and inferential statistical techniques employed through a self-administered web-based questionnaire to provide quantitative descriptions of AT knowledge and needs of four stratified random samples of special educators and related service providers within the European branch of the participating school system.

A multiple contact strategy combined with a monetary reward drawing was employed to ensure the highest participant response rate. Descriptive statistics, central tendency, and measures of variability were used to describe and present the basic features of the data. Inferential statistics were used to analyze whether there are significant differences among provider disciplines in relation to the first three research questions.

Chapter 4 Results

The purposes of this study was to describe and compare the level of AT knowledge among the European branch of the participating school system special education professionals and related service providers, identify AT training needs, and determine staff perceptions of the availability and effectiveness of AT technical assistance and support. Four research questions were posed:

1. What assistive technology knowledge and skills do the European branch of the participating school system special education teachers and related services personnel report to possess? Do differences in knowledge and skills exist among special educator subgroups and related service personnel?
2. To what degree does the level of knowledge and skills of special education teachers and related services personnel in the European branch of the participating school system report to match AT professional guidelines recommended by the Quality Indicators for Assistive Technology (QIAT)? Do differences in knowledge and skills that match the QIAT standards exist among special educator subgroups and related service personnel?
3. How do the European branch of the participating school system special education teachers and related services personnel perceive the availability and usefulness of the AT technical assistance and support offered by the school system? Do special educator subgroups and related service personnel have different perceptions regarding the availability and usefulness of AT technical assistance and support?

4. What AT trainings or AT supports do the European branch of the participating school system special education teachers and related service personnel identify as needed, and what trainings or supports in their view have had an impact?

Sample Description

A total of 42 individuals participated in the study and Table 3 shows the frequency and percentage of participants in each occupational category. The largest group consisted of special education teachers of students with emotional impairments or mild to moderate disabilities (SE EI/MM), followed by occupational and physical therapists (OPT), preschool and special education teachers of students with moderate to severe disabilities (PS/SE MSD), and speech and language pathologists (SLP). The initial plan for the participant grouping included a fifth group: special education teachers of students with vision and hearing impairments However, no special educators were identified as working with students having hearing impairments, and only one was identified as working with students having vision impairments. Therefore, this occupational category was not used in this study.

Table 3

Survey Respondents (N = 42)

	Frequency	Percentage
PS/SE MSD	9	21.4
SE EI/MM	14	33.3
SLP	9	21.4

	Frequency	Percentage
OPT	10	23.8

Notes. PS/SE M*SD* = Preschool and special education teachers of students with moderate to severe disabilities; SE EI/M*M* = Special education teachers of students with emotional impairments and mild to moderate disabilities; SLP = Speech and language pathologists; OPT = Occupational and physical therapists.

Table 4 shows descriptive statistics for the demographic and background characteristics of these participants as a function of group and for the combined sample. Overall, the majority of the participants had a Master's degree (71.4%). Most of the PS/SEMSD (66.7%), SE EI/MM (92.9%), and SLP (100.0%) participants had Master's degree, while only 20.0% of the OPT participants had a Master's degree. Half of the participants taught at the elementary level, including 80.0% of OPTs, 55.6% of SLPs, 35.7% of SE EI/MMs, and 33.3% of PS/SE MSDs.

As shown in Table 4, most of the participants (73.8%) had between 1 and 10 hours of AT training in the past 2 years. Nearly all of the OPT participants had between 1 and 10 hours of training (90.0%), compared to 85.7% of the SE EI/MMs, 66.7% of the SLPs, and 44.4% of the PS/SE MSDs. A chi-square was used to compute statistical differences among service providers in terms of the number of AT training hours received. This result was not statistically significant, $\chi 2(6) = 8.33$, $p > .05$, indicating there were no differences among the four participant groups in terms of the amount of AT training hours received. Table 4 shows the majority of the participants had networked or shared ideas with others in the field of AT, including the majority of all groups except SLPs. Only 16.7% of the professionals indicated having special AT training or

certifications. Table 4 also shows the average number of years in special education, which was 17.74 years (*SD* = 8.79).

Table 4
*Sample Demographic Composition as a Function of Group (*N *= 42)*

	PS/SE MSD (*n* = 9)		SE EI/MM (*n* = 14)		SLP (*n* = 9)		OPT (*n* = 10)		Total Sample (*N* = 42)	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Education										
4-year degree	3	33.3	0	0.0	0	0.0	7	70.0	10	23.8
Master's	6	66.7	13	92.9	9	100.0	2	20.0	30	71.4
Doctoral	0	0.0	1	7.1	0	0.0	1	10.0	2	4.8
Primary grade level										
Elementary	3	33.3	5	35.7	5	55.6	8	80.0	21	50.0
Middle	1	11.1	6	42.9	2	22.2	1	10.0	10	23.8
High	2	22.2	3	21.4	0	0.0	0	0.0	5	11.9
Preschool	3	33.3	0	0.0	2	22.2	1	10.0	6	14.3
Hours of assistive technology training in past 2 years										
0	4	44.4	1	7.1	3	33.3	1	10.0	9	21.4
1-10	4	44.4	12	85.7	6	66.7	9	90.0	31	73.8
30-40	1	11.1	1	7.1	0	0.0	0	0.0	2	4.8
Network or share ideas with others in the field of AT										
Yes	7	77.8	10	71.4	4	44.4	6	60.0	27	64.3
No	2	22.2	4	28.6	5	55.6	4	40.0	15	35.7
Special assistive technology training or certifications										
Yes	1	11.1	3	21.4	2	22.2	1	10.0	7	16.7
No	8	88.9	11	78.6	7	77.8	9	90.0	35	83.3
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*

Years in special education	17.00	5.32	20.07	9.34	20.89	10.84	12.30	6.68	17.74	8.79

Notes. PS/SE M*SD* = Preschool and special education teachers of students with moderate to severe disabilities; SE EI/M*M* = Special education teachers of students with emotional impairments and mild to moderate disabilities; SLP = Speech and language pathologists; OPT = Occupational and physical therapists.

Research Question 1

The first research question consisted of two parts. The first part of the research question was "What AT knowledge and skills do the European branch of the school system special education teachers and related services personnel report to possess?" while the second part was "Do differences in knowledge and skills exist among special educator subgroups and related service personnel?" The analyses related to each of the two parts of this research question are presented in this section.

AT Knowledge and Skills

To assess the AT knowledge and skills in using AT, the means and standard deviations were reviewed. Tables 5 and 6 are a presentation of descriptive statistics for the knowledge and skill areas of AT, respectively. For the knowledge areas in Table 5, items were rated on a scale from 1 = *no knowledge* to 5 = *extensive knowledge.* For the total sample, the highest level of knowledge was reported for pens/pencils with adapted grips (M = 4.17, SD = .82), followed by adapted paper (M = 4.00, SD = 1.04), word processing (M = 4.00, SD = 1.04), and technology to support the mechanics of the writing process (M = 3.76, SD = 1.05). Conversely, the lowest level of knowledge was reported for electronic braille devices (M = 1.50, SD = .92), auditory cuing devices (M = 1.71, SD = .94), high-tech voice output communication devices (M = 2.10, SD = .91),

magnification devices (*M* = 2.14, *SD* = 1.09), and amplification systems (*M* = 2.19, *SD* = 1.15).

Table 5 also shows for PS/SE MSD participants, the means ranged from 1.78 to 4.33 with the highest levels of knowledge reported for pens/pencils with adapted grips, picture exchange communication systems, word processing, and adapted paper. For participants in the SE EI/MM group, the means ranged from 1.57 to 4.07, with the highest levels of knowledge reported for word processing, technology to support the mechanics of the writing process, adapted paper, and pens/pencils with adapted grips. For SLP participants, the means ranged from 1.22 to 4.00 with the highest levels of knowledge reported for pens/pencils with adapted grips, word processing, adapted paper, and picture exchange communication systems. Finally, for the OPT participants, the means ranged from 1.30 to 4.70, with the highest levels of knowledge reported for pens/pencils with adapted grips, adapted paper, adapted seating, desks, or bolsters, and adaptive toys.

Table 5

Assistive Technology Knowledge Possessed by the European Branch of the Participating School System Special Education Teachers and Related Services Personnel (N = 42)

	PS/SE MSD (*n* = 9)		SE EI/MM (*n* = 14)		SLP (*n* = 9)		OPT (*n* = 10)		Total Sample (*N* = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Word Processing (examples: Microsoft Word, Appleworks, etc.)	3.89	.78	4.07	.62	3.78	.67	3.90	.57	3.93	.64
Multimedia programs for student production (examples: KidPix,	3.00	.87	3.36	.63	3.56	.73	3.10	.88	3.26	.77

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
PowerPoint, Keynote, etc.)										
Text to speech word processors (examples: Intellitalk, Write Outloud, Text Help, Read and Write etc.)	2.89	1.05	2.71	.61	2.56	.88	2.60	1.07	2.69	.87
Voice Input Word Processors (examples: Dragon Naturally Speaking, Dragon Dictate, etc.)	2.22	1.30	2.86	.77	2.11	.93	2.70	1.16	2.52	1.04
Using multimedia (pictures and sound) to support language arts and math (examples: Hyperstudio, PowerPoint, Intellipics Studio, SMART Notebook, etc.)	3.00	1.22	3.07	.62	2.89	1.17	2.10	.88	2.79	1.00
General accessibility options available in Windows and Mac (examples: screen magnification, latch keys, variable keyboard response rates, left handed mouse, etc.)	2.00	1.32	2.79	.70	2.67	.71	2.50	1.35	2.52	1.04
Technology to support student writing process in planning and idea generation (outlining and semantic mapping software, multimedia applications, prompting programs, (examples: Draft Builder, Kidspiration and Inspiration)	2.89	1.17	2.79	.70	3.11	.60	2.00	.94	2.69	.92
Technology to support the writing process in transcription and sentence generation (word prediction, alternate keyboard formats, (example: Co-Writer,	2.67	1.32	2.86	.77	2.22	.67	2.60	1.07	2.62	.96

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Classroom Suite)										
Technology to support the mechanics of the writing process (example: spell and grammar checkers, etc.)	3.56	1.33	4.07	.62	3.56	1.13	3.70	1.25	3.76	1.05
Computer technology to support reading: text reading programs (examples: Kurzweil 3000, Text Help, Read Outloud, WYNN, etc.)	2.56	.88	3.50	.52	2.44	.73	2.50	1.08	2.83	.91
Commercial Programs for Reading/Language Arts (examples: Grammar Blaster, Accelerated Reader, Reader Rabbit, Edmark, Let's Go Read!, Jump Start, Bailey's Book House, etc.)	3.44	1.24	3.14	.86	2.33	1.22	2.50	1.35	2.88	1.19
Commercial Programs for Math (examples: Math Pad, Math Blaster, Millie's Math House, etc.)	2.89	1.45	2.93	1.07	2.11	.93	2.20	1.40	2.57	1.23
Commercial Programs for phonological awareness (example: Earobics)	2.11	1.05	2.43	1.28	3.44	.88	1.90	1.20	2.45	1.23
Commercial Cross-Curricular Adaptive Programs (examples: Classroom Suite and Boardmaker 6.0)	3.56	.88	2.79	1.05	3.00	.71	2.90	1.10	3.02	.98
Pens/pencils with adapted grips	4.33	.71	3.79	.97	4.00	.71	4.70	.48	4.17	.82
Adapted paper (examples: raised lines, graph paper, multi-colored lines)	3.78	1.30	3.86	1.10	3.78	.83	4.60	.70	4.00	1.04
Portable word processor(example:	3.22	1.64	3.57	.76	3.56	.73	3.20	1.40	3.40	1.13

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
AlphaSmart 3000, Dana, NEO)										
Alternate keyboard (example: IntelliKey, Discoverboard, TASH)	2.78	1.20	2.50	1.16	2.11	.78	2.80	1.32	2.55	1.13
Talking calculators/adaptive calculators (example: Coinulators, Money calculators, large key calculators)	3.67	1.50	3.43	1.09	2.33	1.00	2.50	1.43	3.02	1.33
Image scanners	3.67	1.22	3.50	.85	3.11	1.36	3.50	1.18	3.45	1.11
Adaptive or electronic books (examples: BookWorm, Leap pads, Leap desks, books on tape/CDmp3)	3.56	.88	3.50	.76	2.67	.50	3.10	1.29	3.24	.93
Note taking devices (example: digital audio recorders)	2.33	1.66	3.07	1.14	2.67	.87	3.70	1.16	2.98	1.28
Auditory Cuing Devices (examples: Time Pad, Digipad)	1.89	1.27	1.79	1.05	1.56	.53	1.60	.84	1.71	.94
Presentation Devices (examples: SMARTboard, Infocus)	3.11	1.17	3.07	.47	3.00	.71	2.50	1.35	2.93	.95
Switches (examples: Big Red, Jelly Bean switches)	3.33	.71	2.43	1.28	2.22	1.20	3.60	1.07	2.86	1.22
Adaptive toys	3.00	.71	2.36	1.34	2.67	.71	4.00	.67	2.95	1.13
Alternate computer access (example: Touch Windows, track balls, mini key board, etc.)	3.00	1.22	2.36	1.01	2.44	.88	3.00	1.49	2.67	1.16
Picture Exchange Communication Systems	4.11	.93	2.64	1.28	3.78	.83	3.50	.85	3.40	1.15
Single and multiple message communication devices (example BIGmack, LITTLEmack, Super Talker Communicator)	3.00	.71	2.14	1.35	1.89	.93	2.70	1.49	2.40	1.23

	PS/SE MSD (*n* = 9)		SE EI/MM (*n* = 14)		SLP (*n* = 9)		OPT (*n* = 10)		Total Sample (*N* = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Mid-tech voice output communication devices (examples: GoTalk 4 and 9)	3.00	.71	2.00	1.18	2.44	1.42	2.30	1.34	2.38	1.21
High-tech voice output communication devices (examples: Macaw, ChatPC, Dynavox)	2.11	1.05	1.79	.89	2.44	.73	2.20	.92	2.10	.91
Amplification systems (examples: Radium Sound field, Light speed)	2.11	1.05	2.21	1.12	2.56	1.59	1.90	.88	2.19	1.15
Magnification devices (examples: CCTV, computer magnification)	1.78	1.09	2.29	1.14	1.67	1.00	2.70	.95	2.14	1.09
Electronic braille devices (examples: Braille Talk, Electric Perkins Brailler)	1.89	1.36	1.57	.94	1.22	.44	1.30	.67	1.50	.92
Adapted seating, desks, or bolsters	3.11	.78	2.93	1.33	3.00	.71	4.60	.52	3.38	1.15

Notes. PS/SE M*SD* = Preschool and special education teachers of students with moderate to severe disabilities; SE EI/M*M* = Special education teachers of students with emotional impairments and mild to moderate disabilities; SLP = Speech and language pathologists; OPT = Occupational and physical therapists. Knowledge items were rated on a scale from 1 = *no knowledge* to 5 = *extensive knowledge*, and therefore higher means indicate more knowledge.

Table 6 shows descriptive statistics for the participants' level of skill with implementing each of the 35 assistive technologies, rated on a scale from 1 = *unable to use* to 5 = *can implement all features proficiently*. The areas of AT for which the participants felt most skilled were pens/pencils with adapted grips, word processing, adapted paper, and technology to support the mechanics of the writing process. The areas in which the participants felt least skilled were high-tech voice output communication

devices, amplification systems, magnification devices, auditory cuing devices, and electronic braille devices. The means for the total sample ranged from 1.64 to 4.55.

Participants in the PS/SE MSD group reported having the highest skill levels in pens/pencils with adapted grips, picture exchange communication systems, word processing, and talking calculators/adaptive calculators. For participants in the SE EI/MM group, the areas with the highest skill levels were word processing, pens/pencils with adapted grips, adapted paper, and technology to support the mechanics of the writing process. For SLP participants, the highest skill levels were reported for pens/pencils with adapted grips, adapted paper, word processing, multimedia programs for student production, commercial programs for phonological awareness, and technology to support the mechanics of the writing process. The OPT participants had the highest skill levels in the areas of pens/pencils with adapted grips, adapted paper, adapted seating, desks, or bolsters, word processing, technology to support the mechanics of the writing process, and adaptive toys.

Table 6

Assistive Technology Skills Possessed by the European Branch of the Participating School System Special Education Teachers and Related Services Personnel (N = 42)

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Word Processing (examples: Microsoft Word, Appleworks, etc.)	4.44	.53	4.43	.51	4.22	.44	4.40	.52	4.38	.49
Multimedia programs for student production (examples: KidPix,	3.56	1.24	3.93	.47	4.22	.44	3.80	.79	3.88	.77

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
PowerPoint, Keynote, etc.)										
Text to speech word processors (examples: Intellitalk, Write Outloud, Text Help, Read and Write etc.)	3.44	1.13	3.50	.65	2.89	1.27	2.90	1.37	3.21	1.09
Voice Input Word Processors (examples: Dragon Naturally Speaking, Dragon Dictate, etc.)	2.44	1.33	2.86	1.10	2.22	1.20	2.90	1.37	2.64	1.23
Using multimedia (pictures and sound) to support language arts and math (examples: Hyperstudio, PowerPoint, Intellipics Studio, SMART Notebook, etc.)	3.22	1.30	3.14	.86	3.11	1.05	2.60	1.26	3.02	1.09
General accessibility options available in Windows and Mac (examples: screen magnification, latch keys, variable keyboard response rates, left handed mouse, etc.)	2.11	1.36	3.00	.88	2.89	.93	2.80	1.32	2.74	1.13
Technology to support student writing process in planning and idea generation (outlining and semantic mapping software, multimedia applications, prompting programs, (examples: Draft Builder, Kidspiration and Inspiration)	3.00	1.32	3.00	.88	3.44	.73	2.30	1.16	2.93	1.07

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Technology to support the writing process in transcription and sentence generation (word prediction, alternate keyboard formats, (example: Co-Writer, Classroom Suite)	2.89	1.45	3.57	.65	2.33	.87	3.10	1.20	3.05	1.10
Technology to support the mechanics of the writing process (example: spell and grammar checkers, etc.)	3.67	1.58	4.36	.50	4.00	1.22	4.30	1.25	4.12	1.13
Computer technology to support reading: text reading programs (examples: Kurzweil 3000, Text Help, Read Outloud, WYNN, etc.)	2.89	1.27	3.93	.27	2.56	1.01	2.60	1.17	3.10	1.10
Commercial Programs for Reading/Language Arts (examples: Grammar Blaster, Accelerated Reader, Reader Rabbit, Edmark, Let's Go Read!, Jump Start, Bailey's Book House, etc.)	3.78	.83	3.86	.66	2.67	1.50	2.80	1.40	3.33	1.20
Commercial Programs for Math (examples: Math Pad, Math Blaster, Millie's Math House, etc.)	3.22	1.30	3.64	.84	2.56	1.42	2.40	1.51	3.02	1.32
Commercial Programs for phonological awareness (example: Earobics)	2.44	1.13	3.00	1.30	4.11	.60	1.90	1.20	2.86	1.34
Commercial Cross-Curricular Adaptive Programs (examples:	3.78	.83	3.29	1.20	3.56	.73	3.40	1.35	3.48	1.06

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Classroom Suite and Boardmaker 6.0)										
Pens/pencils with adapted grips	4.56	.53	4.36	.50	4.56	.73	4.80	.42	4.55	.55
Adapted paper (examples: raised lines, graph paper, multi-colored lines)	3.89	1.45	4.36	.50	4.33	1.00	4.70	.48	4.33	.90
Portable word processor(example: AlphaSmart 3000, Dana, NEO)	3.33	1.66	3.93	.73	3.78	.83	3.10	1.66	3.57	1.25
Alternate keyboard (example: IntelliKey, Discoverboard, TASH)	3.00	1.12	2.86	1.03	2.33	1.00	2.60	1.35	2.71	1.11
Talking calculators/adaptive calculators (example: Coinulators, Money calculators, large key calculators)	4.11	1.36	3.79	.89	3.00	1.12	2.70	1.34	3.43	1.25
Image scanners	3.78	1.20	3.86	.66	3.11	1.45	3.60	1.26	3.62	1.13
Adaptive or electronic books (examples: BookWorm, Leap pads, Leap desks, books on tape/CDmp3)	3.89	.78	3.64	.84	3.33	.71	3.20	1.23	3.52	.92
Note taking devices (example: digital audio recorders)	2.56	1.67	3.29	1.07	3.00	1.12	3.70	1.25	3.17	1.29
Auditory Cuing Devices (examples: Time Pad, Digipad)	2.22	1.48	2.21	1.05	2.00	.87	1.90	1.20	2.10	1.12
Presentation Devices (examples: SMARTboard, Infocus)	3.00	1.32	3.57	.94	3.33	.87	2.40	1.51	3.12	1.21
Switches (examples: Big Red, Jelly Bean switches)	3.78	.44	2.79	1.31	2.89	1.17	3.80	1.03	3.26	1.15

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Adaptive toys	3.67	.71	3.00	1.24	3.33	1.00	4.20	.42	3.50	1.02
Alternate computer access (example: Touch Windows, track balls, mini key board, etc.)	3.22	1.30	2.57	1.02	3.11	1.05	3.10	1.52	2.95	1.21
Picture Exchange Communication Systems	4.56	.53	2.79	1.37	3.67	1.00	3.60	1.07	3.55	1.23
Single and multiple message communication devices (example BIGmack, LITTLEmack, Super Talker Communicator)	3.56	.88	2.43	1.28	2.33	1.22	2.70	1.49	2.71	1.29
Mid-tech voice output communication devices (examples: GoTalk 4 and 9)	3.44	.88	2.29	1.33	2.67	1.41	2.40	1.35	2.64	1.30
High-tech voice output communication devices (examples: Macaw, ChatPC, Dynavox)	2.22	1.09	1.86	.95	3.00	1.12	2.10	.88	2.24	1.05
Amplification systems (examples: Radium Sound field, Light speed)	2.22	1.20	2.29	1.20	2.67	1.66	1.60	.70	2.19	1.23
Magnification devices (examples: CCTV, computer magnification)	2.11	1.27	2.21	.89	1.89	1.05	2.50	1.35	2.19	1.11
Electronic braille devices (examples: Braille Talk, Electric Perkins Brailler)	2.22	1.39	1.64	.93	1.33	.71	1.40	.70	1.64	.98
Adapted seating, desks, or bolsters	3.56	.88	3.14	1.35	3.44	.53	4.70	.48	3.67	1.10

Notes. PS/SE M*SD* = Preschool and special education teachers of students with moderate to severe disabilities; SE EI/M*M* = Special education teachers of students with emotional impairments and mild to moderate disabilities; SLP = Speech and language pathologists; OPT = Occupational and physical therapists. Skill items were rated on a scale from 1 = *unable to use* to 5 = *can implement all features proficiently*, and therefore higher means indicate more skill.

Special Educator Subgroups and Related Service Personnel

Table 7 shows descriptive statistics for the four composite scales: Knowledge of AT Devices (from Table 5), Knowledge of Computer Applications (from Table 5), Skill in Using AT Devices (from Table 6), and Skill in Using Computer Applications (from Table 6). Scores on the Knowledge of AT Devices scale ranged from 1.67 to 4.43 with a mean of 2.83 (*SD* = .71). For the Knowledge of Computer Applications Scale, scores ranged from 1.64 to 4.57 with a mean of 2.90 (*SD* = .67). Scores on the Skill in Using AT Devices scale ranged from 1.76 to 4.43 with a mean of 3.08 (*SD* = .67). Finally, scores on the Skill in Using Computer Applications scale ranged from 1.57 to 4.57 with a mean of 3.27 (*SD* = .67). Cronbach's alpha (internal consistency) reliability coefficients were computed for the four scale and ranged from .87 to .93, indicating the four composite scores had adequate reliability.

Table 7

Descriptive Statistics for Composite Scores for Knowledge and Skill with Assistive Technology (N = 42)

Variable	# of items	Min.	Max.	Mean	SD	α
Knowledge of assistive technology devices	21	1.67	4.43	2.83	.71	.93
Knowledge of computer applications	14	1.64	4.57	2.90	.67	.90
Skill in using assistive technology devices	21	1.76	4.43	3.08	.67	.91

Variable	# of items	Min.	Max.	Mean	SD	α
Skill in using computer applications	14	1.57	4.57	3.27	.67	.87

Note. Knowledge and skill composite scores were created so that higher scores indicate more knowledge or skill.

Table 8 shows the mean score on each of the four composite scales: Knowledge of AT Devices (from Table 5), Knowledge of Computer Applications (from Table 5), Skill in Using AT Devices (from Table 6), and Skill in Using Computer Applications (from Table 6) as a function of group. Participants of the OPT group reported the greatest knowledge of AT devices with a mean of 3.05 (*SD* = *.72)*. Participants of the SE EI/MM group reported the greatest knowledge of AT applications with a mean of 3.10 (*SD* = .43). Participants of the PS/SE MSD group reported the greatest skill in using AT devices with a mean of 3.28 (*SD* = .79). Participants of the SE EI/MM group reported the greatest skills using AT applications with a mean of 3.54 (*SD* = .35).

Table 8

Descriptive Statistics for Composite Scores for Knowledge and Skill with Assistive Technology as a Function of Group (N = 42)

	PS/SE MSD (*n* = 9)		SE EI/MM (*n* = 14)		SLP (*n* = 9)		OPT (*n* = 10)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*

Knowledge of assistive technology devices	2.99	.81	2.70	.80	2.62	.43	3.05	.72
Knowledge of computer applications	2.90	.92	3.10	.43	2.84	.44	2.66	.84
Skill in using assistive technology devices	3.28	.79	2.99	.64	3.01	.51	3.09	.80
Skill in using computer applications	3.21	.82	3.54	.35	3.20	.56	3.01	.90

Notes. PS/SE M*SD* = Preschool and special education teachers of students with moderate to severe disabilities; SE EI/M*M* = Special education teachers of students with emotional impairments and mild to moderate disabilities; SL*P* = Speech and language pathologists; OPT = Occupational and physical therapists. Higher means indicate more knowledge or skill.

In order to determine the most appropriate statistical technique to analyze the data (multiple ANOVAs with a correction factor or a MANOVA), Pearson Correlations were run. The correlations between the four composite scores for the total sample are shown in Table 9. Adequate correlations were identified and a MANOVA was chosen for the analysis. Scores on all four scales were positively correlated with each other (all *p*s < .001), indicating participants with high scores on one scale also tended to have high scores on the other scales, and vice versa. The highest correlations were between the Knowledge of AT Devices scale and the Skill in Using AT Devices scales (r = .90), and between the Knowledge of Computer Applications scale and the Skill in Using Computer Applications scale (r = .90). Based on the high correlations which produce multicollinearity concerns and the fact that skills cannot exist without knowledge, only the two skills variables were chosen to be used for this research question. Thus, it was determined that the MANOVA be used to assess whether the mean differences between

professional groups on the two dependent variables: skill in using assistive technology devices and skill in using computer applications are likely to have occurred by chance.

Table 9

Correlations Among Composite Scores for Knowledge and Skill with Assistive Technology (N = 42)

	Knowledge of assistive technology devices	Knowledge of computer applications	Skill in using assistive technology devices	Skill in using computer applications
Knowledge of assistive technology devices	1.00			
Knowledge of computer applications	.70*	1.00		
Skill in using assistive technology devices	.90*	.69*	1.00	
Skill in using computer applications	.57*	.90*	.65*	1.00

*$p < .001$.

A one way MANOVA was calculated using one independent variable that consisted of the four groups and the two dependent variables consisting of the composite skills measures. Results of the MANOVA were not statistically significant, $F(6, 74) = 1.95$, $p > .05$. Based on this result, the answer to the first research question of this study

was there were no differences in skills among special educator subgroups and related service personnel.

Research Question 2

The second research question also consisted of two parts: "To what degree does the level of knowledge and skills of special education teachers and related services personnel in the European Branch of the Participating School System match AT professional guidelines recommended by the Quality Indicators for AT (QIAT)?," and "Do reported differences in knowledge and skills that match the QIAT standards exist among special educator subgroups and related service personnel?" Results for these two parts are presented in this section.

Knowledge and Skills of Special Education Teachers and Related Services Personnel

Data related to knowledge and skill in applying AT best practices within the educational setting were examined to address this question. Table 10 contains six aspects of low-technology and high-technology knowledge and skill items. To examine the second research question, the responses from the low-technology and high-technology sections of the survey were combined into composite scores, with descriptive statistics for the new variables shown in Table 11. The means for all six items were less than the nominal value of 4: for the item "With your ability to make informed AT suggestions for students with disabilities" (M = 3.57, SD = .63); for the item "With your ability to include AT services within the IEP" (M = 3.43, SD = .68); for the item "With your ability to evaluate the effectiveness of AT services for a student with disabilities" (M = 3.45, SD = .74); for the item "With the AT knowledge of the CSC team" (M = 3.13, SD

= .86) for the item; for the item "With your ability to use AT in the general education setting" (*M* = 3.14, *SD* = .81); and for item "With your ability to use AT in the special education setting" (*M* = 3.56, *SD* = .66).

Table 10

Perceptions of the Availability and Usefulness of Assistive Technology Technical Skills Offered by the European Branch of the Participating School System (N = 42)

	PS/SE MSD (*n* = 9)		SE EI/MM (*n* = 14)		SLP (*n* = 9)		OPT (*n* = 10)		Total Sample (*N* = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Low Tech Knowledge and Skill										
With your ability to make informed AT suggestions for students with disabilities?	3.89	.33	3.79	.43	4.11	.60	3.90	.99	3.90	.62
With your ability to include AT services within the IEP?	3.67	.71	3.79	.58	3.78	.44	3.50	.97	3.69	.68
With your ability to evaluate the effectiveness of AT services for a student with disabilities?	3.78	.67	3.64	.74	3.89	.60	3.80	.92	3.76	.73
With the AT knowledge of the CSC team?	3.33	.87	3.57	1.02	3.33	.87	3.20	.79	3.38	.88
With your ability to use AT in the general education setting?	3.11	.93	3.71	.61	3.44	.73	3.10	.99	3.38	.82
With your ability to use AT in the special education setting?	4.00	.00	4.00	.55	3.67	.87	3.60	.84	3.83	.66
High Tech Knowledge and Skill										
With your ability to make informed AT suggestions for students with disabilities?	3.00	.71	3.50	.85	3.22	.67	3.10	1.10	3.24	.85
With your ability to include AT services within the IEP?	3.00	1.00	3.50	.85	3.00	.50	3.00	.94	3.17	.85
With your ability to evaluate the effectiveness of AT services for a student with disabilities?	2.89	.78	3.57	.85	2.89	.60	3.10	1.45	3.17	.99

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
With the AT knowledge of the CSC team?	2.89	.93	2.93	1.21	3.00	1.00	2.70	.82	2.88	.99
With your ability to use AT in the general education setting?	2.67	.87	3.14	1.03	3.11	.60	2.60	.97	2.90	.91
With your ability to use AT in the special education setting?	3.44	.53	3.64	.93	3.00	.71	2.90	1.10	3.29	.89

Notes. PS/SE M*SD* = Preschool and special education teachers of students with moderate to severe disabilities; SE EI/M*M* = Special education teachers of students with emotional impairments and mild to moderate disabilities; SLP = Speech and language pathologists; OPT = Occupational and physical therapists. Satisfaction items were scored from 1 = *very dissatisfied* to 5 = *very satisfied*, and higher means indicate higher levels of satisfaction. Effectiveness items were scored from 1 = *very ineffective* to 5 = *very effective*, and higher means indicate higher perceptions of effectiveness.

Table 11

Overall Perceptions of the Availability and Usefulness of Assistive Technology Technical Skills Offered by the European Branch of the Participating School System as a Function of Group (N = 42)

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
With your ability to make informed AT suggestions for students with disabilities?	3.44	.39	3.64	.53	3.67	.56	3.50	.97	3.57	.63
With your ability to include AT services within the IEP?	3.33	.75	3.64	.63	3.39	.33	3.25	.89	3.43	.68

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
With your ability to evaluate the effectiveness of AT services for a student with disabilities?	3.33	.61	3.61	.71	3.39	.42	3.45	1.12	3.46	.74
With the AT knowledge of the CSC team?	3.11	.86	3.25	.98	3.17	.90	2.95	.72	3.13	.86
With your ability to use AT in the general education setting?	2.89	.82	3.43	.78	3.28	.57	2.85	.94	3.14	.81
With your ability to use AT in the special education setting?	3.72	.26	3.82	.54	3.33	.71	3.25	.86	3.56	.66

Notes. PS/SE M*SD* = Preschool and special education teachers of students with moderate to severe disabilities; SE EI/M*M* = Special education teachers of students with emotional impairments and mild to moderate disabilities; SLP = Speech and language pathologists; OPT = Occupational and physical therapists. Satisfaction items were scored from 1 = *very dissatisfied* to 5 = *very satisfied*, and higher means indicate higher levels of satisfaction. Effectiveness items were scored from 1 = *very ineffective* to 5 = *very effective*, and higher means indicate higher perceptions of effectiveness. Responses for low-technology and high-technology areas of the survey were combined for this table.

Differences in Knowledge and Skills

In order to determine the most appropriate statistical technique to analyze the data (multiple ANOVAs with a correction factor or a MANOVA), Pearson Correlations were run. Results are shown in Table 12. Adequate correlations were identified and a MANOVA was chosen for the analysis. Multicollinearity concerns were identified with the high correlations involved with Item 3, ability to evaluate the effectiveness of AT services for a student with disabilities. Due to the fact that this item correlated most strongly with the other variables, and is a very general question, it was excluded from the statistics performed to address this research question. Thus, it was determined that the

MANOVA be used to assess whether the mean differences between the four professional groups on the combination of dependent variables consisting of the ability to make informed AT suggestions for students with disabilities, the ability to include AT services within the IEP, the AT knowledge of the CSC team, the ability to use AT in the general education setting, and the ability to use AT in the special education setting are likely to have occurred by chance.

A one way MANOVA was calculated using one independent variable that consisted of the four groups and the remaining five dependent variables consisting of the ability to make informed AT suggestions for students with disabilities, the ability to include AT services within the IEP, AT knowledge of the CSC team, the ability to use AT in the general education setting, and the ability to use AT in the special education setting. Results of the MANOVA were not statistically significant, $F(15, 94.26) = 1.01$, $p > .05$. This indicated there were no differences between the groups in terms of the knowledge and skills in using AT, and consequently the answer to the second research question was there were no differences in knowledge and skills that match the QIAT standards between special educator subgroups and related service personnel.

Table 12

Correlations among Overall Perceptions of the Availability and Usefulness of Assistive Technology Technical Assistance Offered by the European Branch of the Participating School System (N = 42)

	1.	2.	3.	4.	5.	6.

	1.	2.	3.	4.	5.	6.
1. With your ability to make informed AT suggestions for students with disabilities?	1.00					
2. With your ability to include AT services within the IEP?	.68***	1.00				
3. With your ability to evaluate the effectiveness of AT services for a student with disabilities?	.77***	.79***	1.00			
4. With the AT knowledge of the CSC team?	.56***	.38**	.30*	1.00		
5. With your ability to use AT in the general education setting?	.60***	.57***	.61***	.62***	1.00	
6. With your ability to use AT in the special education setting?	.61***	.61***	.64***	.44**	.56***	1.00

*$p < .05$, **$p < .01$, ***$p < .001$.

Research Question 3

The third research question also consisted of two parts: "How do the European Branch of the Participating School System special education teachers and related services personnel perceive the availability and usefulness of the AT technical assistance and support offered," and "Do special educator subgroups and related service personnel have different perceptions regarding the availability and usefulness of AT technical assistance and support offered by the European Branch of the Participating School System?" Data and results for these two questions are presented in this section.

Availability and Usefulness of the AT Technical Assistance

Table 13 shows descriptive statistics for the two survey items about the use and satisfaction with technical assistance provided by the European Branch of the Participating School System. Overall, 59.5% (n = 25) of the participants had needed assistance from the district regarding AT. Of those who needed assistance, 80.0% (n = 20) reported being able to get the assistance they needed. Table 13 also shows descriptive statistics for these items as a function of group. Two chi-square tests were performed comparing the four groups in terms of their responses to these two items. The test, comparing the likelihood of needing assistance from the district regarding AT, was not statistically significant, $\chi^2(3) = 2.66$, $p > .05$, indicating that the four occupational groups did not differ in terms of the likelihood of needing AT assistance from the district. The test comparing whether the participants were able to get the help that they needed was also not statistically significant, $\chi^2(3) = .10$, $p > .05$, indicating that the four occupational groups did not differ in terms of whether they were able to get the help they needed.

Table 13

Use of Assistive Technology Technical Assistance Offered by the European Branch of the Participating School System (N = 42)

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	n	%	*n*	%	*N*	%	*n*	%	*N*	%
Within the last two years have you needed assistance from										

	PS/SE MSD (n = 9)		SE EI/MM (n = 14)		SLP (n = 9)		OPT (n = 10)		Total Sample (N = 42)	
	n	%	n	%	N	%	n	%	N	%
the district regarding AT?										
Yes	6	66.7	10	71.4	5	55.6	4	40.0	25	59.5
No	3	33.3	4	28.6	4	44.4	6	60.0	17	40.5
Where you able to get the AT assistance you needed from the district?										
Yes	5	83.3	8	80.0	4	80.0	3	75.0	20	80.0
No	1	16.7	2	20.0	1	20.0	1	25.0	5	20.0

Note. Only those participants who have needed assistance were included in the analysis of whether or not they were able to get the assistance they needed.

Different Perceptions

Table 14 shows descriptive statistics for responses to five items related to satisfaction with the availability and usefulness of AT technical assistance offered by the European Branch of the Participating School System. Overall, the participants were most satisfied with the effectiveness of district policy and support for low-technology AT (M = 3.40, SD = .83), and least satisfied with the effectiveness of the school system procedural guidance for high-tech AT. The overall ratings of effectiveness for those who sought assistance were relatively high (M = 4.00, SD = .79), corresponding to the *satisfied* scale point.

Table 14

Satisfaction with the Availability and Usefulness of Assistive Technology Technical Assistance Offered by the European Branch of the Participating School System (N = 42)

	PS/SE MSD (*n* = 9)		SE EI/MM (*n* = 14)		SLP (*n* = 9)		OPT (*n* = 10)		Total Sample (*N* = 42)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Effectiveness of district policy and support for AT? (Low tech)	3.33	.71	3.43	1.02	3.33	.71	3.50	.85	3.40	.83
Effectiveness of school system Procedural Guidance for AT? (Low tech)	3.44	.53	3.07	.92	2.89	.93	3.30	.67	3.17	.79
Effectiveness of district policy and support for AT? (High tech)	3.22	.83	3.07	1.14	2.67	1.00	3.20	.63	3.05	.94
Effectiveness of school system Procedural Guidance for AT? (High tech)	3.33	.71	2.71	1.07	2.78	.97	3.30	.67	3.00	.91
Overall Effectiveness of AT Assistance	3.80	.45	4.38	.92	3.75	.96	3.67	.58	4.00	.79

Notes. PS/SE M*SD* = Preschool and special education teachers of students with moderate to severe disabilities; SE EI/M*M* = Special education teachers of students with emotional impairments and mild to moderate disabilities; SLP = Speech and language pathologists; OPT = Occupational and physical therapists. Effectiveness items were scored from 1 = *very ineffective* to 5 = *very effective*, and higher means indicate higher perceptions of effectiveness.

In order to determine the most appropriate statistical technique to analyze the data (multiple ANOVAs with a correction factor or a MANOVA), Pearson Correlations were run. The correlations among these five items are shown in Table 15. Adequate correlations were identified and a MANOVA was chosen for the analysis. High correlations involving the first two items, both of which relate to low-technology AT

devices were identified indicating the existence of multicollinearity. Therefore, the first two items were excluded from the statistics performed to address this research question. Thus, it was determined that the MANOVA be used to assess whether the mean differences between the four professional groups on the combination of dependent variables consisting of the effectiveness of the district support for AT (high tech), effectiveness of school system procedural guidance for AT (high tech), and overall satisfaction with AT assistance are likely to have occurred by chance.

Table 15

Correlations among Satisfaction with the Availability and Usefulness of Assistive Technology Technical Assistance Offered by the European Branch of the Participating School System Items (N = 42)

	1.	2.	3.	4.	5.
Effectiveness of district policy and support for AT? (Low tech)	1.00				
Effectiveness of school system Procedural Guidance for AT? (Low tech)	.75***	1.00			
Effectiveness of district policy and support for AT? (High tech)	.79***	.71***	1.00		
Effectiveness of school system Procedural Guidance for AT? (High tech)	.68***	.88***	.80***	1.00	
Overall, how satisfied were you with the AT assistance you received?	.42	.39	.67**	.48*	1.00

**p < .05, **p < .01, ***p* < .001.

A one way MANOVA was calculated using one independent variable that consisted of the four occupation groups and the remaining three dependent variables consisting of the effectiveness of the district policy and support for AT (high tech), effectiveness of school system procedural guidance for AT (high tech), and overall satisfaction with AT assistance. The results from the MANOVA were not statistically significant, $F(9, 34.22) = .81$, $p > .05$. This indicated there were no differences between the four groups, and therefore the answer to the third research question of this study was special educator subgroups and related service personnel do not have different perceptions regarding the availability and usefulness of AT technical assistance and support offered by the European Branch of the Participating School System.

Research Question 4

The fourth and final research question of this study was: What AT trainings or AT supports do the European Branch of the Participating School System special education teachers and related service personnel identify as needed, and what trainings or supports in their view has had an impact? Table 16 shows the number (and percentage) of respondents who felt that each of eight possible European Branch of the Participating School System E training topics are currently working to improve the use of AT. Participants were also given the option of indicting no trainings are working. Among the low-technology training areas, the most commonly endorsed as currently useful were increased lending library inventory items (42.9%), staff training to use AT devices (14.3%), and staff training on how to implement AT in the general education setting (11.9%). For the high-technology training areas, the same pattern emerged, with 42.9% of the participants indicating that increased lending library inventory for high-tech

devices were currently working, as well as staff training to use AT devices (16.7%), and staff training on how to implement AT in the general education setting (16.7%). Nearly a third of the respondents indicated nothing was currently working to improve high (33.3%) or low tech AT use (35.7%).

Table 16

Important Options Currently Working to Improve the Use of Assistive Technology in the European Branch of the Participating School System (N = 42)

	N	%
Low-Technology		
Staff training to use AT devices	6	14.3
Staff training on how to conduct AT assessments	2	4.8
Staff training on how to appropriately consider and include AT within the IEP	4	9.5
Staff training on how to implement AT in the general education setting	5	11.9
Staff training on how to implement AT in the special education setting	3	7.1
Staff training on how to measure the success of AT implementation	0	0.0
Staff training to troubleshoot or initiate repairs of broken or malfunctioning equipment	0	0.0
Increased lending library inventory of low tech devices	18	42.9
Nothing is working	15	35.7
High-Technology		
Staff training to use AT devices	7	16.7
Staff training on how to conduct AT assessments	2	4.8
Staff training on how to appropriately consider and include AT within the IEP	4	9.5
Staff training on how to implement AT in the general education setting	7	16.7
Staff training on how to implement AT in the special education setting	5	11.9
Staff training on how to measure the success of AT implementation	1	2.4
Staff training to troubleshoot or initiate repairs of broken or malfunctioning equipment	0	0.0
Increased lending library inventory of high tech devices	18	42.9
Nothing is working	14	33.3

Table 17 shows recommendations for areas of training in need of improvement. Among the low-technology areas, staff training on how to implement AT in the general education setting (57.1%), staff training on how to appropriately consider and include AT within the IEP (45.2%), staff training on how to conduct AT assessments (45.2%), and staff training to use AT devices (40.5%) were the area's most frequently endorsed in terms of needed improvements. Among the high-technology areas, staff training to use AT devices (61.9%), staff training on how to implement AT in the general education setting (52.4%), and staff training on how to conduct AT assessments (38.1%) were endorsed most frequently.

Table 17

Important Options for Future Improvements in the Use of Assistive Technology in the European Branch of the Participating School System (N = 42)

	N	%
Low-Technology		
Staff training to use AT devices	17	40.5
Staff training on how to conduct AT assessments	19	45.2
Staff training on how to appropriately consider and include AT within the IEP	19	45.2
Staff training on how to implement AT in the general education setting	24	57.1
Staff training on how to implement AT in the special education setting	8	19.0
Staff training on how to measure the success of AT implementation	13	31.0
Staff training to troubleshoot or initiate repairs of broken or malfunctioning equipment	5	11.9
Increased lending library inventory of low tech devices	13	31.0
High-Technology		
Staff training to use AT devices	26	61.9
Staff training on how to conduct AT assessments	16	38.1

	N	%
Staff training on how to appropriately consider and include AT within the IEP	15	35.7
Staff training on how to implement AT in the general education setting	22	52.4
Staff training on how to implement AT in the special education setting	15	35.7
Staff training on how to measure the success of AT implementation	7	16.7
Staff training to troubleshoot or initiate repairs of broken or malfunctioning equipment	5	11.9
Increased lending library inventory of high tech devices	14	33.3

Summary of Findings

With respect to what AT knowledge and skills exist between special educator subgroups and related service personnel results indicated that knowledge levels were highest for the use of pens/pencils with adapted grips, adapted paper, word processing, and technology to support the mechanics of the writing process, while the lowest levels of knowledge were for electronic Braille devices, auditory cuing devices, high-tech voice output communication devices, magnification devices, and amplification systems. Similar results were found for skill levels, with the highest levels of skill reported for pens/pencils with adapted grips, word processing, adapted paper, and technology to support the mechanics of the writing process and lower levels of skill for high-tech voice output communication devices, amplification systems, magnification devices, auditory cuing devices, and electronic Braille devices. In testing group differences, the MANOVA comparing skill levels was not statistically significant, indicating no differences between the PS/SE MSD, SE EI/MM, SLP, and OPT occupational groups in terms of their overall levels of skill in using AT.

With respect to the degree to which the level of knowledge and skills of special education teachers and related services personnel in the European Branch of the Participating School System match AT professional guidelines recommended by the Quality Indicators for AT (QIAT) and the differences between these groups results indicated that the participants failed to meet professional guidelines. This was manifested in terms of their ability to make informed AT suggestions for students with disabilities, their ability to ability to include AT services within the IEP, their ability to evaluate the effectiveness of AT services for a student with disabilities, their AT knowledge of the CSC team, their ability to use AT in the general education setting, and their ability to use AT in the special education setting. Thus, for all six items related to the QIAT standards, the participants failed to meet professional guidelines. Further analyses indicated the difference among the four participants groups were not statistically significant, indicating the general failure to meet professional guidelines were a pervasive problem regardless of occupation within the participating school system.

The third research question explored how the European Branch of the Participating School System special education teachers and related services personnel perceived the availability and usefulness of AT technical assistance and support and if there were different perceptions regarding the availability and usefulness of the AT help. Of the 59.5% (n =25) of the participants who had needed assistance from the district regarding AT, 80% reported (n =20) being able to get the assistance they needed. The use of assistance and perceptions of the availability of assistance did not differ between the four groups. While the participants were satisfied overall with the effectiveness of support, the participants were most satisfied with the effectiveness of district policy and

support for low-technology AT and least satisfied with the effectiveness of the participating school system procedural guidance for high-tech AT. Perceptions of the effectiveness of support did not differ between the four school system occupational groups.

The final question of this study dealt with the need for AT training and support and what training or support had an impact. In terms of the AT training and supports that were currently having an impact, participants appreciated increased lending library inventory items, staff training to use AT devices, and staff training on how to implement AT in the general education setting. These same three areas were endorsed most frequently for both low-technology and high-technology components of support. Of note was that nearly a third of the respondents felt no supports were currently impacting implementation for both low and high tech AT. For additional AT training and support in the future, the participants felt staff training on how to implement AT in the general education setting, staff training on how to conduct AT assessment, and staff training to use AT devices were commonly endorsed for both high-technology and low-technology areas. The participants also desired staff training on how to appropriately consider and include AT within the IEP, but primarily for low-technology AT.

Chapter 5 Discussion

Purpose of the Study

The purpose of the research study was to describe the level of AT knowledge and skills among the European branch of the participating school system special education professionals and related service providers, to determine staff perceptions of the availability and effectiveness of AT technical assistance and support and to identify AT training needs. AT has exceptional potential for removing access barriers to student learning. Although AT can be a powerful resource for students with disabilities, the consideration process for AT is often inadequate due to lack of AT knowledge among professionals (Ashton et al., 2005; Ashton & Wahl, 2004; Edyburn, 2008; Gitlow & Sanford, 2003; Long & Perry, 2008; Wilcox et al., 2006). Ashton et al. (2005) demonstrated that consideration and utilization of AT occurs more when professionals possess appropriate training. For the last 8 years the European Branch of the Participating School System has allocated substantial funds under a Special Education Initiative (2008) for improving resources within special education, including increased AT access, development of AT Lending Libraries, and staff training of AT devices. This study was implemented to identify next steps for continued AT implementation and positive student AT outcomes within the European branch of the participating school system.

Study Sample

The target population for this study was a stratified random sample of 88 preschool, elementary, middle, and secondary (grades pre-K-12) special education teachers of students with mild to moderate learning impairments, moderate to severe

learning impairments, emotional impairments, visual impairments, and hearing impairments. In addition, the target population included speech language pathologists, occupational therapists and physical therapists, who also serve the above mentioned special education students. Of the 42 respondents, approximately 75% had at least a Master's degree. Nearly 17% of the participants had special AT training or certifications. Approximately half worked in the elementary school setting.

Research Question 1

The first research question of this study explored what: AT knowledge and skills the European branch of the participating school system special education teachers and related services personnel possessed and if differences existed between them. The findings indicated knowledge and skill levels were highest for the use of low tech AT devices to support writing and the lowest for high tech items to support vision, hearing, and severe communication disabilities. Significant differences in knowledge and skills were not identified between the European branch of the participating school system special education and related service professionals.

Lack of AT knowledge and skills are not a novel discovery. Special education professionals in the European branch of the participating school system affirmed findings from Ashton and Wahl (2004), Ashton et al. (2005), Wilcox et al., (2006), and Wilcox, Dugan, Campbell, and Guimond, (2006). These researchers found professionals considering AT for an IEP or IFSP did not feel confident in making informed decisions due to lack of experience, training, and knowledge resulting in students not having their AT needs met.

The results indicating higher knowledge and skill of low tech AT speaks to the nature of staff members learning or having exposure to basic AT tools that either require minimal training or are common and frequently used by students with and without disabilities and staff. AT tools such as pencil grips and lined paper are intuitive in their implementation compared to high tech AT such as speech to text software. High knowledge was reported for word processors, which encompass a more advanced type of AT that may be attributed to frequent exposure for professional and personal use rather than formal AT training.

Previous researchers (Ashton et al., 2005; Ashton & Wahl, 2004; Wilcox et al., 2006) concluded that professionals with a strong AT knowledge base use technology more and consider it an important consideration for students with disabilities, while those without training do not place as much importance on the value of AT. It is plausible that because professionals have a stronger knowledge base of low tech AT, it is considered and used with greater frequency than high tech AT. Consideration of AT in the IEP may be impacted and biased towards low tech AT due to lack of knowledge of more high tech AT solutions especially for students with high incidence disabilities.

Results confirmed information related to the collective knowledge and skills special education and related service providers bring to the AT consideration process. There were no significant differences among professional groups regarding their knowledge of AT. Each group demonstrated awareness for AT related to their field of study, but still did not demonstrate above average AT knowledge or skill, which is similar to the findings of Brady et al. (2008). Collectively, the professional educator

groups had pockets of AT knowledge related to their profession, but overall they had an undeveloped AT knowledge and skill base.

Implications for Practice

The European branch of the participating school system uses a multidisciplinary case study committee model with the understanding each professional group brings unique skills and knowledge to the IEP process. The lack of statistical difference between the professional groups and their AT knowledge indicated, despite using a multidisciplinary team model, there is still a general lack of knowledge and skills for AT. This lack of AT knowledge negatively impacts the quality and quantity of how AT is considered and implemented with students within the European branch of the participating school system.

Effective AT pre-service training programs and school system in-service professional development must be addressed for special educators, speech language pathologists, occupational therapists, and physical therapists. If professionals share a pool of knowledge regarding AT, then the collective training and preparation must be equally improved across disciplines. Training should increase operational knowledge of AT specific to the profession along with functional, strategic, and social knowledge for AT implementation.

AT standards identified by Lahm (2003) and adopted by the CEC could serve as a guideline for college courses, professional evaluations, and school system professional development plan for educators and related service provider, thus expanding their knowledge of AT. Previous studies suggested implementing collaborative training models between school districts and universities and using a combination of online

resources and in-services to better prepare current teachers on the effective use of AT (Ashton et al., 2005). District AT specialists or university professors tasked with teaching pre-service AT content could head and take overall responsibility for the project.

Research Question 2

The second research question explored the degree to which the level of knowledge and skills of special education teachers and related services personnel in the European branch of the participating school system matched AT professional guidelines recommended by the Quality Indicators for AT (QIAT) and whether there were differences between special educator subgroups and related service personnel. Results for this research question indicated participants failed to meet the four selected professional QIAT guidelines in terms of their ability to: (a) make informed AT considerations and suggestions for students with disabilities; (b) include AT within the IEP; (c) evaluate the effectiveness of AT services for a student with disabilities; (d) make knowledgeable AT decisions within the CSC team; (e) use AT in the general education setting; and (f) use AT in the special education setting. Thus, for the items related to the QIAT standards, the participants failed to meet professional guidelines for both low and high tech AT. Further analyses indicated the difference among the four participant groups was not statistically significant, indicating the general failure to meet professional guidelines was a widespread problem regardless of occupation. In the following section, the results are discussed related to the four separate QIAT guidelines as well as the implications for practice.

QIAT Standard 1: Consideration of AT

The results indicated the participants did not effectively consider AT and a variety of factors can be attributed to poor AT considerations. The most commonly cited reason is a lack of professional AT knowledge and skills, which is supported by the findings of the first research question and consistent with findings by previous studies (Ashton & Wahl, 2004; Ashton et al., 2005; Wilcox et al., 2006; and Wilcox, Dugan, Campbell, & Guimond, 2006).

When looking further at AT knowledge, each professional group scored below the recommended QIAT benchmark when rating their personal AT knowledge. Interestingly, the groups rated the collective AT knowledge of the CSC lower than their personal AT knowledge. Several factors contributing to this are possible. Directions and guidelines within the school system Procedural Guide may not be descriptive or referenced enough for the CSC to feel supported when considering AT. Professionals may be reluctant in a group setting to share AT recommendations for fear of committing expensive resources to a legal document such as the IEP. Participants may hurry through the AT consideration process for fear of shedding light on the CSC's limited knowledge of AT. It is logical that AT considerations would follow a similar pattern to AT knowledge, as people cannot consider what they do not know.

The AT consideration process may also be negatively impacted by (a) technology mismatched to student needs, (b) data not used to make AT decisions, (c) poor AT documentation in the IEP, and (d) a lack of or refusal to utilize resources aimed to support the AT consideration process. The European branch of the participating school system special education staff members and related service personnel require guidance

and support to accept the value and importance of AT and purposeful considerations. School administration within the European branch of the participating school system also require managerial knowledge of AT along with special education procedures to support the consideration process and ensure CSC's utilization of available AT consideration resources.

Implication for Practice

Inadequate AT considerations have several implications to practice in the European branch of the participating school system. Whole student populations, along with devices, software, or services may be excluded or inconsistently included in the AT consideration process due to lack of AT knowledge and skills. This can lead to opportunities lost for using technology to increase access for individuals with disabilities. Inadequate AT considerations can also lead to a failure to meet the needs of the student. Every child who is excluded from an informed AT consideration process misses the opportunity for AT to increase access to social, functional, and curricular activities. This may result in uniformed purchases of AT equipment that does not meet the needs of students. Clear strategies and tools to support the consideration process, increased AT procedural guidance, and ongoing training to increase knowledge of AT is needed to support and empower the European branch of the participating school system special education teams during the AT consideration process.

QIAT Standard 2: Including AT Within the IEP

Results indicated professionals are not satisfied with their ability to include AT within the IEP. There are many possibilities for this finding. The first reason may be personnel may lack awareness or understanding of the current school system procedural

policy for including AT within the IEP. Second, procedural AT guidance may either be basic causing omissions of important procedures or overly complex providing information that a majority of professionals do not adequately comprehend. Fear of misinterpreting policy along with the fear of committing the district to expensive devices or services could lead to discomfort among the staff resulting in exclusion of AT from the IEP.

Implications for Practice

The IEP process drives the inclusion of AT for students with disabilities. Results suggested staff members lacked the basic knowledge of AT to appropriately include AT in the IEP, thus negatively impacting the ability for AT to be part of a student's educational program. Professionals must have resources to support the inclusion of AT devices and services, together with strategies that link AT to measurable IEP goals, objectives, or accommodations. Clear procedural guidance, access to the European branch of the participating school system AT support personnel, and timely feedback to questions and concerns are needed.

QIAT Standard 3: Measuring the Effectiveness of AT Devices

Results suggested staff members did not have clear responsibilities, tools, or procedures for collection, evaluation, and interpretation of student data. Without these supports, school level data to measure the effectiveness of AT devices is either not done or done inconsistently.

Implication for Practice

If the European branch of the participating school system professionals lack skills, procedures, or strategies to evaluate AT effectiveness, then AT decisions are either not

made or made with limited understanding and skills that limit the validity and reliability of the results. Further, without qualitative and quantitative data collected across settings, it would be impossible to pinpoint effective AT features, tools, and instructional strategies for specific students. Time, training, funding, and motivation for AT are wasted without an evaluative process that measures the student's AT efficacy. Evaluation of AT effectiveness is essential for reducing factors that could lead to AT abandonment. Special education and related service professionals within the European branch of the participating school system need training, resources, guides and strategies to collect, analyze, and interpret data related to the effectiveness of AT for special education students.

QIAT Standard 4: Implementation of AT

Participants were asked to evaluate their ability to implement AT in both the regular and special education classroom. Results suggested each professional group had difficulty implementing AT in either setting. Results could be attributed to (a) the lack of a collaborative AT implementation plan, (b) uncertainty with how to integrate AT into the curriculum, (c) the absence of shared responsibility for AT implementation, (d) poor training opportunities for family, (e) students, and staff, insufficient logistical support, and (f) infrequent opportunities for the student to implement AT strategies to complete a variety of meaningful tasks.

Implications for Practice

For AT to be implemented with success, it must be implemented in the natural environment of the student. Results indicated the European branch of the participating school system special education professionals and related service personnel were not

confident in their ability to implement AT across settings. Clearly, the results indicated a need for pre-service and in-service training to provide strategies to implement AT across settings. This goes beyond functional knowledge of a device and moves toward development of Universal Designs of Learning (UDL) instructional practices that use technology to remove learning barriers from curriculums. Special education and related service professionals must work to increase overall knowledge of AT and general education curriculum while also developing strong collaborative partnerships with general educators, students and parents.

Research Question 3

The third research question of this study dealt with how the European branch of the participating school system special education teachers and related services personnel perceive the availability and usefulness of the AT technical assistance and support offered and if there were different perceptions regarding the availability and usefulness of AT technical assistance and support offered by the European branch of the participating school system. Technical AT support appeared to be effective. Nearly 60% of the participants indicated having a need for AT support, with 80% of that group expressing satisfaction with the assistance received. This may be attributed to the SEI funded AT Lending Libraries, which offer access to AT along with basic troubleshooting and technical support. In addition, there are two AT professionals available to train, troubleshoot, and evaluate students within Europe. The combination of materials and access to assistance may contribute to the perceived satisfaction of overall effectiveness of AT assistance.

Perceptions of the effectiveness of AT support did not differ between the four participant groups. While the participants were satisfied overall with the effectiveness of AT support, both district and school system assistance and policy was not regarded as either effective or ineffective. The participants were most satisfied with the effectiveness of district policy and support for low-tech AT and least satisfied with the effectiveness of school system procedural guidance for high-tech AT.

Results suggested professionals do not have an effective policy, plan, or procedural guide at the district or school system level in terms of AT. Results from research question 1 illustrated that knowledge and skills of AT are limited across professionals. In times of need, these same professionals may look for guidance using district or school system resources. If professionals lack a clear guide for AT, chances for procedural errors and AT omissions are greatly increased.

Implications to Practice

Professionals in the field felt confident with technical help, but are unsatisfied with procedural supports. The school system procedural guide is often used as the primary source of guidance, direction, and clarification for all topics regarding special education. While the guide offers procedural assistance regarding AT, the results draw into question the usefulness of the content. Bell and Blackhurst (1996) recommended key components personnel should consider as they develop AT policy or technical assistance guidelines. The most frequently addressed topic was definition of AT devices and services, followed by eligibility requirements for AT services, AT screening and assessment, equipment management, use, and maintenance, AT staff development, AT

funding, and planning for AT services. The inclusion or expansion of these components into the school system special education procedural guide is recommended.

Research Question 4

The fourth research question explored what AT training or AT support the European branch of the participating school system special education teachers and related service personnel identified as needed, and what training or support in their view had an impact. Results shown on Table 17 indicated infrastructure supports, such as the Lending Libraries, are most recognized for improving AT use. Current staff trainings for AT topics were not identified as a successful option to improve AT use. These results make sense, as the funding for the SEI focused primarily on AT items and infrastructure, with less regard to ongoing AT staff training. Thus, what has been funded and supported is most recognized as working.

Other factors contributing to the high appreciation of AT Lending Library inventories might be the reduction of funding barriers, school initiated hardware and software approvals, and increased choice of AT devices at a local level. Having items in the AT Lending Libraries may constitute an unofficial endorsement of approval from the European branch of the participating school system, thus taking pressure off the CSC for making AT recommendations that may be questioned from supervisors.

Over one third of the participants (34.5%) felt no actions were currently working to improve the use of low or high tech AT in the European branch of the participating school system despite significant funding and resources provided by the SEI. This finding is consistent with similar findings by the Wilcox et al. (2006) study that found

individuals with less training were more likely discouraged by AT availability, funding, and technical support.

For additional AT training and support in the future, the participants felt staff training about how to implement AT in the general education setting, staff training about how to conduct AT assessment, and staff training about how to use AT devices were commonly endorsed for both high-technology and low-technology areas. The participants also desired staff training about how to appropriately consider and include AT within the IEP, but primarily for low-technology AT.

Nearly 80% of the professionals indicated they used face-to-face meetings, classes, and online resources to network or share ideas with others in the field of AT. Future training opportunities should encompass a combination of local level professional collaboration, face-to- face classes and trainings, and synchronous and asynchronous virtual resources, collaboration and instruction.

The recommendations identified by the study participants serve to highlight many barriers to successful AT implementation, which are similar to the findings of the Ashton and Wahl (2004) and Ashton, Lee, and Vega (2005) studies, which documented a lack of knowledge and learning about how to use and implement AT in various settings. Practitioners in the field recognize that knowing about AT requires more than operating the features of a device.

Implications for Practice

Results support the presence of the European branch of the participating school system Lending Libraries focused on providing access to AT devices. Professional responses indicated a need for ongoing funding to keep AT inventories current along with

a shift in focus from AT devices to AT training. Access to AT is not enough; professionals need to implement the functional, operational, and strategic use of AT across settings. Results indicated the need for the European branch of the participating school system to establish a balanced approach to providing AT resources and implementation plans along with integrated virtual and actual AT training opportunities.

Summary of the Findings

Professional knowledge and use of AT are closely tied together, indicating someone who is knowledgeable about AT reports a greater ability to use AT. Special education teachers and related service personnel demonstrated greater knowledge of low tech rather than high tech AT. While there are multidisciplinary teams of professionals making AT considerations, all professionals reported having similar levels of knowledge and skill levels when considering and using AT. Professional AT knowledge and skills fall short of recommended best practices outlined by the Quality Indicators of Assistive Technology.

Generally, AT technical support was adequately provided, but there was dissatisfaction with school system policy and guidelines for high tech AT. Participants indicated an appreciation for practices that increased access to AT devices. Participants indicated the greatest need for AT device training, using AT in the general education setting, and conducting AT assessments. Overall, there was a general lack of AT knowledge among special education staff and related service providers and dissatisfaction with current school system AT policy. These findings raise concern for the efficacy of special education teams considering and implementing AT.

Limitations of the Study

There are several factors that could have influenced and limited the results of this study. Of note was the overall lack of significance between the four professional groups with regard to the four research questions. The possible influence of subject characteristics, methodology, measures, and power will be examined.

Subject Characteristics

Despite various professional groups surveyed, the groups could be homogenous and have attended similar pre-service and in-service AT training, thus limiting variance among groups. Research suggested overall dissatisfaction with pre-service AT preparation at the university level, which could explain the constant lack of AT knowledge demonstrated by the study (Brady, Long, Richards, & Vallin, 2008; Smith & Kelley, 2007). Further, opportunities for diverse professional development are limited due to the remote geographic location of the European branch of the participating school system.

Methods

The survey method relied on a self-report method of data collection without independent means of verifying the accuracy of the data. Intentional deception, poor memory, response bias, or misunderstanding of the question could have contributed to inaccuracies in the data. In addition, this study was descriptive and therefore cannot offer any insights into cause-and-effect relationships such as the effect of the SEI on school system special education teacher knowledge of AT, nor the effectiveness of its use in the delivery of special education services.

Measures

The survey tool was created using a variety of professional resources. In addition, the survey was field tested by AT professionals to identify instrument deficiencies and make improvements to the questions and survey design. Despite these precautions, the survey may have been flawed by poor survey design, sampling errors, processing errors, and misinterpretation of the results. The power of the study may be limited due to the small sample size as a whole and within the four subgroups. Perhaps, if there were more subjects in the study, individual variability would have had a diminished impact on the levels of significance achieved in the analyses.

Implications for Further Research

Further exploration of the following issues appears to be warranted within the school system and possibly in research devoted to a larger sample of educational systems:

1. What effect does AT policy and procedures have on staff AT perceptions and student AT outcomes? What effect does AT policy and procedures have on staff consideration and inclusion of AT? How does AT policy and procedure impact student achievement?
2. Special education and related service personnel ranked their personal AT knowledge higher when not working in a Case Study Committee. What factors contribute to lower collective AT knowledge? Why are special education groups less knowledgeable about AT than the individuals comprising the group?
3. To what degree are student outcomes impacted by professional development for; AT device use, AT implementation, AT consideration within the IEP, AT

assessments, increased AT preservice training, use of AT professional standards, and inclusion of curriculums that employ UDL principles.

4. Is consideration of AT in the IEP impacted and biased towards low tech AT due to lack of knowledge of more high tech AT solutions?

Conclusion

The study provided data on assistive technology skills, knowledge, and professional development needs of the European branch of the participating school system special education professionals and identified areas for further research. The findings are consistent with existing research in the field of AT regarding the lack of knowledge and skills of special education and related service providers. The findings of this study indicated special education professionals in the European branch of the participating school system lack essential skills and knowledge on selected AT knowledge and skill measures and that current AT practices do not meet established quality indicators. Each professional had AT knowledge specific to their profession, but the quality and depth of the AT knowledge was similarly limited. Collectively, professionals indicated a lack of ability to: make informed AT considerations; include AT within the IEP; measure the effectiveness of AT and implement AT. The findings question the current effectiveness of existing AT training, policy and supports across professional disciplines. Results suggested this is in part due to a lack of operational device knowledge and skills compounded by uncertainty of district AT procedures and policy for low and high tech AT. While the AT Lending Libraries were identified as useful to support increased access to AT, a clear need was identified to increase device

training along with strategies to increase successful implementation of AT across educational settings.

The lack of statistical significance in comparisons between professional groups indicated special education and related service professionals appear to be undifferentiated in their need for knowledge and skills and clearly each group must collectively enter the work force with an improved knowledge of AT. Once employed, the school system should provide ongoing professional development that capitalizes on research based operational, functional, strategic, and social AT competencies. The European branch of the participating school system professionals need further development of skills to implement AT across settings and curriculums. This training should be flexible and take advantage of online and face-to-face classes. School system special education policy should clearly outline how to evaluate, consider, include, document, and implement AT. Finally, AT technical support and AT Lending Libraries should continue to develop and grow as technologies and curriculums evolve to meet the diverse needs of individuals. The potential of AT will only be truly realized when special educators possess the knowledge and skills and have access to the infrastructures needed to support the assistive technology process.

APPENDICES

Appendix A: Literature Matrix and Summary of Related Research

Study	Rationale/Purpose Research Questions	Design
Ashton, Lee, & Vega, (2003)	Assess perceived knowledge, attitudes, and challenges of AT use by special education teachers in California since the mandate of IDEA'97	Descriptive
Ashton & Wahl, (2004)	Gain baseline data about what special education staffs know and what they use in the way of assistive technology.	Descriptive
Bell & Blackhurst, (1996)	Examine the perceptions of State Directors of Special Education in 1995-1996 regarding the need for assistive technology policies in local school districts and conduct an analysis of existing assistive technology policies to help design model AT policies.	Descriptive
Brady, Long, Richards, & Vallin, (2008)	Determine the extent AT /AT services and telehealth are included into the curricula of occupational therapy, physical therapy, speech language pathology and special education pre-service education programs.	Descriptive
Gitlow & Sanford, (2003)	Determine the interest, content, and delivery preferences of AT instruction to a variety of allied health professionals in Maine.	Descriptive
Lahm, (2003)	Determine what technology related skills and knowledge assistive technology specialists should possess.	Descriptive records review
Long & Perry, (2008)	Determine perceived adequacy of previous AT training, training challenges, preferred methods of training, and the confidence level of pediatric physical therapists providing AT.	Descriptive

Smith & Kelley, (2007)	Describe AT training for pre-service teachers of students with visual impairments.	Descriptive
Wilcox, Dugan, Campbell, & Guimond, (2006)	Describe parent and family perspectives of their experiences with AT for infants and toddlers who are receiving early intervention services.	Descriptive records review
Wilcox, Guimond, Campbell, & Weintraub Moore, (2006)	Identify/Examine providers' perspectives on issues thought to be influential or important to the selection and use of AT in early intervention.	Descriptive

Summary of Related Research

Study	Sample Participants	Methods/ Procedures	Analyses	Results
Ashton, Lee, & Vega, (2003)	599 teachers, specialists, and coordinators from 48 school districts in rural California comprised the nonrandom sample chosen from school directories and school administrators. 25 % (N=154) of the surveys were returned	Self-administered mailed survey	Descriptive statistics-percentage, frequencies, and Chi-square analyses.	AT training significantly increased AT use and perceived importance. Only half felt comfortable using AT. AT barriers: lack of knowledge, resources, training, and time. Academic software most widely used. Generalizations of the results are limited due the limited geographic area, poor response rate and nonrandom sampling of participants.
Ashton & Wahl, (2004)	356 speech language pathologists, occupational and physical therapists, special day class teachers, resource teachers, and instructional specialists working in a large suburban district in Northern California selected 49% (N=173) responded. Not specified if sample was randomly selected, convenience etc.	Self-administered mailed survey with cash incentive drawing.	Descriptive statistics- percentage and frequencies	Speech Language Pathologists show the highest awareness of AT along with the greatest access to AT devices. Knowledge of low-tech devices was significantly higher than high tech. There was a significant interest in continued AT education. AT services are not being provided to all students in need. Significant study limitations due to the less than half survey response rate, limited geographic

				area and poor reporting of participant selection.
Bell & Blackhurst, (1996)	Directors of Special Education of each of the 50 states plus the District of Columbia. Survey achieved 100% return rate.	Self-administered mailed survey with a phone nonrespondent follow up.	Descriptive statistics-percentages, database and content analysis	Over 85 % indicated need for policies to be developed by local education agencies to guide the delivery of AT services. Fourteen AT areas identified when developing assistive technology policy or technical assistance guidelines. Frequently addressed topics were definition of AT devices and services, eligibility requirements for AT services, AT screening and assessment, equipment management, use, and maintenance, AT staff development, AT funding, and planning for AT services. Finding are cautioned due to the age of the study.
Brady, Long, Richards, & Vallin, (2008)	959 directors of accredited occupational therapy, physical therapy, special education, and speech language pathology preparation programs in the United States were identified in the fall of 2004. 153 responded for a 15% return rate.	Online survey with telephone follow up.	Descriptive statistics-frequencies, percentages, and averages.	All curricula included AT instruction using similarly qualified staff and teaching methods. Programs were satisfied with the amount of time teaching AT. There was variance among the time each university spent teaching AT and the specific AT devices taught-most AT instruction on devices specific to each program. Academic programs reported offering limited information on how to address AT at IEP meetings. Results limited due to poor response rate and untested validity and

				reliability of the testing instrument.
Gitlow & Sanford, (2003)	A nonexperimental random stratified sample of 335 licensed OT's, PT's and SLP's working with children and adults in Maine were identified. 62 surveys were returned for a response rate of 19%.	Self-administered mailed survey	Descriptive statistics-frequencies, and Chi-square analysis. SPSS used for quantitative analysis.	More than two thirds of the respondents indicated having nonexistent or foundational knowledge of most AT areas. More than half indicated a need for additional training in AT. AT funding and AT specific for individuals with visual and auditory needs were highly requested topics for training. Respondents demonstrated more comfort and awareness of AT devices specific to their field of study. The results are limited due to the poor response rate and that the professionals may have worked with individuals out of the school system, which limits generalizeability to academic settings. The survey was reported to be difficult to understand and there were mail distribution problems.
Lahm (2003)	154 compiled professional AT competencies	5 total rounds of reviews and ratings from AT experts and random mailing of competencies to CEC members for validation.	Using a Delphi validation method, panelists rated each competency on estimated usefulness to AT professionals. Second validation achieved by a content review of competencies by the Knowledge and Skills subcommittee of the CEC. A third validation was achieved by randomly mailing the final competencies to 200	CEC approved 10 knowledge and skill standards for AT specialists to be used as guidelines for administrators hiring AT experts, the development of collegiate AT preparation programs, and as guidelines for school and district training and professional development.

			CEC members. Results were reviewed on return for a final validation check.	
Long & Perry, (2008)	Random sample of 1000 physical therapists who identified themselves as members of the Pediatrics of the American Physical Therapy Association were selected. 380 responded for a return rate of 38%.	Self-administered mailed survey	-Survey respondents analyzed using descriptive frequency statistics. -The responses to the research questions were analyzed using the Kruskal-Wallis tests with post hoc comparisons. -A nonparametric equivalent analysis of variance used for ordinal data. -Open-ended questions were analyzed using qualitative data analyses using phenomenological designs.	Pediatric physical therapists have insufficient training in AT and have a lack of confidence in delivering AT services. There is an increased need for providers of AT services to have pre-service training along with ongoing professional training once in the field. Results are limited due to the small sample size and poor response rate. No data was collected for nonresponders. Respondents were all part of the same professional organization. Results cannot be generalized to all physical therapists. The survey had limited psychometric testing.
Smith & Kelley, (2007)	Faculty members from 38 major universities indentified 30 responded for a 79% return rate.	Online survey with e-mail and phone follow up	Descriptive statistics-calculated by SPSS frequencies.	Universities teach general knowledge of AT. Discrepancies found on scope and sequence of AT topics taught at the various universities indicating a lack of agreement on what AT is considered most beneficial. Possible study limitations are related to different training, knowledge and authority of respondents at the different universities. More credibility could be obtained by improved respondent returns and a clearer definition of who is to complete the survey.
Wilcox, Dugan, Campbell	924 parents or family members of children with at least one	Archival dataset of responses	Descriptive statistics- percentage and	Results indicated that AT is being used by over 90% of the children prior to

, & Guimond , (2006)	disability receiving part C early intervention services from 33 states. Ages of the children ranged from birth to 36 months.	to computer assisted telephone interviews	frequencies	turning two. Findings indicated a less than 50% success rate for AT. Parents took the primary role in choosing, buying and implementing the AT. Professionals play a limited consulting role, usually with high tech devices. Limitations are related to sample size and inherent errors to surveys i.e. saying but not doing.
Wilcox, Guimond , Campbell , & Weintraub Moore, (2006)	17,126 randomly selected early intervention providers were identified from a national representation of states. Sample represented 20% of provider population based on estimated data from OSEP. 2166 providers agreed to participate (12.9%). 967 individuals (OT's, PT's SLP's, nurses, paraprofessional, audiologists, and child development teachers completed the survey for a 45% completion rate from the 2166, but only a 5% return from the initial 17,126.	Initial survey queries mailed. Survey administered using computer assisted telephone interviews	Descriptive statistics-ANOVAs, omnibus chi-square test and follow up pairwise comparisons.	Half the respondents had some AT training specialized in early intervention. Few felt significantly trained. Low-tech knowledge more prevalent than high tech. Nearly 45% of the respondents indicated that children who needed AT services were not receiving AT interventions. The more AT training the respondents had the greater incidence of using AT and making informed AT decisions. Problems with generalizing the findings result from most of the respondents coming from 13 states, a limited number of respondents from each profession, an overall poor response rate and possible bias or design flaws within the survey.

Appendix B: Survey Pre-Notice

Dear_____

A few days from now, you will receive an e-mail request to fill out a survey for an important project conducted as part of doctoral research through the University of Maryland, College Park.

The purpose of the survey is to study the assistive technology (AT) knowledge, skills, and needs of special educators and related service providers within REMOVED. The results of this study will be used to describe the level of AT knowledge among special education professionals and related service providers, to determine staff perceptions of the availability and effectiveness of AT technical assistance and support, and to identify AT training needs within REMOVED.

Thank you very much for your time and consideration and please plan to take the survey. The information provided by REMOVED special education professionals and related services providers like yourself will be essential to improve AT knowledge, skills, and use within REMOVED.

Aaron Marsters
Doctoral Candidate
University of Maryland, College Park

PS: By participating in this study you will be eligible for a $200 dollar drawing for your school's PTA to buy classroom supplies or equipment.

If you just can't wait to start please follow the link below.

If you need to need to quit before finishing, the survey will remember where you left off. Just close the web browser and use the attached link to open it back up to the last question you answered.

Appendix C: Invitation and Consent Form

Dear _____

I am inviting you to participate in a research project to study the assistive technology knowledge, skills, and needs of special educators and related service providers within REMOVED. This research is a requirement of the doctoral degree at the University of Maryland, College Park.

The results of this study will be used to describe the level of AT knowledge among special education professionals and related service providers, determine staff perceptions of the availability and effectiveness of AT technical assistance and support, and identify AT training needs within REMOVED. Through your participation, I hope to understand how to improve training, resource allocation, and implementation of assistive technology within REMOVED. The results should be beneficial to REMOVED as well as professionals in the field of special education, who are working to improve the use of assistive technology with individuals with disabilities.

If you decide to participate in this survey, there are no known risks and responses will not be personally linked to you. No personally identifiable information will be kept. You may use the web-based survey or request a paper copy with postage paid envelope.

Please take 20 minutes of your time to complete this survey. Your input will be helpful in the effort to improve REMOVED use of assistive technology. Your participation is voluntary and there is no penalty if you do not participate. Regardless of whether you choose to participate, please let me know if you would like a summary of my findings. To receive a summary, please e-mail me your contact information at aem@umd.edu

If you complete the survey, you will be eligible for a $200 donation to your school's PTA that can be used for classroom supplies or equipment. There will be two drawings at the conclusion of the study as a token of appreciation for your time.

If you have any questions about the research study itself, please contact my advisor Dr. Philip J. Burke, 1308 Benjamin, University of Maryland, College Park, MD 20742, 301-405-6515; email: pjburke@umd.edu . If you have questions about your rights as a research subject, please contact: Institutional Review Board Office, University of Maryland, College Park, MD 20742; email: irb@deans.umd.edu; telephone: 301-405-0678. This research has been reviewed according to the University of Maryland College Park IRB procedures for research involving human subjects.

Your participation indicates that you are at least 18 years of age; the research has been explained to you; your questions have been fully answered; and you freely and voluntarily chose to participate in this research project.

If you would like a paper copy, please e-mail me your request.
aem@umd.edu

If you need to need to quit before finishing, the survey will remember where you left off. Just close the web browser and use the attached link to open it back up to the last question you answered.
Thank you in advance,

Aaron Marsters

Doctoral Candidate

University of Maryland-College Park

Appendix D: Survey Reminder

Dear_____

One week ago, you received an e-mail seeking your input about assistive technology (AT) knowledge, skills, and needs of special educators and related service providers within REMOVED.

If you have already completed the online survey, please accept my sincere thanks. If not, I request that you to please consider doing so today. Your answers are very important in allowing me to identify the current needs for assistive technology within REMOVED. Your time does matter, and I am very grateful for your help. Your participation is voluntary.

If you would like a paper copy, please e-mail me your request.
aem@umd.edu

Don't forget that your completed survey gives you a chance at winning $200 dollars for your school!

With thanks,

Aaron Marsters
Doctoral Candidate
University of Maryland, College Park

PS: if you need to need to quit before finishing, the survey will remember where you left off. Just close the web browser and use the attached link to open it back up to the last question you answered.

Appendix E: Reminder Letter of Invitation

Dear_____

Two weeks ago, I invited you to participate in a research project to study the assistive technology knowledge, skills, and needs of special educators and related service providers within REMOVED.

I request that you to take 20 minutes to complete this survey. You represent a sample of REMOVED special educators and related service providers and I need your input to get a detailed picture of the current AT skills, uses, and needs within REMOVED The survey results will not be identifiable to you personally. Participation in this study is voluntary.

Time is valuable and by completing this survey, you have an opportunity to win $200 dollars for your school's PTA to buy classroom supplies and equipment. I will also share the summary of my findings if requested.

The purpose of this research study is to use data to improve the knowledge, skills, and use of AT within REMOVED. The more people that complete the survey add increased importance to the findings. Please share your insight and opinions! The results should be beneficial to REMOVED as well as professionals in the field of special education who are working to improve the use of assistive technology for individuals with disabilities.

The survey has been designed and piloted to be thorough, but brief. I encourage you to open the link and offer your input regarding AT within REMOVED.

If you need to need to quit before finishing, the survey will remember where you left off. Just close the web browser and use the attached link to open it back up to the last question you answered.

If you would like a paper copy, please e-mail me your request.
aem@umd.edu

Thank you in advance,

Aaron Marsters

Doctoral Candidate

University of Maryland-College Park

Appendix F: Survey Questionnaire

1. Please take 20 minutes of your time to complete this questionnaire on assistive technology (AT). Your input is critical in the effort to improve REMOVED use of AT. This research is a requirement of the doctoral degree at the University of Maryland, College Park. If you decide to participate in this survey, there are no known risks and responses will not be personally linked to you. No personally identifiable information will be kept. If you complete the survey, you will be eligible for a $200 donation to your school that can be used for classroom supplies or equipment. There will be two drawings at the conclusion of the study as a token of appreciation for your time. If you have any questions about the research study itself, please contact my advisor Dr. Philip J. Burke, 1308 Benjamin, University of Maryland, College Park, MD 20742, 301-405-6515 pjburk@umd.edu. If you have questions about your rights as a research subject, please contact: Institutional Review Board Office, University of Maryland, College Park, MD 20742; email: irb@deans.umd.edu; telephone: 301-405-0678. This research has been reviewed according to the University of Maryland College Park IRB procedures for research involving human subjects. Your participation indicates that you are at least 18 years of age; the research has been explained to you; your questions have been fully answered; and you freely and voluntarily chose to participate in this research project.

1 Accept

2. What is the highest level of education you have completed?

1 4-year College Degree
2 Master's Degree
3 Doctoral Degree

3. What is your current district placement?

1 Choice 1
2 Choice 2
3 Choice 3
4 Choice 4
5 Choice 5

4. Current primary teaching position:

1 Special Education Teacher LI/MM
2 Special Education Teacher LI/MS
3 Special Education Teacher EI
4 Special Education Teacher VI
5 Special Education Teacher PSCD
6 Speech Language Pathologist
7 Occupational Therapist
8 Physical Therapist
9 Special Education Teacher HI

5. Special education populations you primarily work with:

1 CAT-A
2 CAT-B
3 CAT-C
4 CAT-D
5 CAT-E

6. Grade levels you primarily work with:

1 Elementary
2 Middle
3 High
4 Preschool

7. Amount of years teaching in special education:

8. Estimate the amount of assistive technology training in hours you have received in the last 2 years:

1 0
2 1-10
3 10-20
4 20-30
5 30-40
6 Greater than 40 hours

9. Do you network or share ideas with others in the field of AT (ListServ, AT Professional organizations, other staff members, etc.)

1 Yes
2 No

10. Please list how you network with others:

11. Do you have any specialized assistive technology training or certifications (College course work, school level professional development, RESNA, ATP, ATACP, etc.)

1 Yes
2 No

12. Please list specialized training or certifications:

Prompt: Assistive technology is 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 a child with a disability. The following questions ask about your knowledge and use of computer applications and assistive technology devices.

13. My use of assistive technology computer applications:

Likert Scale:
Unable to use
Able to use with direct or live support
Able to use with written or web support
Can implement basic features
Can implement all features proficiently

1 Word Processing (examples: Microsoft Word, Appleworks, etc.)
2 Multimedia programs for student production (examples: KidPix, PowerPoint, Keynote, etc.)
3 Text to speech word processors (examples: Intellitalk, Write Outloud, Text Help, Read and Write etc.)
4 Voice Input Word Processors (examples: Dragon Naturally Speaking, Dragon Dictate, etc.)
5 Using multimedia (pictures and sound) to support language arts and math (examples: Hyperstudio, PowerPoint, Intellipics Studio, SMART Notebook, etc.)
6 General accessibility options available in Windows and Mac (examples: screen magnification, latch keys, variable keyboard response rates, left handed mouse, etc.)
7 Technology to support student writing process in planning and idea generation (outlining and semantic mapping software, multimedia applications, prompting programs, (examples: Draft Builder, Kidspiration and Inspiration)
8 Technology to support the writing process in transcription and sentence generation (word prediction, alternate keyboard formats, (example: Co-Writer, Classroom Suite)
9 Technology to support the mechanics of the writing process (example: spell and grammar checkers, etc.)
10 Computer technology to support reading: text reading programs (examples: Kurzweil 3000, Text Help, Read Outloud, WYNN, etc.)
11 Commercial Programs for Reading/Language Arts (examples: Grammar Blaster, Accelerated Reader, Reader Rabbit, Edmark, Let's Go Read!, Jump Start, Bailey's Book House, etc.)
12 Commercial Programs for Math (examples: Math Pad, Math Blaster, Millie's Math House, etc.)
13 Commercial Programs for phonological awareness (example: Earobics)
14 Commercial Cross-Curricular Adaptive Programs (examples: Classroom Suite and Boardmaker 6.0)

14. My knowledge of assistive technology computer applications:

Likert Scale:
No Knowledge
Little Knowledge
Some Knowledge
Good knowledge
Extensive Knowledge

1 Word Processing (examples: Microsoft Word, Appleworks, etc.)
2 Multimedia programs for student production (examples: KidPix, PowerPoint, Keynote, etc.)
3 Text to speech word processors (examples: Intellitalk, Write Outloud, Text Help, Read and Write etc.)
4 Voice Input Word Processors (examples: Dragon Naturally Speaking, Dragon Dictate, etc.)
5 Using multimedia (pictures and sound) to support language arts and math (examples: Hyperstudio, PowerPoint, Intellipics Studio, SMART Notebook, etc.)
6 General accessibility options available in Windows and Mac (examples: screen magnification, latch keys, variable keyboard response rates, left handed mouse, etc.)
7 Technology to support student writing process in planning and idea generation (outlining and semantic mapping software, multimedia applications, prompting programs, (examples: Draft Builder, Kidspiration and Inspiration)
8 Technology to support the writing process in transcription and sentence generation (word prediction, alternate keyboard formats, (example: Co-Writer, Classroom Suite)
9 Technology to support the mechanics of the writing process (example: spell and grammar checkers, etc.)
10 Computer technology to support reading: text reading programs (examples: Kurzweil 3000, Text Help, Read Outloud, WYNN, etc.)
11 Commercial Programs for Reading/Language Arts (examples: Grammar Blaster, Accelerated Reader, Reader Rabbit, Edmark, Let's Go Read!, Jump Start, Bailey's Book House, etc.)
12 Commercial Programs for Math (examples: Math Pad, Math Blaster, Millie's Math House, etc.)
13 Commercial Programs for phonological awareness (example: Earobics)
14 Commercial Cross-Curricular Adaptive Programs (examples: Classroom Suite and Boardmaker 6.0)

15. My use of assistive technology devices:

Likert Scale:
Unable to use
Able to use with direct or live support
Able to use with written or web support
Can implement basic features
Can implement all features proficiently

1 Pens/pencils with adapted grips
2 Adapted paper (examples: raised lines, graph paper, multi-colored lines)
3 Portable word processor(example: AlphaSmart 3000, Dana, NEO) 5
4 Alternate keyboard (example: IntelliKey, Discoverboard, TASH)
5 Talking calculators/adaptive calculators (example: Coinulators, Money calculators, large key calculators)
6 Image scanners
7 Adaptive or electronic books (examples: BookWorm, Leap pads, Leap desks, books on tape/CDmp3)
8 Note taking devices (example: digital audio recorders)
9 Auditory Cuing Devices (examples: Time Pad, Digipad)
10 Presentation Devices (examples: SMARTboard, Infocus)
11 Switches (examples: Big Red, Jelly Bean switches)
12 Adaptive toys
13 Alternate computer access (example: Touch Windows, track balls, mini key board, etc.)
14 Picture Exchange Communication Systems
15 Single and multiple message communication devices (example BIGmack, LITTLEmack, Super Talker Communicator)
16 Mid-tech voice output communication devices (examples: GoTalk 4 and 9)
17 High-tech voice output communication devices (examples: Macaw, ChatPC, Dynavox)
18 Amplification systems (examples: Radium Sound field, Light speed)
19 Magnification devices (examples: CCTV, computer magnification)
20 Electronic braille devices (examples: Braille Talk, Electric Perkins Brailler)
21 Adapted seating, desks, or bolsters

16. My knowledge of assistive technology devices:

Likert Scale:
No Knowledge
Little Knowledge
Some Knowledge
Good knowledge
Extensive Knowledge

1 Pens/pencils with adapted grips
2 Adapted paper (examples: raised lines, graph paper, multi-colored lines)
3 Portable word processor(example: AlphaSmart 3000, Dana, NEO)
4 Alternate keyboard (example: IntelliKey, Discoverboard, TASH)
5 Talking calculators/adaptive calculators (example: Coinulators, Money calculators, large key calculators)
6 Image scanners
7 Adaptive or electronic books (examples: BookWorm, Leap pads, Leap desks, books on tape/CDmp3)
8 Note taking devices (example: digital audio recorders)
9 Auditory Cuing Devices (examples: Time Pad, Digipad)
10 Presentation Devices (examples: SMARTboard, Infocus)
11 Switches (examples: Big Red, Jelly Bean switches)
12 Adaptive toys
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18 Amplification systems (examples: Radium Sound field, Light speed)
19 Magnification devices (examples: CCTV, computer magnification)
20 Electronic braille devices (examples: Braille Talk, Electric Perkins Braille
21 Adapted seating, desks, or bolsters

Prompt: This section will ask questions about your knowledge and experiences with various assistive technologies (AT), including how services are selected and supported within REMOVED. For the purpose of this section AT will be grouped into low and high tech categories that are consistent with AT guidance found in the REMOVED Special Education Procedural Guide.

Examples of low tech devices:
Include hand-held magnifying glasses, headphones for a computer, large button phones, talking calculator, adapted toys, highlight text (e.g., highlight tape and markers, rulers), pen/pencil with adapted grip, aids to find materials (e.g., index tabs, color coded folders), Velcro straps, etc.

Examples of high tech devices:
Include portable word processors such as Alpha Smarts, augmentative communication devices, laptop computers, powered wheelchairs, alternative keyboards, assistive listening devices, switch interfaces, Braille printers etc.

17. Thinking about your skills with low tech AT, how satisfied are you:
Likert Scale:
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied

1 with your ability to make informed AT suggestions for students with disabilities?
2 with your ability to include AT services within the IEP?
3 with your ability to evaluate the effectiveness of AT services for a student with disabilities?
4 with the AT knowledge of the CSC team?
5 with your ability to use AT in the general education setting?
6 with your ability to use AT in the special education setting?

18. Thinking about your skills with high tech AT, how satisfied are you:
Likert Scale:
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied

1 with your ability to make informed AT suggestions for students with disabilities?
2 with your ability to include AT services within the IEP?
3 with your ability to evaluate the effectiveness of AT services for a student with disabilities?
4 with the AT knowledge of the CSC team? 2

5 with your ability to use AT in the general education setting?
6 with your ability to use AT in the special education setting?

19. With respect to low tech AT, how effective do you consider:
Likert Scale:
Very Effective
Effective
Neither Effective nor Ineffective
Ineffective
Very Ineffective

1 District policy and support for AT?
2 REMOVED Procedural Guidance for AT?

20. With respect to high tech AT, how effective do you consider:
Liker Scale:
Very Effective
Effective
Neither Effective nor Ineffective
Ineffective
Very Ineffective

1 District policy and support for AT?
2 REMOVED Procedural Guidance for AT?

21. Within the last two years have you needed assistance from the district regarding AT?
1 Yes
2 No

22. Where you able to get the AT assistance you needed from the district?
1 Yes
2 No

23. Overall, how satisfied were you with the AT assistance you received?
1 Very Dissatisfied
2 Dissatisfied
3 Neutral
4 Satisfied
5 Very Satisfied

24. Choose up to three important options for improving low tech AT use in REMOVED.

1 staff training to use AT devices
2 staff training on how to conduct AT assessments
3 staff training on how to appropriately consider and include AT within the IEP
4 staff training on how to implement AT in the general education setting
5 staff training on how to implement AT in the special education setting
6 staff training on how to measure the success of AT implementation
7 staff training to troubleshoot or initiate repairs of broken or malfunctioning equipment
8 increased lending library inventory of low tech devices
9 nothing is needed (Only check this one)

25. Choose up to three important options for improving high tech AT use in REMOVED.

1 staff training to use AT devices
2 staff training on how to conduct AT assessments
3 staff training on how to appropriately consider and include AT within the IEP
4 staff training on how to implement AT in the general education setting
5 staff training on how to implement AT in the special education setting
6 staff training on how to measure the success of AT implementation
7 staff training to troubleshoot or initiate repairs of broken or malfunctioning equipment
8 increased lending library inventory of high tech devices
9 nothing is needed (Only check this one)

26. Choose up to three options that are currently working to improve low tech AT use in REMOVED.

1 staff training to use AT devices
2 staff training on how to conduct AT assessments
3 staff training on how to appropriately consider and include AT within the IEP

4 staff training on how to implement AT in the general education setting
5 staff training on how to implement AT in the special education setting
6 staff training on how to measure the success of AT implementation
7 staff training to troubleshoot or initiate repairs of broken or malfunctioning equipment
8 increased lending library inventory of low tech devices
9 nothing is working (Only check this one)

27. Choose up to three options that are currently working to improve high tech AT use in REMOVED.

1 staff training to use AT devices
2 staff training on how to conduct AT assessments
3 staff training on how to appropriately consider and include AT within the IEP

4 staff training on how to implement AT in the general education setting
5 staff training on how to implement AT in the special education setting
6 staff training on how to measure the success of AT implementation
7 staff training to troubleshoot or initiate repairs of broken or malfunctioning equipment
8 increased lending library inventory of high tech devices
9 nothing is working (Only check this one)

28. Thank you for taking the time to participate in this online survey. Please leave your e-mail address if you would like to be considered for the 200 dollar school funds drawing. Two separate prize drawings will be held at the conclusion of the survey deadline. Your assistance in this research is highly appreciated.

Note: All references to the school system, district, or school have been replaced with REMOVED.

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