2015

A Study of Assistive Technology Competencies of Specialists in Public Schools

Betsy B. Burgos
Nova Southeastern University, tech4bb@gmail.com

A Study of Assistive Technology Competencies of Specialists in Public Schools

by

Betsy B. Burgos

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor in Philosophy
in
Computing Technology in Education

College of Engineering and Computing
Nova Southeastern University

2015

We hereby certify that this dissertation, submitted by Betsy Burgos, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

Laurie P. Dringus, Ph.D. — Date
Chairperson of Dissertation Committee

Steven R. Terrell, Ph.D. — Date
Dissertation Committee Member

Michael Sharpe, Ph.D. — Date
Dissertation Committee Member

Approved:

Amon B. Seagull, Ph.D. — Date
Interim Dean, College of Engineering and Computing

College of Engineering and Computing
Nova Southeastern University

2015

An Abstract of a Dissertation Submitted to Nova Southeastern University
in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

A Study of Assistive Technology Competencies of Specialists in Public Schools

by
Betsy B. Burgos
July 2015

Despite the rapid proliferation of assistive technology implementation, studies have revealed that a number of professionals that provide assistive technology services do not have adequate competencies to recommend and deliver assistive technologies in school settings. The purpose of the study was to examine the competencies of assistive technology specialists in Florida K-12 public schools, and identify training opportunities that may have helped them achieve professional competence in the evaluation and provision of assistive technology devices and services across AT service providers from different preparations.

The study applied quantitative and qualitative methods to determine answers to the following six research questions: (1) to what extent does the perceived level of AT knowledge differ among AT specialists from different occupations in the Florida public school setting, (2) to what extent does the perceived level of AT skills differ among AT specialists from different occupations in the Florida public school setting, (3) what are the AT specialists' perceptions about their AT knowledge and skill levels, (4) what common competency sets are needed for the AT specialist, regardless of their occupational role, (5) what are the training opportunities among AT specialists from different occupations in the Florida public schools setting, and (6) what type of training opportunities are essential among AT specialists from different occupations in the Florida school setting.

In order to gather data of breadth and depth, the researcher disseminated an online survey, which 39 AT providers from the five Florida school regions completed. Interviews were conducted with seven of the survey respondents to triangulate interview data with the survey data. Results suggested that assistive technology specialists possess different levels of assistive technology knowledge and skills. Assistive technology specialists from different professional backgrounds and years of experience identified a lack of competence in several areas where they currently provide AT services. Assistive technology specialists should seek continuous in-service training to increase their assistive technology knowledge in the evaluation and recommendation of AT equipment and services for students with special needs in schools. This training is vital to meet their students' assistive technology needs and legislation requirements for assistive technology services for students with disabilities. Recommendations for the improvement of assistive technology professional practice in schools are included in the study.

Acknowledgements

I would like to express my deepest gratitude to my husband and son for their unconditional support and for cheering me through the good times and the bad ones too. I would also like to thank my sister Odette and my friend Hernan Ruf for their support and best wishes.

My gratitude also goes to Dr. Laurie P. Dringus, Dr. Steven R. Terrell and Dr. Michael Sharpe for being part of my dissertation committee. Most importantly, I want to thank all those individuals with special needs that have been part of my life and have made me participant of their success with the use of assistive technologies. They made me a believer and inspired me to help them with my knowledge.

Table of Contents

List of Tables

Tables

List of Figures

Figures

Chapter 1

Introduction

Background and Overview

As a result of the Individuals with Disabilities Education Act (IDEA) mandate in 1997 to provide assistive technology in schools, federal legislation has been enacted that provides funding for the development of public information and training programs for individuals with disabilities, as well as the provision of services and equipment for providers. Assistive technology (AT) has been incorporated into these services as it has been shown to be a practical solution to promote academic success for students with disabilities (Akpan, Beard, & McGahey, 2014; Smeak, 2014; Simpson, McBride, Spencer, Lowdermilk, & Lynch, 2009). AT services are educational services provided to individuals with disabilities to promote technology mastery, and are often shown to improve student outcomes. For example, Retter, Anderson and Kieran (2013) found that the use of iPad 2 with specific applications could result in academic gain in reading comprehension, reading fluency and vocabulary in students with learning disabilities. Raskind and Higgins (1999) suggested that the use of speech recognition technologies with children with learning disabilities between elementary and secondary grades improves their writing skills. Zhang (2000) demonstrated improvement in writing behaviors and performances in children with learning disabilities and behavioral problems with the use of a computerized writer. Cook, Adams, Volden, N. Harbottle and C. Harbottle (2011) demonstrated that the use of adapted robots increases social and language skills in children with cerebral palsy, resulting in an increased attention span in academic tasks.

The IDEA mandate for AT services does not specify which professional should assume the role of assistive technology providers in schools, making this assignment open to a variety of professionals. In most schools, assistive technology providers or assistive technology specialists, include general teachers, special education teachers, occupational therapists, speech and language pathologists, psychologists, rehabilitation engineers, and physical therapists among others (Davis, Barnard-Brak, & Arredondo, 2013; Dyal, Carpenter, & Wright, 2009). These assistive technology specialists are often responsible for the evaluation of students' assistive technology equipment and services that are identified in the Individualized Education Plan (IEP). In many occasions they are also part of the IEP team. As part of the process of identifying assistive technology needs for students, assistive technology specialists often perform evaluations and discuss educational goals with teachers and school personnel who are responsible for the care and education of the students.

Overall, the process for identifying assistive technology needs varies among professionals acting in the role of assistive technology specialist (Davis, Barnard-Brak & Arredondo, 2013; Bausch, Jones, Evmenova, & Behrmann, 2008). Bausch, et al. (2008) investigated differences in AT services by providers from different backgrounds. They found that occupational therapists focused their AT services on functional skills, speech and language pathologists on augmentative and alternative communication, teachers on child training and curriculum integration, and paraprofessionals on the set up and support of AT. The AT process also varies by school district and the state where AT specialists are practicing, as unique regulations vary by school district and state as well (Dalton & Rouch, 2010).

Another legislation that supports the use of assistive technology services is The No Child Left Behind Act (P.L. 107-110) of 2002. The No Child Left Behind Act requires that states

establish general statewide performance standards and measures of performance of all students. It also requires that highly qualified personnel be responsible for their evidence-based instructional practices (Parette et al., 2013; Parette, Blum, & Boeckmann, 2009). The NCLB specifies that to be highly qualified, teachers need to be fully licensed, certified or pass a state competency test and follow guidelines that are based on professional practice standards (Roach & Frank, 2007). However there are no specific competencies established in NCLB for school AT specialists. There are also no national guidelines in place that identify the minimal training required of the individuals that provide assistive technology services in schools (Dalton & Rouch, 2010). As a result, Simpson, McBride, Spencer, Lowdermilk, and Lynch (2009) reported that many professionals currently working with students with disabilities have not received adequate training and do not have the competence for the appropriate provision of assistive technology services in public schools. The lack of personnel in schools that possess appropriate competencies in AT affects the implementation of legal mandates that encourage the development of services and provision of equipment for individuals with disability to improve their educational outcomes and independence (Beard, Carpenter & Johnston, 2011; Hemmingsson, Lidstrom & Nygart, 2009). The dissertation study identified specialized knowledge and skill levels in AT to increase awareness of the necessary competencies that AT specialists must acquire through training.

Training in Assistive Technology

Since the evolution of the AT specialists began, the identification of professional competencies with delineated practical knowledge, skills and standards in AT has been a main challenge and concern in the AT community (Beard, Carpenter & Johnston, 2011). As a result, some organizations have identified minimal competencies in the area of AT to comply with best

practices and guide educational programs for pre-service training and further continuing education for professional development in the AT area (Post, 2009; RESNA, 2015; Smith et al., 2009). In recognition of the importance of professional competence in AT, and the lack of previous training available, several professional organizations and educational institutions have also modified their programs and curriculums to add or increase the number of hours dedicated to the training of specialized knowledge and skills in AT (Brady, Long, Richards, & Vallin, 2007; Judge & Simms, 2009). The general AT knowledge covered in these courses include some of the following topics: AT definition, laws and legislation related to AT, AT models, ethical guidelines, assessment procedures, basic biomechanical and ergonomic principles, products information, and technology-related terminology (Dyal, Carpenter, & Wright, 2009). Participants are required to demonstrate proficiency in identifying an individual's AT needs and then recommend the best practical AT devices. Additional course objectives include the practice in the developing procedures for evaluation, implementing instructional guidelines for students, educators and caregivers, and designing and fabricating new AT devices (Brady, Long, Richards, & Vallin, 2007; Lahm, 2003). Despite the efforts to increase the AT awareness of professionals, empirical evidence suggests that there is still a lack of knowledge and skills in relation to AT (Judge & Simms, 2009; Lee & Vega, 2005; Long, Woolverton, Perry, & Thomas, 2007). For example:

Special education teachers. Numerous researchers find that training for technology appropriations is lacking, especially within the special education discipline. Lee and Vega (2005) studied the assistive technology preparation of 154 special education personnel in California, and found that 41% of the participants reported having a lack of knowledge related to assistive technology. Judge and Simms (2009) also examined the preparation of special education teachers

in assistive technology and found that only one third of undergraduate special education programs require an assistive technology course, and that less than one quarter of the master's programs required one assistive technology course. Smith and Kelly (2007) reported that only 18 out of 30 academic programs that train teachers of students with visual impairments offered assistive technology courses and of the other programs surveyed just integrated AT within other courses in their programs. McCray, Brownell and Lignugaris (2014) stated that special education teacher pre-service programs are now including more basic information about the importance of AT in communication, seating, positioning, mobility for individuals with sensory and physical disabilities; however, the researchers also found that at the time of graduation, most special education teachers do not possess the knowledge to evaluate and recommend AT to students independently. These findings are alarming and result in a lack of training of teachers who later may be requested to serve as an assistive technology provider. This lack of preparation in the pre-service phase of training has researchers and experts calling for augmented opportunities for assistive technology preparation in special education as well as other disciplines.

Speech and language pathologists. When examining the preparation and performance of other education professionals who work with assistive technology in schools, similar findings are evident. According to the American Speech-Language-Hearing Association (2014), one of the knowledge and skills standards for speech and language pathologies establishes that oral, manual, augmentative and alternative communication (AAC) techniques and assistive technologies should be addressed in the pre-service phase. However, Ratcliff, Koul, and Lloyd (2008) investigated speech pathology programs and found that only 73% of the speech and language pathology programs included one or more courses in AAC, and 77 of those courses were only offered at the graduate level. When investigating the educator's perceptions about

their preparation in AT, survey data revealed that only 33% of the educators perceived that 76-100% of their students were prepared to work with individuals that needed AAC, 54% of the educators believed that 1-75% of their students were prepared to work with AAC, and 13% of the educators reported that none of their students were prepared to work with ACC. Although the results indicate an increase in the number of educational programs now offering training in AAC and assistive technologies in speech and language pathology, there is still a perceived lack of knowledge in AT that may be affecting the recommendation and delivery of AAC and assistive technologies services (Ratcliff, Koul, & Lloyd, 2008).

Occupational therapy practitioners. The American Occupational Therapy Association (2007a, 2007b, 2007c) requires entry-level doctorate and masters programs in occupational therapy as well as the entry-level occupational therapy assistant programs, an accreditation standard related to assistive technology knowledge and skills. This standard requires that all academic occupational therapy programs prepare their students in the areas of design, fabrication, application, and training of assistive technologies and devices. To investigate the assistive technology training experiences of occupational therapists, Long, Woolverton, Perry and Thomas (2007) administered a national survey to 272 graduated pediatric occupational therapists. The findings of their study revealed that 40-73% of the participants reported having inadequate training in assistive technology (e.g. policies related to assistive technology services, assistive technology organization and services). The study also indicated that pediatric occupational therapists (67-92%) lack confidence in the evaluation and selection of assistive technology services and devices, and had difficulties determining outcomes and dealing with a culturally diverse population. Although schools and associations are recommending, and in some cases requiring AT training, research indicates that training is insufficient or not taking place.

Long et al. (2007) maintained that this lack of training as well as low confidence level in educators providing AT create great concern in the field of education. Even though most occupational therapy practitioners receive some type of training in AT, research by Long et al. (2007) indicates that OT practitioner's confidence levels when performing evaluations, and selecting and operating appropriate AT devices are low. Hemmingson, Lisdtrom and Nygard (2009) also purported that the lack of AT knowledge and skills in school personnel interferes with the selection of appropriate services and equipment that could allow students with special needs to improve academically and be more independent.

The current investigation sought to provide additional understanding of this important topic and describe the incidence of training opportunities and current competencies of educational professions providing AT services across different disciplines. By the identification of the specific needs areas related to AT knowledge and skills, administrators will be able to design discipline specialized training to AT professionals to target these needs. Furthermore, the identification of the current training opportunities available for different professionals will contribute to the development of comprehensive guidelines for training as well as strict requirements for professional recruitment of assistive technology specialists.

Problem Statement and Goals

As a result of the rapid growth in the identification of students with special needs, and the integration of these students into the regular curriculums in schools, the demand for assistive technology devices and services has increased in the past two decades. Many students with special needs use assistive technology to make the necessary accommodations and adaptations to access information needed to improve learning and meet academic goals. For example, students with visual impairment and blindness are able to use devices such as handheld magnifiers and

styluses to write Braille, as well as computer screen magnifiers, and Braille printers and screen reading software. These devices enable students to access the material assigned and discussed in their courses (Johnstone, Thurlow, Altman, Timmons, & Karo, 2009). Cook et al. (2010) and Zhang (2000) identified that students with communication and cognitive deficits are better expressing their thoughts and needs to teachers with the help of assistive technology devices such as communication boards, picture exchange communication systems and computer electronic speech devices.

Legislation has been passed to support assistive technology programs in schools for students with special needs and requires that the AT needs be identified on each student's IEP (Petcu, Yell & Fletcher, 2014). Many schools have implemented efforts to better assess and implement the assistive technology needs of their students, however, numerous researchers argue that barriers are still affecting the provision of AT services in schools (Luft, Bonello, & Zirzow, 2009; Wisdom, White, Goldsmith, Bielavitz, Rees, & Davis, 2007). Luft, Bonello, and Zirzow (2009) maintained that a major challenge that is preventing the delivery of appropriate assistive technology is the lack of knowledge and skills of educational professionals related to assistive technology devices and services. Their research demonstrated a lack of knowledge of Ohio middle school teachers related to the AT used for students that are deaf or have hearing difficulties, preventing their students to be exposed to useful technologies. Wisdom, White, Goldsmith, Bielavitz, Rees and Davis (2007) purported that a major barrier in the provision of AT services is that schools do not have the adequate number of personnel to perform the evaluation, provision of services and training of assistive technologies. Although there is disagreement surrounding the reasons for inadequate AT service delivery, the fact remains that outcomes are being compromised and students and families are dissatisfied with the assistive

technology services provided at schools (Riemer-Reiss & Wacker, 2000; Verza, Lopes, Battaglia, & Uccelli, 2006).

It is unknown whether certain school professionals are fully prepared or suited to serve as AT specialists. Research focused on the evaluation of specific personnel like special education teachers, speech pathologists and occupational therapists that work with assistive technology has been published (Judge & Simms, 2009; Long, et al., 2007; Marins & Emmel, 2011; Ratcliff, Koul, & Lloyd, 2008; Zhou, Smith, Parker, & Griffin-Shirley, 2011). However, there are no studies found that evaluated the level of AT competencies of AT specialists, given the range of personnel that assume different roles as they apply AT in their positions. The addressable problem of the study was a lack of information regarding known differences among these professionals. The overarching goal was to examine and describe the perceived AT competencies and training opportunities of school AT specialists across different disciplines. Two sub-goals framed this study in addressing the problem:

Goal One: To describe the perceived knowledge and skill level differences among AT specialists in Florida K-12 public schools. This is relevant as current practices reveal that a diverse group of professionals occupy positions as assistive technology specialists in schools. There is also a need to identify the differences among these professionals as this information might help school administrators know the factors that may impact the lack of competence in the provision of AT services in schools.

Goal Two: To describe the incidence of training opportunities for educational professions providing AT services across different disciplines.

Research Questions

The following research questions were investigated in the current study:

1. To what extent does the perceived level of AT knowledge differ among AT specialists from different occupations in the Florida public school setting?

   Lee and Vega (2005) found that the lack of knowledge in AT was the largest barrier that teachers had in the provision of AT services. They indicated that the lesser knowledge level that professionals have about AT, the lesser provision of services were provided. Zhou, Smith, Parker, and Griffin-Shirley (2011) also found that one of the greater barriers on the provision of AT services is the lack of AT preparation of teachers at schools, especially for students with visual impairments.

2. To what extent does the perceived level of AT skills differ among AT specialists from different occupations in the Florida public school setting?

   Specialized skills on the use of assistive technologies are required to determine which AT devices and services are needed to best meet the needs of users (Long, et al., 2007).

3. What are the AT specialists' perceptions about their AT knowledge and skill levels?

   According to Davis (1993) an individual's technological acceptance is an essential factor in determining the success or failure of a computer system project. Smarkola (2008) also reported that teacher's perceptions about their use of technology affect how they might use it.

4. What common competency sets are needed for the AT specialist, regardless of their occupational role?

   Zhou, Smith, Parker, and Griffin-Shirley (2011) reported that the perception of teachers that work in assistive technology is that they learn the basic information about technology unless they identify specific student's needs. According to Lee and Templeton (2008), regardless of the challenges related to the provision of AT services in educational agencies, educational professionals should seek for additional knowledge and skills in AT. Some of the competencies needed for educational professionals in AT include: knowledge and skills in AT devices and services, knowledge about funding sources, collaboration with families, caregivers and other professionals, and know how to advocate for the students and their families.

5. What are the training opportunities among AT specialists from different occupations in the Florida public schools setting?

   The evaluation process of the individual's competence for professional practice should be dynamic and ongoing to promote an increase on education and skills related to the job responsibilities (McGaghie, 1991). Education and training should be available to professionals for the incorporation of best practice models (Fouad et al., 2009).

6. What type of training opportunities are essential among AT specialists from different occupations in the Florida school setting?

   Continuous training in assistive technology is crucial and as training and

experience increases, confidence in applying AT knowledge increases (Hecimovich & Volet, 2011; Long et al., 2007).

Relevance and Significance

Professional Standards and Competencies

Given that children with disabilities are supported by law and legislation to succeed in academic settings, it is vital that the professionals who try to help them meet these goals possess the qualifications necessary to facilitate the process. The No Child Left Behind Act requires highly qualified educators that apply instructional practices supported by scientifically based research for accountability and efficiency in the classroom (U.S. Department of Education, n.d.). Contrary to what is established by legislation, Hemmingsson, Lidstrom and Nygart (2009) identified that there are barriers in the provision of AT services in schools. In their research on children with physical disabilities, Hemmingsoon et al. demonstrated that a student's AT devices were often provided without a supportive rationale and/or were not integrated into their academic goals. This practice directly affects the academic achievement of students with the use of AT devices, as there was not significant value and application to their academic activities. Smith, Kelley, Maushak, Griffin-Shirley and Lan (2009) corroborated these findings and reported that an educator's lack of knowledge in AT affects the evaluation and selection of adequate AT services and devices. They also identified the need to implement competencies in the provision of AT services specifically to students with visual impairments.

There is a body of AT literature related to standards and professional competence requirements in the assistive technology industry (Dalton, & Rouch, 2010; Marins & Emmel, 2011; Post, 2009; RESNA, 2015; Smith et al., 2009). Many organizations have established specific practice guidelines related to AT. Examples are the Guidelines for Knowledge and Skills

for Provision of Assistive Technology Products and Services of the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA), Specialized Knowledge and Skills in Technology and Environmental Interventions for Occupational Therapy practice of the American Occupational Therapy Association (AOTA), and the National Educational Technology Standards (NETS) of the International Society for Technology in Education (ISTE). Unfortunately, Dalton and Rouch (2010) reported that there are no compilations of comprehensive uniform standards implemented among AT specialists in the educational setting as these are adopted mostly by individualized disciplines. This represents a barrier in the AT field, and without uniform standards, the integration of AT in educational environments is fragmented. Alper and Raharinirina (2006) identified inconsistencies in the use of guidelines and practice standards. Some of the imparities include the lack of uniform application of individualized assessments to identify AT services and equipment, and the lack of support and follow up to students and their families. These activities resulted in misappropriation of available funds, and nonuse or abandonment of the equipment recommended, and this, in turn, affected the satisfaction of students and delayed the process of identifying best AT options.

The overarching goal of the proposed study was to examine and describe the AT competencies and training opportunities of school AT specialists across different disciplines. With this information, educators, researchers and school administrators can better develop requirements for professional recruitment of AT specialists and comprehensive guidelines for training to assist the educational institutions meet the students' demands and AT needs. The recommendations identified from this study are relevant to the professional practice of assistive technology in schools. These recommendations may help augment training programs that can

assist educational institutions meet the legislation requirements for AT services for students with disabilities.

Barriers and Issues

To the best of the researcher's knowledge, there was no physical or psychological risks or issues associated with the procedures in this study. Only three possible barriers or discomforts were identified in the study. The first possible barrier or source of discomfort was the proclivity of the participants to honestly respond to the survey questions, which may have resulted in biased study results. Participants with lower AT competency may have rated themselves higher for fear that if they rated themselves at a lower competency, then this rating may have affected their jobs. These concerns may have interfered with an accurate representation of their professional competencies and resulted in them not answering the questions accurately. Assurance of confidentiality and the positive intentions of the study were reinforced to the participants in the informed consent document to facilitate honest responding.

The possible perception of loss of time was the second barrier or discomfort identified in the study. Given that the online survey took approximately 20 minutes to complete (5 minutes to read the instructions and sign the consent and approximately 15 minutes to complete the actual online survey) and the phone interview 25 minutes, possible participants might have perceived this as a loss of time in their daily schedule. In order to prevent the feeling of loss of time, the completion of the online survey and phone interview was held at a time and location convenient for the participants and did not interfere with daily job related activities.

The third barrier or discomfort was the loss of confidentiality. Participants may have perceived that their names were going to be associated with their responses. In order to protect the confidentiality of the participants, their names were not associated with their records.

Confidentiality information was provided to all potential participants prior to the study to assure them that their identity would be protected.

Assumptions, Limitations and Delimitations

Assumptions

1. The participating assistive technology specialists were honest about their perceived level of AT knowledge and skills as well as their training needs while completing the interview and/or survey.
2. The participating assistive technology specialists would complete all items from the survey.

Limitations

1. The information collected about the perceived level of AT knowledge and skills, as well as the AT training received and needed was based on self-report data from the participants, representing uncontrolled information.
2. The small sample might have contributed to the differences between the mean scores among different professions.

Delimitations

1. The participants were professionals identified as assistive technology specialists working in Florida public schools.
2. The study was limited to obtain information about the general perceived AT level of knowledge and skills of ATS and not about specific knowledge that they possess related to AT equipments. Thus, participants mentioned a variety of AT equipment categories in their open-ended question responses and in the phone interview.

Definitions of Terms

The following terms are used throughout the study:

Assistive Technology Devices - Any item, piece of equipment or product, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities (Assistive Technology Act, P.L. 108-364, 2004).

Assistive Technology Services - The evaluation of the needs of the child; purchasing, leasing, or otherwise acquiring a specific device; selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing specific devices; coordinating and using other services such as therapy, education, rehabilitation, and vocational training or technical assistance to the child, family, or caregivers in the use of specific devices; and technical assistance or training for professionals or others who provide services to the child (P.L. 100-407).

Assistive Technology Specialists – A professional who specialized in the assessment and provision of assistive technology. The assistive technology specialists usually possess a professional background in engineering, occupational therapy, special education, physical therapy, speech-language pathology or vocational rehabilitation counseling (Cook & Polgar, 2014)

Competency – Competency is related to an individual's ability to make deliberate choices from a repertoire of behaviors for handling situations and tasks in specific contexts of professional practice (Govaerts, 2008).

Knowledge level – For the purpose of this study, knowledge level represents the information related to how much understanding the participants have about AT definition, laws

and legislation related to AT, AT models, ethical guidelines, assessment procedures, basic biomechanical and ergonomic principles, products information, and technology-related terminology (Dyal, Carpenter, & Wright, 2009).

Assistive Technology Specialist (ATS) – ATS are the professionals appointed by Florida school regions to evaluate students on their assistive technology needs. The ATS coordinate their region's assistive technology evaluations and implementation of services (Florida Department of Education, 2011).

Professional Competence – Professional competence is related to the in-depth and supported communication, knowledge, technical skills, clinical reasoning, emotions, and values that professional possess in their daily practice to the provision of services (Epstein & Hundert, 2002).

Proficiency – Proficiency relates to a high level of competence or skill in a specific area (North Oxford American Dictionary, 2010).

Skills level – For the purpose of this study, skills level represents the application of knowledge related to the identification of the individual's AT needs, the identification and operation of the best practical AT devices selected for individuals with special needs, development and implementation of procedures for evaluation, implement instructional guidelines for students, educators and caregivers, and design and fabricate devices (Brady, Long, Richards, & Vallin, 2007; Lahm, 2003).

Summary

The recognition of assistive technology as a medium to facilitate learning as well as a solution to increase independence in persons with disabilities has increased during recent decades. The need for assistive technologies have also have caught the attention of professional

organizations that created guidelines and standards to guide professionals in their use and delivery of services. However, questions related to the lack of AT knowledge, skills, and training that professionals in the field possess have been raised. This study examined and described the AT competencies and training opportunities of school AT specialists across different disciplines. This information will facilitate educators, researchers and school administrators to develop requirements for professional recruitment of AT specialists. It will also help create comprehensive guidelines for training that will assist the educational institutions meet the students' demands and AT needs.

Chapter 2

Review of Literature

Assistive Technology

Assistive technology devices (AT) are described by the U. S. Assistive Technology Act of 1998 as any item, piece of equipment, or product system (commercially acquired, modified, or customized), that is used to increase, maintain, or improve functional capabilities of individuals with disabilities (U.S. Government, n.d.). The types of AT vary from no-technology to high technology according to the electrical power required, complexity and practicality (Edyburn, 2009). From these groups, an array of technologies is currently available to promote learning for students with disabilities. In K-12 school settings, the AT available may vary according to the student's cognitive, mobility and sensory disabilities or by their function (e.g., aids for daily living, communication aids) in order to facilitate academic achievement (Beard, Carpenter, & Johnston, 2011). Examples might be raised-line paper, switches, magnifiers, audio books, word predictors and augmentative communication devices among others.

The implementation of assistive technology equipment in schools is based on the team's (e.g., teachers, therapists, parents, students) decisions in accordance with each student's Individualized Education Plan (IEP) and the state accommodations policies (Parette, Blum, & Boeckmann, 2009). All recommended equipment should be justified by a need to promote and facilitate a student's independence and learning in the school setting. Some approved equipment is retained in schools while other equipment are maintained by the students with special needs in their home.

Assistive Technology Devices

Assistive technologies used in schools are selected to promote learning and functional skills in students. They vary from postural support systems to increase and maintain posture during classes to iPad applications to facilitate problem-solving steps during mathematical solutions (Cook & Polgar, 2014). Many educational applications are used in primary grades to facilitate subjects like reading, writing, science and music. Vocational applications are also used in schools to prepare students for work environments. A variety of simple to complex and hard to soft technologies are used to help students succeed in future workplaces. Assistive technology strategies as well as accommodations are also considered to promote communication skills, and tasks like filing, sorting, and assembly (Cook & Polgar, 2014).

Reading. For students that present difficulties with visual acuity, oculomotor functions, scanning, and letter and word recognition, there are solutions that can assist them with reading. Electronic readers as well as electronic books include features that allow the users to adjust the font type and size of the text, change the background colors of the screens and have integrated text to voice features that can read books out loud. Siegenthaler, Wurtz and Groner (2010) studied the use of electronic books on ten individuals between the ages of 16 and 71. Results of the study showed that changes on font size on e-readers significantly reflected an increase in legibility in users. The eye-tracking data collected on the participants also showed a significant decreased fixation on the text when compared to paper books, which represented an increase in legibility.

Many of the assistive technologies available for students with low vision in schools and libraries to facilitate reading include enlarged prints (e.g. books, watches, board games) and other low and high technologies that help magnify text and graphics (e.g. magnifying glasses,

magnifier computer screens, software). Lazarus, Thurlow, Lail, Eisenbraun and Kato (2006) conducted a study that found that 48 states used large-prints examinations to display items on tests. Findings also revealed that 44 states used Braille testing (including audio features) allowing students with visual impairments to perform higher than without the use of technology. Johnstone, Thurlow, Altman, Timmons and Karo (2009) reported that technologies available in school for students with visual impairments included both visual and auditory features for reading (i.e. JAWS for Windows, Duxbury, ZoomText Magnifier/Reader). These devices have also been used for instruction and testing resulting in positive performance and scoring for students with visual impairments.

Writing. Writing deficits are often seen in students that present language, motor, cognitive and sensory impairments (Wollak & Koppenhaver, 2011). Students with special needs tend to have two to four times more difficulties in spelling than typical students (MacArthur, Graham, Haynes & DeLaPaz, 1996). Other difficulties that students with special needs possess that interfere with their writing skills are in the areas of written expression, punctuation, capitalization and organization of thoughts and ideas. New features integrated into computer software are allowing teachers to make accommodations for students with special needs in order to promote writing skills. Personal computer spell checkers, digitized text, word prediction software, speech or voice recognition, and alternative writing are the most common computer features used in schools to facilitate writing (Cullen & Richards, 2008; Barbetta & Spears-Bunton, 2007).

Math. Students with learning disabilities, visual and cognitive deficits often present difficulties with mathematics. Ortega-Tudela and Gomez-Ariza (2006) studied the use of educational software to learn mathematical counting skills by students with Down syndrome.

The researchers assigned multimedia education software to ten students and a traditional paper-and-pencil approach to eight students to learn basic counting skills. Results indicated that the students who used the multimedia software performed significantly higher than those that used the paper-and-pencil approach.

Landau, Russell, Gourgey, Erin and Cowan (2003) examined the use of the Talking Tactile Tablet on the mathematic performance of students with visual impairments. The results of the study revealed that students performed better on five of the eight items used on the math examinations when using the Talking Tactile Tablet. These results represented a positive impact of the use of technology and multisensory approach on the examination of students with visual impairments.

Music. Students with physical disabilities who exhibit fine motor and cognitive deficits present challenges using musical instruments (Criswell, 2014). Hobbs and Worthington-Eye (2008) studied the efficacy of a software program to promote an augmented reality (AR) environment for musical creativity. The software program used was the Virtual Music Instrument (VMI). The VMI used a standard webcam to capture the students' movements and displayed them on a television screen or data projector. When the students reached for an object on the screen, a musical sound was emitted. At the conclusion of the eight-week study, all students showed improvement in the areas of alertness, eye contact, movement, responses, colors, shapes, and sounds.

Music teachers in a K-12 school in North Carolina used music notation software to create parts of Braille for music and audio files (Coates, 2010). Their students' initial and major challenge was to develop the Braille music reading and learning skills that were necessary for more complex instruction in preparation for band instruments. The teachers were then

responsible to obtain or create reading materials in print or Braille for the students. Music instruction was reinforced by audio recording. Recording software packages were used to develop large audio files and produce compact discs for rehearsals that served to reinforce memory skills and completion of assigned work (Coates, 2010). An example of a program that is used for music notation is the BrailleMUSE (Braille Music Support Environment), which is a free Braille music translator server. It was designed to translate digital music scores from the Internet into Braille. The BrailleMUSE system also allows the translation of MusicXML (word processing and spreadsheet program) documents of scanned music sheets with the use of computer software (Gotoh, Minamikawa & Tamura, 2008).

Communication. According to the National Institute on Deafness and Other Communication Disorders (2015) between 6 and 8 million people in the United States possess some form of language impairment. Children who present language impairments at an early age have demonstrated difficulties in the academic and social areas (Kaiser & Roberts, 2011). Augmentative and alternative communication (AAC) systems are assistive technology solutions used in schools to enhance and promote functional communication that facilitate learning and social interaction. Letter boards, gestures, sign language, picture boards and speech-generating devices (SGDs) are some AAC systems used in schools. Rackensperger (2012) identified that high school students with complex communication needs recognize the importance of AAC systems to assist them with the necessary accommodations needed, motivation and self-determination to succeed in academic settings.

Mellman, DeThorned, and Hengst (2010) conducted a study to examine speech-generating devices in schools. The study consisted of classroom observations and interviews with three students between the ages of 4-9 who presented with complex communication needs

and used speech-generating devices. Despite barriers identified for SGDs access, the investigator identified that the students continued to use speech-generating devices to participate in class and to communicate with other students. Ganz, et al. (2012) also reported that speech-generating devices and Picture Exchange Communication Systems (PECS) were mostly used by children with autism spectrum disorders (ASD) to facilitate communication and behavioral outcomes.

Computer access. Students with physical, cognitive and learning disabilities are now able to access computers to facilitate education, communication, independent living and recreation. Many students with disabilities are able to operate a computer with the latest accessibility features that their computer operating systems have (i.e. Narrator, text-to-speech, screen magnification, VoiceOver, on-screen keyboard) (Dell, Newton, & Petroff, 2012). Low assistive technology adaptations like keyboard labels, mouth sticks, pointers, keyguards, moisture guards, and magnifying lenses are also used for computer access. Other more sophisticated technologies available are adaptive joysticks, head-pointing systems, eye-gaze systems, touch screens and special software.

Bouck, Flanagan, Joshi, Sheikh and Scheppenback (2011) studied the efficacy and efficiency of computer-based voice input, speech output (VISO) calculator for high school students with visual impairments. The participants used VISO during 20 assessments to resolve mathematic problems (i.e. basic operations, exponents, square root problems). The results of their study revealed that the VISO facilitated the students to be more independent in the use of calculators and it decreased the time that it took them to complete mathematical activities.

Legislation

Since the 1970's, legislation has been enacted that supports the use of assistive technology devices and services in the United States. Supporters, professionals, families and legislators have advocated for civil rights laws and legislation related to assistive technology to eliminate discrimination and increase the accessibility and integration of people with disabilities into the community. The first major legislative success for people with disabilities was the approval of the civil rights law of the Rehabilitation Act of 1973 (P.L. 93-112). Section 504 of the Rehabilitation Act established that it was prohibited to discriminate against individuals with disabilities in regards to employment and academic program admission. Due to the Rehabilitation Act, many architectural changes occurred in academic organizations as well as in work-based settings. Another major civil rights law was the American with Disability Act (ADA) (P.L.101-336) that established that all public buildings should be accessible to individuals with disabilities.

As advancements in technology continued, people with disabilities became accustomed to the use of community facilities and adaptive equipment to become independent which resulted in increased legislation to meet the needs of this population. The following are the major legislative actions related to assistive technology and education approved in the U.S.

Special education legislation. In 1975, the U.S. Congress enacted the Education for All Handicapped Children Act (EHA) (P.L. 94-142). This act granted access to educational programs for children with disabilities by requiring schools to provide equal services to all students. EHA was reauthorized in 1986 (P.L.9-457) for the inclusion of infants, toddlers and their families. The Individualized Family Services Plan (IFPS) was also introduced in this legislation (Beard, Carpenter, & Johnston, 2011).

The Individuals with Disabilities Education Act (IDEA) (P.L. 101-476) was later approved in 1990. IDEA mandated that all public schools should provide assistive technology devices as needed for children with disabilities. IDEA represented a challenge to education providers, as many of them were new to assistive technologies. The number of students with disabilities increased in the classrooms as were the demands for AT, but legislation did not indicate how schools should augment their identification of the needs and delivery of care to students with disabilities related to assistive technologies. In 1997, IDEA was amended to affirm that public schools must provide children with disabilities Free Appropriate Public Education (FAPE) using the general education curriculum, requiring increased use of assistive technologies (Mittler, 2007). IDEA was reauthorized in 2004 after some changes and the requirement that students with visual impairments or blindness should have free access to all print instructional material. IDEA 2004 also became more clear in its mandate that special and general education teachers must possess knowledge about AT to provide quality services (Van Laarhoven et at., 2008).

In 2001, President George W. Bush signed the No Child Left Behind Act (P.L. 107-110) requiring states to establish statewide performance standards and measures of performance for all students. The No Child Left Behind Act also required that schools must teach children using evidence-based instructional practices supported by scientifically based research and that teachers must be highly qualified in the subjects they are assigned to teach (Parette, Blum, & Boeckmann, 2009).

The Individuals with Disabilities Education Improvement Act (IDEIA) of 2004 (P.L. 108-446), required that all children with disabilities to be included in the state accountability systems and participate in statewide assessments as appropriate (Parette, Blum, & Boeckmann,

2009). IDEIA also stated that special education teachers must be certified in both the content area they teach and in special education to meet the highly qualified criteria required to teach. In some states, in order to obtain the state teaching certificate, special education teachers are required to demonstrate competencies in the use of assistive technology. For example, New York State requires that special education teachers possess courses in assistive technology, curriculum, instruction and managing environments related to students with disabilities (New York State Education Department, n.d.). IDEIA stipulations were directed to all professionals in the education area that worked with children to have a better understanding of the AT process and better serve the participation of children in academic activities.

Assistive technology legislation. The Technology Related Assistance for Individuals with Disabilities Act of 1988 (P.L. 100-407) was approved with the purpose of providing funding for the development of consumer information and training programs. In this law the terms assistive technology devices and assistive technology services were initially defined (Dyal, Carpenter, & Wright, 2009). These definitions were broad and were developed with a medical background in mind. In 1998, the Assistive Technology Act (AT Act) (P.L. 105-394) mandated the approval of federal grant funds to develop statewide resources to make assistive technology devices and services accessible for people with disabilities (U.S. Department of Education, n.d.). The AT Act was revised in 2004 in order to assist states in developing the infrastructure to provide assistive technology to individuals. The state requirement of continuous evaluation of the effectiveness of the programs established was also added creating accountability for how the AT grants were to be used (Beard, Carpenter, & Johnston, 2011).

Assistive technology policy in Florida. Florida public K-12 statutes identify that the following agencies are responsible to guarantee accessibility, utilization, and coordination of

appropriate assistive technology devices and services statewide: The Florida Infants and Toddlers Early Intervention Program in the Division of Children's Medical Services (CMS) of the Department of Health, The Division of Blind Services, the Bureau of Exceptional Education and Students Services, and the Division of Vocational Rehabilitation of the Department of Education, and The Voluntary Prekindergarten Education Program administered by the Department of Education and the Agency for Workforce Innovation (Florida Department of Education, 2011). In Florida K-12 public schools, a group of professionals appointed as assistive technology specialists (ATS) act as evaluators and providers of assistive technology. The ATS work under the administration of the Bureau of Exceptional Education (ESE) of the Department of Education.

Assistive Technology Non-use or Abandonment

The lack of strict and clear competency and training guidelines in the assistive technology area in schools has resulted in nonuse or abandonment of devices by students with disabilities as well as negative attitudes or feelings of incompetence from professionals that provide AT (Hemmingsson, Lidstrom, & Nygart, 2009; Leung, Brian, & Chau, 2013). In 2009, Hemmingsson, Lidstrom and Nygart, investigated the use and nonuse of assistive technology devices by observing and interviewing students with physical disabilities and therapists in schools during a period of six months. Part of the rationale supporting the nonuse of assistive technology devices included: teachers' rejection attitude about the use of AT devices in the classroom and their questioning related to their integration in educational activities, and lack of social support. In addition, the identification of training needs for therapists recommending AT was made in order to increase collaborative competencies in the integration of AT in schools.

Verza, Lopes, Battaglia and Uccelli (2006) identified that the reasons for abandoning AT devices by individuals with multiple sclerosis were the inappropriateness of the devices recommended and the insufficient information and training received about them from AT providers. Sharpe (2010) reported that most teachers (80.3%) surveyed from 19 Georgia school districts concur that they needed more professional development opportunities in order to use AT effectively. In addition, 60% of the teachers interviewed considered that their lack of training limited their use of AT in the classroom. Other reasons found for the non-use or abandon of AT were related to time constraints, technical problems, and the lack of staff or facilities to support AT.

The literature also mentions the lack of involvement of individuals with disability during the evaluation process and selection of devices as another factor for AT discontinuation. Riemer-Reiss and Wacker (2000) survey research investigated the factors associated with continuance/discontinuance of assistive technology among 115 individuals that received equipment in Colorado agencies. Researchers identified the lack of users' involvement as a significant factor of abandonment. Professional support was also identified as one of the most important factors for the continuous use of assistive technology. A practice model was recommended to include both professionals and users (individuals with special needs and their caregivers) in the evaluation team. A practice model recommendation was also supported by Watson, Ito, Smith and Andersen (2010) in their study that explored the effects of AT equipment in a special education setting at a public school. Investigators provided AT devices to 13 participants with the use of a multidisciplinary AT team. The use of a service delivery model was critical in the provision of AT. Results suggested that the use of a service delivery model provided by a multidisciplinary team demonstrated a positive impact on student achievement,

resulting in a total participation of students in the use of their AT equipment.

Assistive Technology Providers

Under IDEA, schools are responsible for the selection of the persons who will be providing assistive technology services. Very often, an evaluation team is gathered to conduct the AT evaluations but in many cases only one person per district is assigned for this duty for complex cases. The professionals that are typically involved in the evaluation process of AT in schools are composed of general and special education teachers, occupational therapists, psychologists, physical therapists, biomedical engineers, and assistive technology specialists (Beard, Carpenter, & Johnston, 2011; Dyal, Carpenter, & Wright, 2009; Parette, Blum, & Boeckmann, 2009). On occasions, this job is often assigned to staff who present interest in assistive technologies and that have no academic background or experience in the area of AT. This practice has been adopted by a number of schools or districts due to the lack of trained and knowledgeable professionals in the area of AT or the lack of funds (Hemmingsson, Lidstrom, & Nygart, 2009).

Even though the National Assistive Technology in Education (NATE) Network is committed to support professionals and teams who provide assistive technology services in schools, studies revealed that AT providers experience barriers in the provision of services (Beard, Carpenter, & Johnston, 2011; Costello, 2014; Long, et al., 2007; Smith & Kelley, 2007). Some of these barriers are related to funding and availability of equipment, lack of information, negative staff attitudes, and failure to provide follow up, but the main barrier is the lack of professional training (Costello, 2014; Hemmingsson, Lidstrom, & Nygart, 2009; Lee & Vega, 2005). With additional assistive technology preparation in educational curriculums, there is a need for continuous education and training in the latest technologies, patients' conditions and

legislation (Alper & Raharinirina, 2006). One study that surveyed the training needs of 272 pediatric occupational therapists (OTs) in assistive technology revealed that even though they received training in this area as part of their occupational therapy preparation, most rated their preparation in the area of AT as less than adequate (Long et al., 2007). The survey also revealed that most OTs rated them as having low confidence in terms of delivering assistive technology and services to the pediatric population.

Several studies also revealed that teachers of students with disabilities report that they have inadequate knowledge of assistive technology (Lee &Vega, 2005; McCray, Brownell & Lignugaris, 2014; Smith, et al., 2009). A study by Smith, et al. (2009) identified the need for highly reliable assistive technology competencies for teachers of students with visual impairments. The researchers used a Delphi method to evaluate the perceptions of 40 professionals related to their assistive technology competencies. The results led to the development of a set of 111 assistive technology competencies that could be used to train teachers of students with visual impairments in assistive technologies.

Presently, there are no specialized certifications or boards that monitor the requirements that all AT providers need to maintain competency in the field. In addition, there are no national certification or licensure requirements for assistive technology providers through the Department of Education (Dalton & Rouch, 2010). Rehabilitation Engineers Society of North America (RESNA) (a multidisciplinary association) is the only organization that provides the assistive technology professionals (ATP) certification to those who meet the experience and educational requirements (RESNA, 2015). However, individuals who pass their initial examination and follow renewal guidelines are not necessarily specialized in all of the areas related to AT. Some academic institutions have developed guidelines to add basic knowledge about AT to their

curriculums. However, there are no national standards implemented that require AT courses to be successfully completed by all health and educational professionals (RESNA, 2015; Smith et al., 2009). This leaves the area of assistive technology an unmonitored one for continuous competencies. A number of educational institutions are creating programs and guidelines to assist with the demands to facilitate training of professionals dealing with assistive technology services but more attention to this area is needed.

Evidence-Based Practices

In the 1990's the use of evidence-based practices (EBP) emerged in professions like medicine, nursing, rehabilitation, psychology and education. One reason that initiated the development of EBP was the continuing use of unsupported justification of discipline specific interventions (Goodman, 2003). The recommendation of modalities and services that lacked effectiveness and the treatment recommendations of services that were not needed for clients caught the attention of third-party payers. Consequently, third-party payers decided to implement regulations that limited the provision of services to interventions proven to be effective (Bouffard & Reid, 2012). The evidence based-practice model is now considered to be the model to follow to ensure best practices during the implementation of clinical and educational procedures and interventions in many disciplines (Morrison & Roberts, 2011). EBP employs the use of the best available research evidence in addition to the professional's expertise and experience, and the student's preferences (Bronson & Davis, 2012).

In education, the No Child Left Behind Act (P.L. 107-110) intensified the use of evidence-based practices with the new mandate that research-based instructional methodologies must be implemented in K-12 public schools (Parette, Blum, & Boeckmann, 2009). Burns and Ysseldyke (2009) administered a survey to 174 special education teachers and 333 school

psychologists to examine the frequency in which they use evidence-based practices with students with disabilities. Results revealed that the instructional methodologies with the highest empirical support were frequently used by both special education teachers and school psychologists on a weekly basis (6-32%). The participants also used instructional practices that had little empirical support and ineffective approaches (14-20%). These results indicate an improvement from the study presented by Agran and Alper (2000) that surveyed 78 general education teachers about the implementation of instructional strategies used with their students. The use of evidence-based procedures in the classrooms was limited among the special education teachers.

Some of the general barriers identified in the implementation of evidence-based practice are related to practice environment (e.g. organizational constraints, patient's expectations), prevailing opinion (e.g. usual routines, key persons not agreeing with evidence) and knowledge and attitudes (e.g. inability to identify evidence, self-confidence skills) (Fouad et al., 2009; Grol & Grimshaw, 2003). Pakos (2010) identified in a survey administered to school personnel several recommendations in the use of evidence-based interventions to encourage best practices. Some of these recommendations include the development of staff committees in schools to discuss topics related to school-based practice, a focus to increase staff competencies and knowledge with workshops and mentorship opportunities, and to create journal clubs and case study presentations. In addition, there are many approaches being developed to improve evidence-based practice but if they are not properly implemented by professionals due to the lack of knowledge, the proactive change to create best practices is null as it involves a continuous professional development.

Summary

Current provisions of assistive technology services for students with special needs in schools require some examination and attention. The rapid proliferation of the use of advanced technologies in K-12 schools has created both opportunities and challenges to teachers and professionals that are responsible for the evaluation, training, and delivery of assistive technology services. One of the challenges identified by the literature states that the lack of knowledge and skills of AT providers have often resulted in the recommendation of AT equipment and services that have failed to meet students' academic achievement or have been abandoned or unused by the students. Moraiti, Abeele, Vanroye, and Geurts (2015) stated that current AT abandonment rates range from 8-75%, suggesting that AT services and the devices that are recommended may be failing to meet users' needs and wasting the financial and human resources of the agencies that support them. Overall, the information presented in this chapter indicates that there is an urgent need to identify training needs of AT providers and develop strict requirements of professional competencies to comply with best practices.

Chapter 3

Methodology

Study Design

This descriptive research study used a sequential mixed quantitative and qualitative approach to examine the perceived competencies of assistive technology specialists (ATS) in Florida K-12 public schools. The identification of training opportunities that may have helped the ATS achieve professional competence in the evaluation and provision of assistive technology (AT) services was also examined. The study employed a self-administered online survey and a semi-structured phone interview. The online survey was developed from existing surveys that examine AT knowledge and skills and training of assistive technology specialists (University of Kentucky Assistive Technology, n.d.; Long et al., 2007). The qualitative data were collected through a single semi-structured interview with selected participants to obtain in-depth understanding of the participant's perceived AT knowledge and skills and training needs (Kvale & Brinkmann, 2009; Guggenberger, 2008). The research questions addressed were:

1. To what extent does the perceived level of AT knowledge differ among AT specialists from different occupations in the Florida public school setting? (Zhou, Smith, Parker, & Griffin-Shirley, 2011; Lee & Vega, 2005).
2. To what extent does the perceived level of AT skills differ among AT specialists from different occupations in the Florida public school setting? (Long et al., 2007).
3. What are the AT specialists' perceptions about their AT knowledge and skill levels? (Smarkola, 2008; Davis, 1993).

4. What common competency sets are needed for the AT specialist, regardless of their occupational role? (Zhou, Smith, Parker, & Griffin-Shirley, 2011; Lee & Templeton, 2008).
5. What are the training opportunities among AT specialists from different occupations in the Florida public schools setting? (Fouad et al., 2009; McGaghie, 1991).
6. What types of training opportunities are essential among AT specialists from different occupations in the Florida school setting? (Hecimovich & Volet, 2011; Long et al., 2007).

Population and Sample

The specific population for this study consisted of 80 professionals identified as assistive technology specialists (ATS) at K-12 public schools in Florida. The ATS are professionals appointed by the different school regions in Florida to serve, as a front line of support, students with assistive technology needs. Assigned responsibilities include the coordination of their district's assistive technology evaluations and implementation of services. The ATS group offers services at the five geographical regions of Florida (the Panhandle, North East, East Central, West Central, and the South). The sample consisted of 39 ATS from the five regions representing professionals from rural and urban areas.

Instrumentation

A self-administered online survey titled Assistive Technology Competencies and Training (ATCT) Survey (Appendix A) and a phone interview guide (Appendix B) were the instruments used in this study. The self-administered online survey was developed to gather data regarding the perceived AT knowledge and skill levels, and training opportunities of assistive

technology practitioners in Florida K-12 public schools. Items in the online survey were drawn from existing questionnaires and from literature devoted to assistive technology. Although previous questionnaires have been developed to measure AT knowledge and skills levels and training needs of professionals within a certain profession (e.g., special education teachers, occupational therapists, vocational counselors), until this current study, no single research instrument targeting all professionals identified as AT specialists has been developed.

The two existing surveys were combined to target all professionals identified as AT specialists. One single online survey incorporated the *University of Kentucky Knowledge and Skills Survey* (University of Kentucky Assistive Technology, n.d.) and *The Training Needs of Providers of Assistive Technology* (Long, et al., 2007). The *University of Kentucky Knowledge and Skills Survey* was created as part of the University of Kentucky Assistive Technology (UKAT) Toolkit. The University of Kentucky collaborated with the Kentucky Public schools during six years of research to create this toolkit. The survey includes 50 skills and knowledge competencies that were built from the Technology Competencies for Beginning Special Educators as recommended by the Council for Exceptional Children (CEC).

The *Training Needs of Providers of Assistive Technology* was developed by Long et al. (2007) to evaluate the assistive technology needs of occupational therapists working with children with disabilities and special health care needs. The 19 questions included in this survey are related to the adequacy of assistive technology training, usefulness of potential training topics to their current practice, and the effectiveness of different training methods (Long et al., 2007). The researcher selected the two surveys based on their relevance and purpose related to the study. According to copyright protection, the researcher obtained written permission from Toby Long to use and adapt *The Training Needs of Providers of Assistive Technology* survey. The

University of Kentucky has granted permission to the general public to reproduce their survey for non-commercial purposes. Additionally, the researcher also obtained permission from the University of Kentucky to use the survey in this study.

The survey employed in this study consisted of an introduction and three sections (demographics, knowledge and skills, and training) containing multiple-choice and multi-pronged questions in Likert-type scale, and open-ended questions for a total of 100 items. The average completion time of the 100 items among the 39 participants that completed the survey was 20 minutes. The introduction included a description of the study and consent information. The first section of the survey consisted of the demographic data. The demographic section included questions about the participant's educational level, professional discipline, school district, years of experience, gender, race/ethnicity, age group and geographic area. These questions were taken from section C of *The Training Needs of Providers of Assistive Technology* and from the heading questions of the *University of Kentucky Knowledge and Skills Survey.* Several of these questions were modified to avoid duplicity of information and to accommodate information related to the study.

The second section was related to AT knowledge and skills levels. The questions related to knowledge levels included information about the participant's knowledge in relation to AT definition, laws and legislation related to AT, AT models, ethical guidelines, assessment procedures, products information, and technology-related terminology among other questions. The questions related to AT skills levels included information about the participant's skills to identify individual AT needs, operation of AT devices, development of procedures for evaluation, implementation of instructional guidelines for students, educators and caregivers, and design and fabrication of devices. The researcher used 50 items stated on the *University of*

Kentucky Knowledge and Skills Survey for this section as they were all specifically related to AT knowledge and skill levels. Sixteen of the 50 items were related to knowledge levels and 34 items were related to skills levels. Two new open-ended questions related to the participant's perceptions about their assistive technology knowledge and skills levels were integrated into section two.

The third section was related to the training needs of AT specialists and included questions about the participant's current training in AT, their perceptions of their training needs, and the effectiveness of different training methods. This section included all items from section A of *The Training Needs of Providers of Assistive Technology*, which were three general questions that had additional sub-questions with a Likert-type scale. In addition, the three open-ended questions related to the participant's perceptions about their training needs that were located on a non-identified section at the end of *The Training Needs of Providers of Assistive Technology* were integrated into section three of the study survey. Questions from section B of *The Training Needs of Providers of Assistive Technology* were not used for this study as they were related to the confidence levels in providing AT services, which was not a topic related to this study.

The phone interview followed a semi-structured interview guide. Semi-structured interviews are often used for clarification or additional information related to the research questions. For the purpose of this study, the semi-structured interview included questions about the participant's general information (i.e., pseudonym, profession, gender), and current AT preparation as well as any challenges presented to demonstrate professional competency in K-12 public schools. The interview included six open-ended questions with several sub-questions available according to the responses received from the participant. These questions were

different from the open-ended questions presented in the study survey and intended to recollect in-depth information regarding the participant's AT knowledge and skills, and training needs and challenges. The interviews lasted approximately 25 minutes or less according to the length of the participant's responses.

Validity and Reliability

Long et al. (2007) stated that *The Training Needs of Providers of Assistive Technology* was validated by the use of a focus group of 18 professionals (occupational therapists, physical therapists, assistive technology providers). The reliability for *The Training Needs of Providers of Assistive Technology* was also tested. The survey presented a Cronbach's alpha of .90, which indicates a high degree of internal consistency. There is no information published related to the validity or reliability of the *University of Kentucky Knowledge and Skills Survey*.

In order to establish content and item validity of the instruments, the researcher contacted five knowledgeable professionals in the area of assistive technology to be part of a panel of experts and review the draft of the instruments (i.e., the sections taken from the *University of Kentucky Knowledge and Skills Survey*, the two new open-ended questions related to the participant's perceptions about their assistive technology knowledge and skills levels and questions from the interview guideline).

The panel of experts was composed of professionals from different disciplines (psychology, occupational therapy, special education, and speech-language pathology) with a minimum of ten years of experience working in assistive technology. The inclusion of a diverse group of professionals with different educational backgrounds and experiences was intended to have a better understanding of the appropriateness of the questions for the selected sample. The panel of experts was asked to evaluate the content (e.g., if the items were actually measuring AT

knowledge, skills and training needs), clarity (i.e., simple and easy to understand, question wording), appropriateness (e.g., related to the specific topics of the study and research hypotheses) and appearance (e.g., organization, layout) of the survey (Michaels & McDermott, 2003). The recommendations received from the panel of experts were incorporated into the final version of the survey and the semi-structured interview questions.

Procedures

The following procedures were implemented after The Nova Southeastern University Institutional Review Board (IRB) granted permission (Appendix C) to implement the study and the dissertation committee approved the dissertation proposal.

The first step in recruitment was to send letters to assistive technology experts to invite them to be part of the expert panel of the online survey and phone interview. After the panel of experts agreed to participate on the review of the instruments, the investigator sent them a package of information by e-mail including the explanation of the study, the study survey and the interview guide. After the review process was completed, the researcher made changes to the instruments so as to incorporate the recommendations made by the expert panel.

The second step in recruitment was to initiate the process of identifying the volunteers that were going to participate in the study through the administration of the Florida Department of Education. The researcher first sought and gained the approval from the Chief of the Bureau of Exceptional Education and Student Services from the Florida Department of Education to conduct the study. Information related to the intentions of the study was included in the email letter sent as well as a request to contact the regional technology coordinators.

After receiving the approval from the Chief of the Bureau of Exceptional Education and Student Services, the researcher contacted the five regional technology coordinators from each

Florida region by e-mail. The e-mail message sent introduced the researcher, explained the intentions of the study, assured confidentiality of the participants and included a request for e-mail contacts of all the Assistive Technology Specialist (ATS) at their school regions. Weekly e-mails were sent to the regional technology coordinators as a reminder to send the information requested. Thus after three consecutive reminder e-mails sent to the regional technology coordinators, only one replied to the requested information. The researcher contacted several coordinators by phone to follow up on the email sent and they verbalized that they were not comfortable sending contact information of their employee to researchers outside of their educational system. After several phone and email conversations, the consensus was to send the recruitment letters directly to the East Central Florida regional coordinator and she would forward it to potential participants.

The third step took place at the same time of the second step as the investigator reproduced the self-administered survey on a selected platform which was a website located at http://www.surveymonkey.com (now merged with http://www.zoomerang.com). Settings on this platform were activated to allow the use of pseudonyms on the participants' responses to allow confidentiality. A description of the study and clear instructions on how to complete and submit the survey was available at the face page of the website. Information related to confidentiality was also included on this page. On the last page of the survey, participants were asked to submit the information completed, which was saved in the platform to be tabulated and analyzed. In addition, a section was created to ask participants to provide their contact information to the principal investigator if they wanted to be part of a semi-structured interview.

After obtaining the contact information of the East Central Florida regional coordinator, the fourth step consisted of sending her the recruitment information to allow her to forward to potential participants. During this fourth procedure, the researcher followed a three-phase survey

administration process to encourage a high return rate (Creswell, 2013). The first step of the three-phase survey administration process was to send the first invitation e-mail to the participants through the East Central Florida regional coordinator. Information about the study was included on the invitation e-mail message as well as a link to the survey, which included instructions on how to complete the confidential self-administered online survey. Contact information of the primary investigator was included in the e-mail letter in case the potential participants had any questions regarding the study.

The invitation e-mail letter specified information to complete the survey within the next seven days after they received the invitation letter. This time was allowed to read the instructions, and complete the online survey at their available time. Potential participants were intended to read elements of the informed consent in the introduction section of the online survey and be informed that by completing the survey, they were confirming their voluntary participation in the study. At the end of the online survey, the participants were encouraged to participate in a phone interview. The 12 individuals who agreed to participate in the phone interview were contacted by the principal investigator by e-mail or phone to schedule the interviews.

The second step of the three-phase survey administration process was to send reminder e-mails to the potential participant through the East Central Florida regional coordinator two weeks after the initial e-mail was sent. The third step of the three-phase survey administration process was to send a second reminder e-mail after another two weeks to the potential participants to encourage them to complete the survey.

The fifth step of the study was to conduct the semi-structured phone interviews. The investigator first identified all of the individuals who stated interest in being part of the interview

and provided their contact information. To ensure confidentiality, each individual was assigned a number starting with 1 through the total number of individuals that agreed on completing the interview. The total number of participants who agreed to participate in the phone interview were twelve but as only seven returned emails and phone calls to schedule the interviews, they were all invited to sign a consent form (Appendix D) with wet ink and to schedule the phone interview at least one week in advance. The consent form was sent by mail to the participants and included a self- addressed, and a postage-paid envelope to be returned with the signed consent to the investigator.

After the signed consent form was received by mail, the phone interviews were completed on the scheduled dates. Additional time was allotted for questions or any unanticipated interruptions. The researcher used an audio recorder to record the interviews. The information was then transferred into an electronic word document to be analyzed. In order to protect the identity of the participants that completed the interview, their actual names were replaced with pseudonyms.

Statistical and Data Analysis

Data analysis consisted of descriptive methods using computer statistical software programs. The IBM Statistical Package for the Social Sciences (SPSS) version 22.0 was used for the statistical analysis of the quantitative data and NVivo 10.0 software was used for the analysis of the qualitative data. The sequential mixed quantitative and qualitative approach was selected to better examine the perceived competencies and training needs of assistive technology specialists (ATS) in Florida K-12 public schools. The mixed method approach is an instrumental methodology in research for data analysis that was selected to expand the findings obtained from the survey and interviews (Creswell, 2013; Ivankova, Creswell, & Stick, 2006). Statistical

analysis for the quantitative data included means, percentages and standard deviations for the study variables. Qualitative data collected in the survey and the semi-structured interview through open-ended questions was analyzed following six steps commonly used in qualitative studies (Creswell, 2013) with the assistance of computer software NVivo for qualitative data analysis to identify and categorize emerging codes.

The first step was to collect the data from the open-ended questions. As suggested by Fasick (2001), the investigator performed verbatim transcriptions from the tape recordings to ensure valid information from the interviews. Non-verbal cues (i.e. silence) and emotional aspects (i.e. laughs, sighs) were incorporated into the transcribed text. The investigator did not contact participants to verify the accuracy of the information collected. The investigator referenced the original recordings when necessary to check details of the findings.

The second step consisted of preparing the data for analysis as it was transcribed into a computer software program for qualitative data analysis. During this process the investigator selected, condensed and transformed the information from the questionnaires to identify the information and the resulting themes that best addressed the research questions. The use of tables and diagrams facilitated the identification of patterns, recurring themes, similarities and differences. Single words, brief phrases or paragraphs were used for the content analysis. The data were organized then into categories with the help of the NVivo computer software program. NVivo was also used to create visualizations that represented the themes identified in the data collected.

The third step was to develop a general sense of the data by reading throughout all of the information. The investigator read and re-read the information collected to assure that there was no missing information. The fourth step was to code the data. The investigator used codes to

label the themes, ideas and behaviors into categories. Coding the text for description was the fifth step and coding the text for themes was the sixth step. Some of the categories were combined with others or main categories were broken into subcategories during this process. Simultaneously, the researcher repeated these steps to identify a final list of trends and patterns on the categories and themes selected.

Resources

The researcher used several resources to complete the study. For example, a group of knowledgeable professionals in the area of assistive technology were used to review the draft of the instrument. The following surveys were used to create the study survey: The University of Kentucky Knowledge and Skills Survey and The Training Needs of Providers of Assistive Technology Survey. In addition, an online platform for the development of the survey (http://www.surveymonkey.com) was used. Lastly, computer software (i.e. Statistical Package for the Social Sciences software version 22.0, NVivo version 10.0) was used for the statistical data analysis, respectively.

Summary

In order to examine the perceived level of AT knowledge and skills of assistive technology specialists a descriptive design was selected. An online survey was used in the study to collect data. In addition, semi-structured interviews were performed to obtain additional in-depth information from the participants. The use of a mixed-methods approach provided a description and better understanding of the research problem. Details related to the composition of the survey and the interview, as well as information regarding the validity and reliability of the survey are also included in this chapter. The procedures used to implement the study were presented with information on how the data were collected and analyzed.

Chapter 4

Results

Introduction

This chapter is divided into a demographics section and three major topics to present the results obtained from the online survey and the semi-structured telephone interviews. The following major result topics were identified: 1) Perceived levels of knowledge and skills; 2) Common competency sets needed for AT specialists; and 3) Training offered, effective trainings, and training needs for AT specialists. These resulting topics directly relate to the study survey that consisted of an introduction and three sections (demographics, knowledge and skills, and training) containing multiple-choice and multi-pronged questions in Likert-type scale, open-ended questions for a total of 100 items, and six major questions with several sub-questions asked during the semi-structured interview. Response rate, frequencies, standard deviations, and statistical analysis of how the research questions compared to the research data are presented within these sections.

Demographics

A total of 39 individuals from a pool of approximately 80 potential individuals participated in this study. This participation was estimated to be a 49 percent response rate of the targeted professionals that provide assistive technology services at Florida K-12 public schools. Demographic data on the survey (items #2 - #15) revealed that most of the participants were female (*n*=35, 89.74%) and 10.26% were male (*n*=4). One participant held a doctoral degree; 31 participants held master's degrees; five held bachelors' degrees; and two held other degrees. All Florida Department of Education (DOE) regions were represented as listed in Table 1. The

professions represented by the participants were speech and language pathology (SLP), special education, occupational therapy (OT), and general education with seven participants from 'other' professions (e.g. assistive technology coordinator, speech language pathology assistant, assistive technology specialist, curriculum support specialist, center technology program specialist). There were no participants representing audiology, physical therapy, rehabilitation engineering, or vocational counseling.

Table 1

Demographics Features of Participants

	Demographics	*n*	Percentage
Gender	Male	4	10.3%
	Female	35	89.7%
Race	White/Caucasian	36	92.3%
	Hispanic	2	5.1%
	Multiracial	1	2.6%
Florida School Regions	Panhandle	3	7.7%
	North East	3	7.7%
	East Central	14	35.9%
	West Central	5	12.8%
	South	14	35.9%
Professions	Educator	2	5.1%
	Occupational Therapist	4	10.3%
	Special Educator	8	20.5%
	Speech Language Pathologist	18	46.2%
	Other	7	17.9%
Years of AT experience	3-5 years	5	12.8%
	6-10 years	9	23.1%
	11 years or longer	25	64.1%
AT Certifications	Yes	9	76.9%
	No	30	23.1%

Participants were asked to indicate their primary provision area of assistive technology services under item #9 of the demographic section. The two most frequent areas were identified as verbal communication (*n*=35, 89.74%) and written communication (*n*=34, 87.18%), followed by academic achievement (*n*=27, 69.23%), cognition (*n*=24, 61.54%), behavior (*n*=23, 58.97%),

activities of daily living (*n*=21, 53.85%), hearing (*n*=14, 35.90%), vision (*n*=13, 33.33%), and sensory processing (*n*=12, 30.77%). The least frequent areas of provision were seating (*n*=7, 17.95%) and mobility (*n*=15.38%). When examining the responses by professions, similar results were reported by Bausch et al. (2008) when they found that occupational therapists focused most of their AT services on functional skills, speech and language pathologists on augmentative and alternative communication, and teachers on child training and curriculum integration.

Seven of the 39 participants completed the semi-structured phone interview. Basic demographic information about the participants including their profession and years of experience in assistive technology are identified in Table 2.

Table 2

Basic Demographics of the Interviewed Participants

	Profession	**Gender**	**Race**	**Florida School Regions**	**Years of Experience with AT**
Participant # 1	Special Education Teacher	Female	Hispanic	South	16 years (since 1998)
Participant # 2	Educator	Male	White/Caucasian	East Central	7 years
Participant # 3	Special Education Teacher	Female	White/Caucasian	South	19 years
Participant # 4	Other (Assistive Technology Specialist)	Male	White/Caucasian	West Central	15 years
Participant # 5	Other (Curriculum Support Specialist)	Female	Hispanic	South	3-5 years
Participant # 6	Speech and Language Pathologist	Female	White/Caucasian	East Central	8 years
Participant # 7	Occupational Therapist	Female	White/Caucasian	East Central	25+ years

Perceived Levels of AT Knowledge and Skills

The second section of the online survey was composed of the perceived AT knowledge and skills questions (item #16 Knowledge and Skills). There were a total of 50 questions in this section with a Likert scale of 1 to 5. A rating of 1 indicated 'no expertise', 2 indicated 'below

average' expertise, 3 indicated 'average' expertise, 4 indicated 'above average' expertise, and a rating of 5 indicated 'expert'. Sixteen questions were related to the perceived AT knowledge and 34 questions were related to the perceived AT skills. The perceived AT knowledge questions were completed by 35 participants with the exception of one which was a question related to their knowledge related to ergonomic principles.

Overall, the results of the perceived knowledge revealed an 'average' level of expertise (M = 3.49, SD = 1.56). Participants revealed that their perceived knowledge in assistive technology was high with the majority of responses landing just under 'above average' expertise (36.85%) following the 'expert' category with 32.74% as seen in Figure 1. Most respondents (54.29%) believed that they were “experts” (M = 4.37, SD = 1.58). Respondents reported the lowest levels of knowledge regarding ergonomic principles, with 5.88% reporting 'below average' expertise (M = 3.5, SD = 1.66). Prior studies revealed significantly lower levels of perceived AT knowledge. In comparison, the participants from this study held AT specialist positions that required solely AT responsibilities and greater demands.

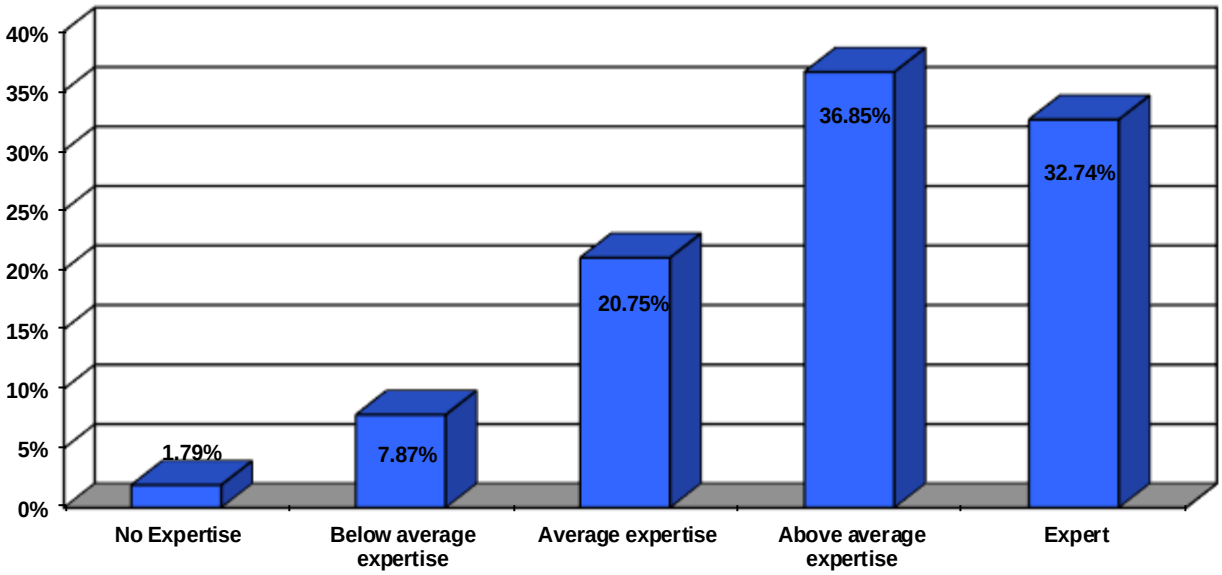

Figure 1. Perceived AT Knowledge

The overall perceived AT skills data revealed an 'average level' of expertise (M = 3.5, SD = 1.62). Most participants perceived themselves to have 'above average' expertise (37.57%) in AT skills with 36.56% of the participants perceiving themselves as being 'experts' (Figure 2). These results demonstrate that more respondents rated themselves as experts regarding perceived AT skills as compared to their ratings regarding perceived AT knowledge. Respondents also demonstrated a slight increase on the 'no expertise' area when compared to the perceived AT knowledge section, indicating that participants perceived themselves as having a higher level of skills over knowledge. Respondents identified skills areas with the highest mean; these included the provision of technology support to individuals with exceptional learning needs who are receiving instruction in the general education setting (M = 4.37, SD = 1.51) and the arrangement of demonstrations and trial periods with potential assistive or instructional technologies prior to making purchase decisions (M = 4.37, SD = 1.59). Respondents demonstrated the lowest levels of expertise (M = 2.91, SD = 1.63) in writing proposals to obtain technology funds.

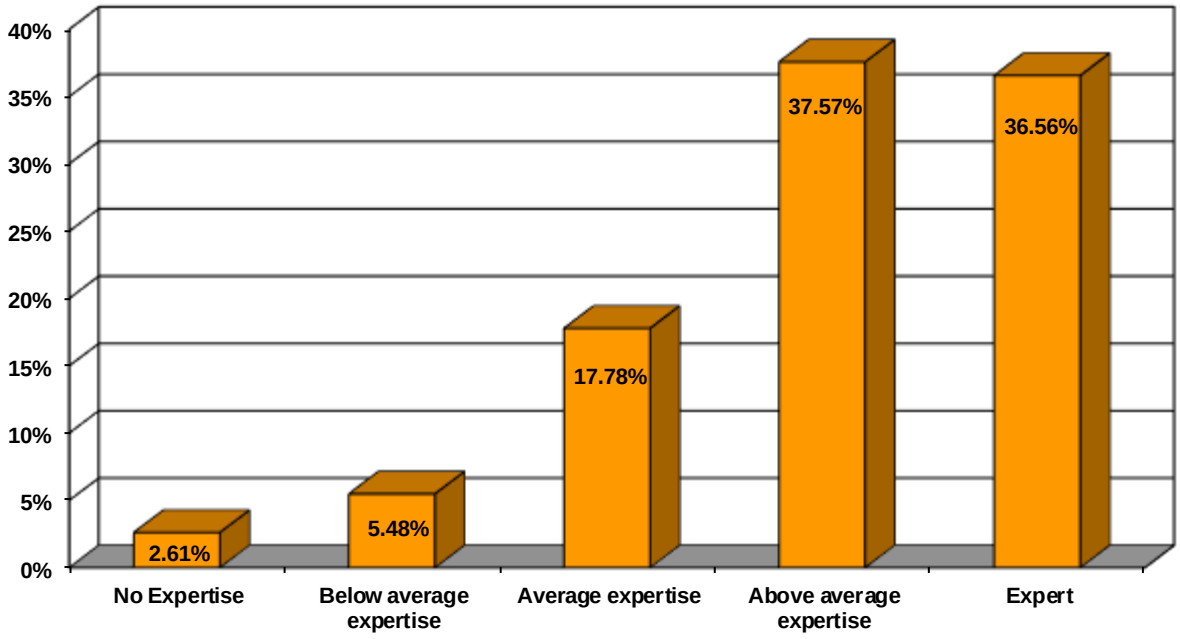

Figure 2. Perceived AT Skills

The results for perceived AT skills represent an overall higher perceived skill levels than knowledge. The participants had a variety of different backgrounds and professional preparation and when they had continuing education in assistive technology, most of them did not have pre-service training or certifications in assistive technology. The phone interviews revealed that many of the participants use their intuitiveness in the use and application of assistive technology based on experience with equipment over previous knowledge on the basics and principles of AT. This intuitiveness concurs with experience-based learning in which information-processing abilities are gained by doing (Nass, 1994). This model also supports the acquisition of new techniques by gathering, manipulating and interpreting information at the same time that the individual is performing a task, which is what several participants revealed doing while learning how to match equipment with student's needs.

Assistive Technology Knowledge by Profession

The perceived AT knowledge responses collected under item #16 Knowledge and Skills on the online survey were also analyzed to identify the differences per profession. In addition, during the semi-structured interviews, participants identified their perceived strongest and weakest AT knowledge area (question #2) and the responses were also analyzed per profession.

Under item #16, the occupational therapists (OTs) perceived themselves as having the most expertise in AT knowledge among the participants (M = 4.4, SD = .624) followed by the speech language pathologists (SLPs)(M = 4.2, SD = .224) educators (M = 3.9, SD = .507) special educators (M = 3.7, SD = .364) and 'Other' professionals (M = 3.2, SD = .417) (Figure 3).

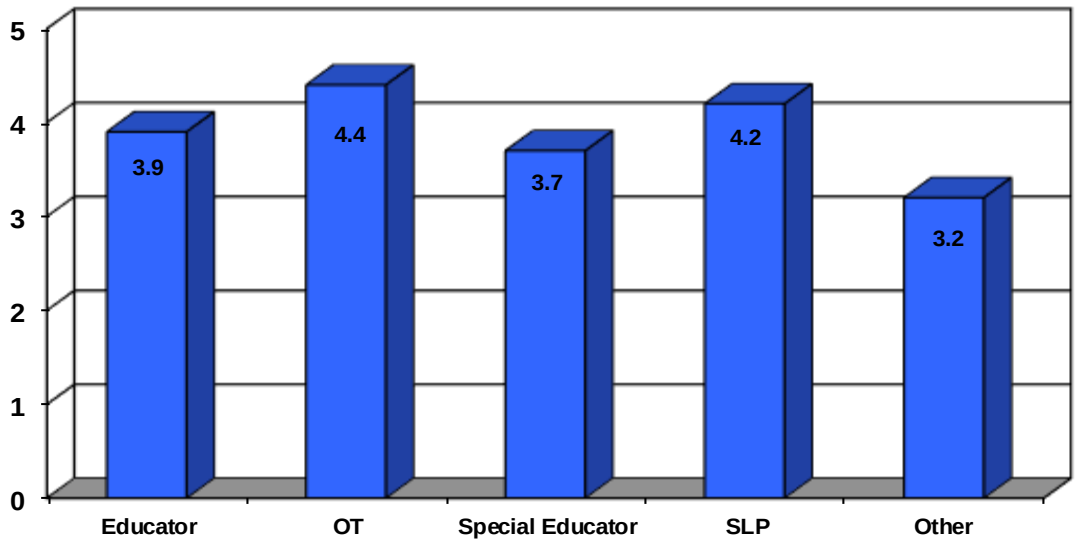

Figure 3. Perceived AT Knowledge Mean by Profession

Respondents reported their strongest and weakest areas of AT knowledge during semi-structured interviews. Results are displayed in Table 3 and Table 4. Participants (71.43%) reported that they felt strongest in "evaluation and recommendations of alternative and augmentation communication devices," but at the same time, 28.57% of the participants identified the use of alternative and augmentative communication devices as well as high technology devices as areas with the weakest knowledge. These results concurred with the major roles that the participants have in their districts as assistive technology specialists in which they are mostly responsible to screen and evaluate students for the use of AT devices and services to facilitate and enhance learning in the classroom. In addition, they are responsible to educate teachers, assistants and other related school staff in the use of the AT services and equipment recommended. The pre-service training received in their professions has prepared many of the AT specialists with basic AT knowledge (AOTA, 2007; ASHA, 2014, Lee & Vega, 2015), though there are still many opportunities for growth.

Table 3

Perceived Strongest AT Knowledge per Profession

	Educator	OT	Special Educator	SLP	Other	Total
1. Evaluation and recommendations of alternative and augmentative communication devices	0.00% 0	14.29% 1	28.57% 2	14.29% 1	14.29% 1	71.43% 5
2. Educational technologies	14.29 1	14.29% 1	0.00% 0	0.00% 0	28.57% 2	57.14% 4
3. Evaluation process	0.00% 0	0.00% 0	0.00% 0	14.29% 1	14.29% 1	28.57% 2
4. Teach others	0.00% 0	0.00% 0	0.00% 0	0.00% 0	14.29% 1	14.29% 1

Table 4

Perceived Weakest AT Knowledge per Profession

	Educator	OT	Special Educator	SLP	Other	Total
1. Intervention	14.29% 1	0.00% 0	28.57% 2	0.00% 0	28.57% 2	71.43% 5
2. New Technologies	0.00% 0	0.00% 0	14.29% 1	14.29% 1	14.29% 1	42.86% 3
3. Evaluation and services to students with visual and hearing impairments	14.29% 1	14.29% 1	14.29% 1	0.00% 0	0.00% 0	42.86% 3
4. Use of alternative and augmentative communication devices	0.00% 0	0.00% 0	14.29% 1	0.00% 0	14.29% 1	28.57% 2
5. High technology devices	0.00% 0	0.00% 0	28.57% 2	0.00% 0	0.00% 0	28.57% 2

Simultaneously, the AT specialists revealed that they felt that their intervention knowledge is the weakest due to the rapid proliferation of new technologies and lack of training. Among all the perceived weaknesses identified, participants stated some reasons why these areas might affect the application of AT in schools. Their comments included the following:

- It is difficult to identify and implement the use of assistive technologies to specific populations and age groups.
- Technology is expanding and growing so quickly, especially in terms of all the mobile applications and devices are hard to manage and deploy all that in the classroom.
- I do not have enough time to research what is out there and to find all the new devices.

- There are many new technologies available every year and if I am not aware of them, I never try them.
- We do not have a lot of students with visual and hearing impairments so I do not know a lot about visual or hearing aids.
- We do not know how to even use technologies that are currently at schools.

In this section, the reasons indicated by the participants were also representative of other schools' AT specialists following traditional AT approaches in schools. DeCoste (2013) identified that current traditional AT approaches followed in schools are not designed to provide expert model of AT services to all their students; when the AT specialists are committed to provide good services, the AT service delivery is not scalable to the available need. These results bring about frustrations to the AT staff and create challenges in the desire to acquired needed knowledge in the AT field. DeCoste (2013) suggested that schools should move to a capacity-building approach with a High Incidence Accessible Technology (HIAT) teams that help build the staff expertise in AT.

Assistive Technology Skills by Profession

As with the perceived AT knowledge responses, the perceived skills responses collected under item #16 Knowledge and Skills on the online survey were also analyzed and identified per profession. The Likert rating used also indicated 1 as 'no expertise', 2 as 'below average' expertise, 3 as 'average' expertise, 4 as 'above average' expertise, and a rating of 5 indicated 'expert'. The semi-structured interview results were presented to display the participants' identified perceived strongest and weakest AT skills areas. Results from both instruments were analyzed and compared with the AT knowledge responses to better understand the perceived AT

knowledge and skills that AT specialists from different professions that work Florida K-12 public school possess.

The Likert scale results (Figure 4) revealed that both OTs (M = 4.4, SD = .458) and SLPs (M = 4.3, SD = .321) perceived having AT skills levels of expertise between 'above average' and ‘expert’ levels, the highest among the different professions. This was followed by the educators (M = 4.1, SD = .544) and special educators (M = 3.9, SD = .552) expertise levels between 'average' and 'above average' level and 'other' professionals (M = 3.3, SD = .429) with 'average' expertise.

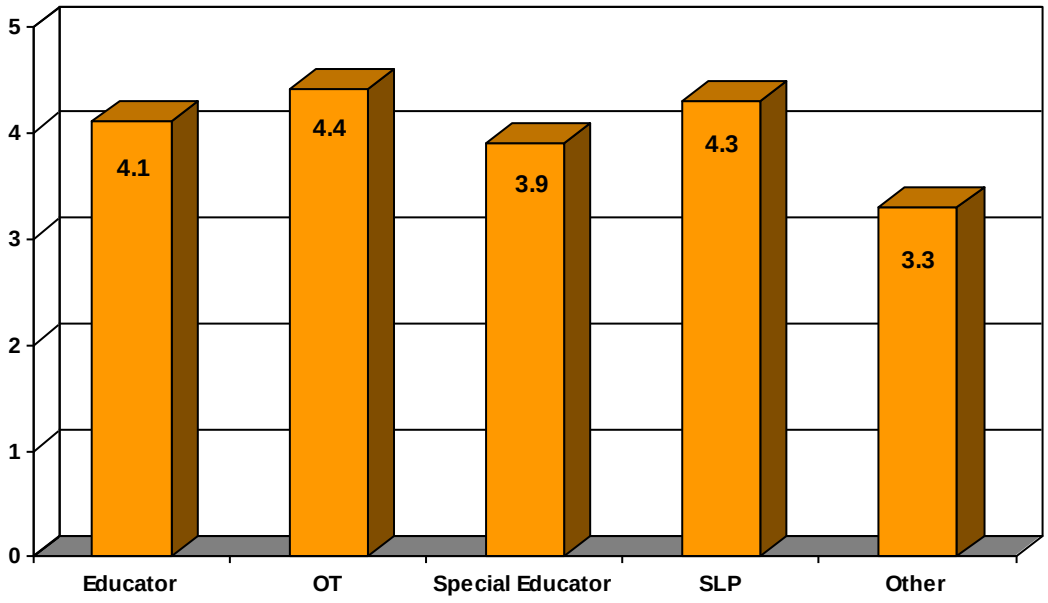

Figure 4. Perceived AT Skills Mean by Profession

The overall strongest perceived AT skill areas varied on each profession thus most of the highest AT skill areas were related to the identification and operation of assistive hardware, software and peripherals, provision of technology support to individuals with exceptional learning needs, arrangement for demonstrations and trial periods with potential assistive or instructional technologies prior to making purchases, and the identification of demands of

technology on the individual with exceptional learning needs. The overall weakest perceived AT skill area was the development of specifications and/or drawings necessary for technology acquisitions, with the exception of the educators, as this was one of the strongest areas for them. Another skill that was identified by four different professions (educators, occupational therapists, special educators and 'others') to be one of their weakest was writing proposals to obtain funds. All these weak AT skill areas were identified as some of the participants during the interview as tasks that they do not perform regularly due to spending most of their time one-on-one with students and other school staff in the evaluation of AT service.

The semi-structured interview results related to the strongest and weakest AT skill areas per profession (question #3) were also analyzed and coded into themes and displayed in Table 5 and Table 6. Participants reported that they felt strongest in the use of technology and grading and adapting technology in the classroom. The theme, adapting technology in the classroom, was anticipated as it is one of the pre-service skills taught in most of occupational therapy, SLP, and education programs. The participants felt weakest in the use of technology, use of AAC devices, and the evaluation and provision of AT for students with hearing and visual impairments. These skills are related to the use of devices, which are constantly changing with technology advancements in which participants revealed in often in this study that they require more training on.

Table 5

Perceived Strongest AT Skills per Profession

	Educator	OT	Special Educator	SLP	Other	Total
Use of technology	14.29% 1	0.00% 0	14.29% 1	14.29% 1	14.29% 1	57.14% 4
Grading and adapting technology	14.29% 1	14.29% 1	0.00% 0	14.29% 1	14.29% 1	57.14% 4

Table 6

Perceived Weakest AT skills per Profession

	Educator	OT	Special Educator	SLP	Other	Total
Use of technology	0.00% 0	14.29% 1	14.29% 1	14.29% 1	28.57% 1	57.14% 4
Use of AAC devices	14.29% 1	0.00% 0	0.00% 0	0.00% 0	14.29% 1	28.57% 2
Evaluation and provision of AT for students with hearing and visual impairments	0.00% 0	0.00% 0	14.29% 1	0.00% 0	0.00% 0	14.29% 1

In summary, participants identified the use of technology as both a strong AT skill and a weak AT skill. Participants revealed that they are knowledgeable with the use of computer systems (e.g. laptops, tables, and smartphones), grading and adapting the technology, and identifying the proper location of the technology on a wheelchair or seat to facilitate use. In contrast, participants also expressed that they do not feel competent in the use of high technology devices available these days given the rapid technological advancements. One of the types of electronic devices that are constantly changing are the AAC devices and that they are having challenges learning how to perform the programming. Devices used for users with hearing and visual impairments were also identified as a weak skill mostly due to the lack of exposure.

Common Competency Sets Needed for AT Specialists

Under the open-ended questions section on the online survey (items #17, #18 and #22c), participants were asked what they thought were the most critical knowledge, skill and training areas required in AT and AT services. The following responses were obtained based on the 31 participants that responded to the open-ended questions. Figures 5 and 6 present the most critical AT knowledge and skill areas identified by the participants. The most critical AT knowledge areas were: technology knowledge, evidence based practice, AT awareness, evaluation process, matching technology and student's needs, implementation process, team work, and legislative

mandates. The most critical AT skill areas were: implementation, evaluation, training skills, effective use of technology, teamwork and implementation.

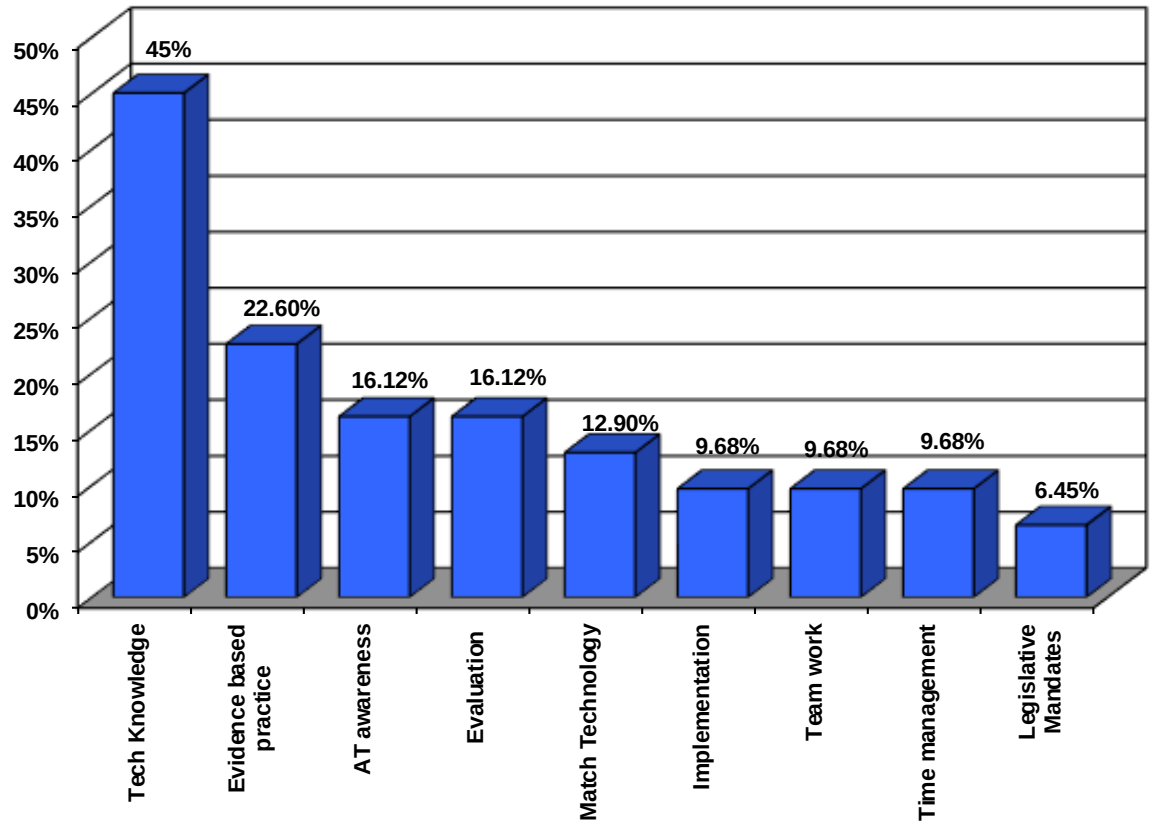

Figure 5. Critical AT Knowledge Areas

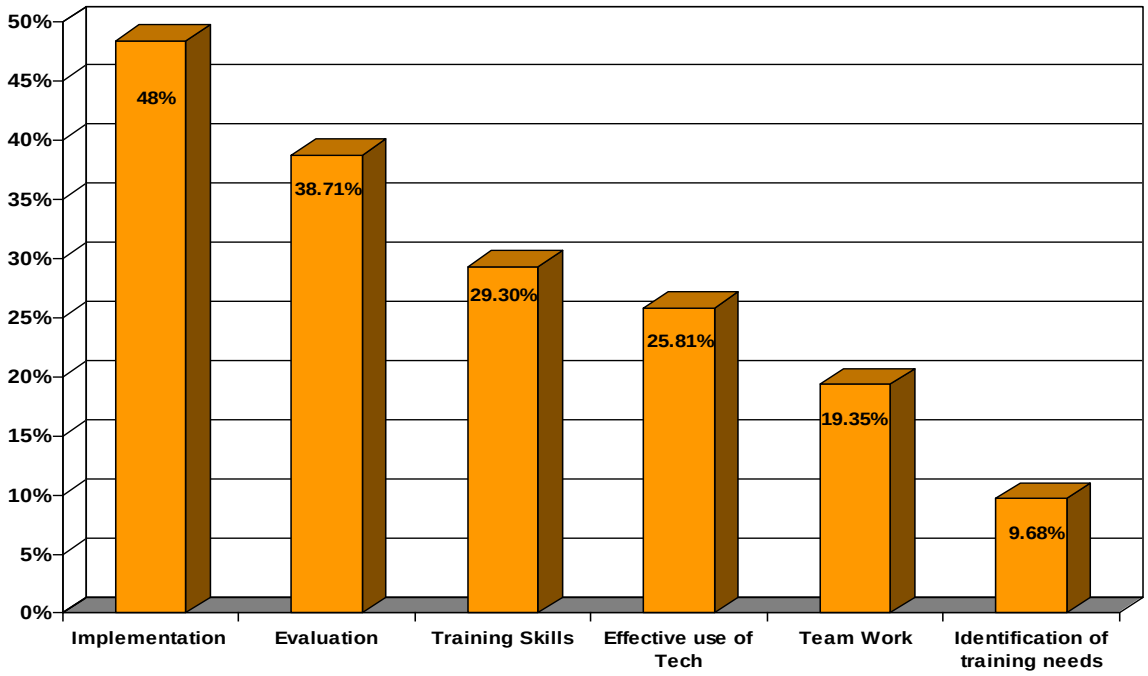

Figure 6. Critical AT Skill Areas

All of the identified critical knowledge and skill areas in the figures coincide with areas mentioned in professional guidelines such as the Specialized Knowledge and Skills in Technology and Environmental Interventions for Occupational Therapy practice of the American Occupational Therapy Association (AOTA), and the National Educational Technology Standards (NETS) of the International Society for Technology Education (ISTE). Despite the identified areas being supported by formal guidelines created from different organizations, it was previously noted in the literature review that there are no compilations of comprehensive uniform standards implemented among AT specialists in the educational setting (Dalton & Rouch, 2010). This represents a barrier not only in the provision of AT services in Florida K-12 public schools but in all school settings in the United States, as often is the case that the integration of AT in educational environments is fragmented (Beard, Carpenter & Johnston, 2011; Hemmingsson, Lidstrom & Nygart, 2009). Thus, the identification of this barrier represents valuable information for school administrators for the recruitment and training of AT

specialists in the K-12 school system. In addition, the identified critical knowledge and skill areas, could be key areas to consider when developing competency guidelines for AT specialist and general guidelines for the provision of AT and AT services.

Figure 7 presents the coded nodes of the most critical AT training areas (item #22c) identified by the participants on the survey, based on the NVivo analysis. These identified critical training areas also represent knowledge and skills areas that AT specialists that work in school systems should master for the provision of AT and AT services.

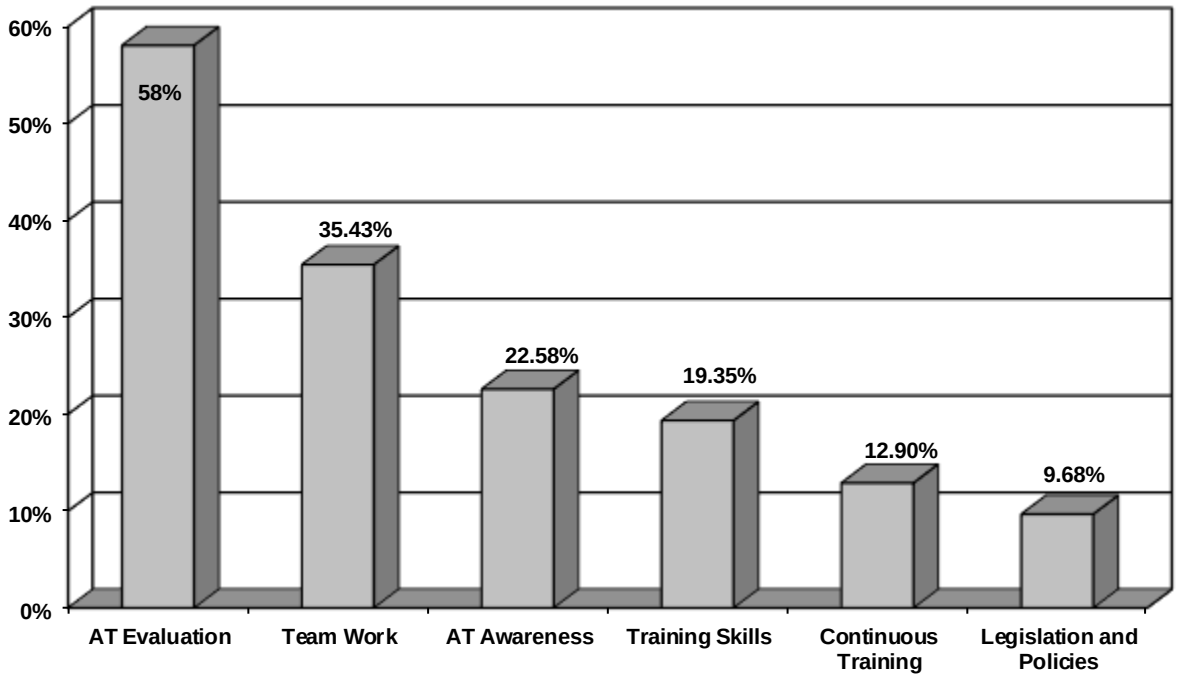

Figure 7. Critical AT Training Areas

Regarding the identified AT Evaluation knowledge and skill area, one participant stated: "We need training in AT evaluation and the roles of the people involved in the process. Large counties have too many people and lines of role responsibilities are gray." Another participant identified that AT professionals should know how to work as a team to be able to incorporate student's AT into all the individual's activities and curriculum on a daily basis. Knowledge about

AT awareness was identified as crucial to know to be able to tell other about benefits of AT in order to increase support of AT use. As identified under crucial skill areas, knowing how to train others is a crucial skill that AT specialists need to master, especially in the areas of consultation, mentoring, student/family AT use, and the AT continuum. In addition, participants stated that AT specialists should possess the professional consciousness of scheduling continuous training as new technologies, AT legislation and policies emerge constantly in assistive technology and that they should be knowledgeable on these areas to establish and maintain competence.

Training Offered, Effective Trainings, and Training Needs for AT Specialists

Training data related to assistive technology in this section was collected from questions containing Likert Scales (items #19, #20 & #21) and from an open-ended question (item #22b) in the online survey, and from one question from the semi-structured interview (question #5). A total of 40 questions (two of them were open-ended questions) were presented in the survey regarding the quality of AT training received, significance of future training, preferred training methods, biggest challenge in becoming trained in AT, and helpful strategies in training. An average of 31 participants answered the training questions.

Training Offered

Item #19 on the survey represented the question related to the quality of AT training received and utilized the following Likert scale: 0 = no training, 1 = not adequate, 2 = slightly less than adequate, 3 = adequate, 4 = more than adequate, 5 = exceptional. Most of the participants (34.95%) stated that they received 'exceptional' training in assistive technology as presented in Figure 8. Thus, there were participants that identified that they received 'no training' (4.84%) or that the training received was 'slightly less than adequate' (12.90%) or 'not adequate' (1.07%). Based on the mean (M = 2.93, SD = 1.89) (z-score = 1), it was observed that 68% of

the Florida K-12 school AT specialists received AT training between the quality of ‘slightly less than adequate’ and ‘adequate'. The areas that were identified with the highest scores in quality or under 'exceptional' training were related to knowledge about disabilities and training related to legislation, regulation, and policy impacting AT and AT services. On the contrary, participants stated that they did not receive any previous AT training on the following areas: knowledge related to clients with disabilities and special health care needs, service delivery systems, working with families, and collaborating with other service providers.

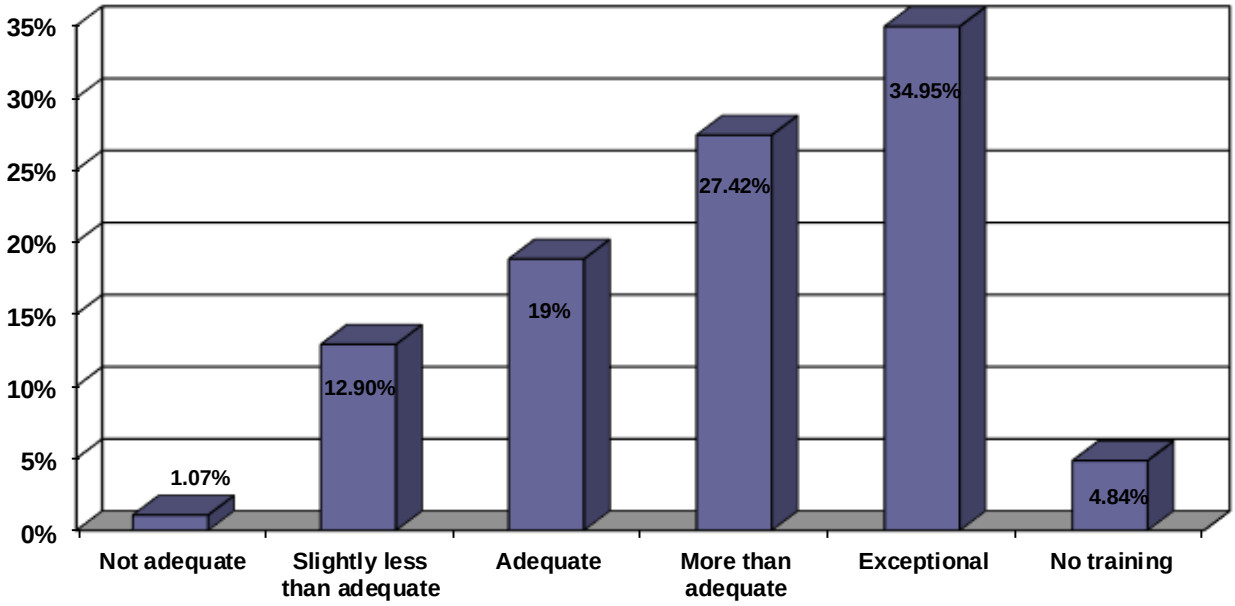

Figure 8. Quality of AT Training Received

These results revealed a general satisfaction with the quality of previous training received. During the phone interviews and the open-ended questions in the survey, participants conveyed that they were satisfied with the previous continuing educational activities received but that they needed more continuous hands on workshops with mentoring approach to meet their professional needs and growth.

Effective Training Topics

Participants were asked to rate a list of selected training topics on the survey (item #20) as 'not useful' = 1, 'somewhat useful' = 2 or 'very useful' = 3. Data collected shown on Appendix E represent training opportunities among AT specialists from different occupations in the Florida public schools setting. The following training areas were identified by 50% or more participants as 'very useful', which represent a mean below 3 on the Likert scale:

- Computer access devices (M = 2.33, SD = 1.22)
- Alternative and augmentative communication devices (M = 2.23, SD = 1.22)
- Techniques used to train or teach an individual to use AT (M = 2.23, SD = 1.22)
- Educational software (M = 2.21, SD = 1.22)
- Developing a collaborative consultation service delivery model to obtain AT and provide AT services (M = 2.15, SD = 1.22)
- Voice activated software (M = 2.18, SD = 1.21)
- Documentation (M = 2.05, SD = 1.21)
- Client strengths, needs and abilities related to service delivery issues assessment (M = 1.92, SD = 1.20)
- Impact of AT on access to education, employment, independence (M = 2.02, SD = 1.20)
- Client's use of device related to service delivery issues assessment (M = 2.08, SD = 1.18)
- Client's abilities in different contexts/environments related to service delivery issues assessment (M = 2.10, SD = 1.16)
- Clinical decision-making and AT (M = 2.03, SD = 1.18)

- Legislation, regulation and policy impacting AT and AT Services (M = 1.97, SD = 1.16)
- Funding sources (M = 1.85, SD = 1.18)

The following training areas were identified by 50% or more participants as 'somewhat useful', which represent a mean below 2 on the Likert scale:

- Seating devices (M = 1.67, SD = 1.06)
- Mobility devices (M = 1.61, SD = 1.04)
- Working with families (M = 1.77, SD = 1.09)
- Environmental control devices (M = 1.82, SD = 1.10)
- Service delivery systems (M = 1.85, SD = 1.09)
- The influence of culture on use of AT and AT Services (M = 1.77, SD = 1.09)

The top two areas that were identified as ‘Not useful’ were training related to an overview of AT and mobility devices. Participants verbalized during the phone interviews that they were already aware of information about the basics of AT as AT specialists and that many of them do not get involved with mobility devices as this area is assigned to the occupational and physical therapists.

The overall list of training topics represent areas that are considered ‘more than useful’ in the training of AT specialists in the provision of AT and AT services in the school system. Moreover, they should be considered by school administrators to develop training and professional improvement activities. They should also be evaluated based on the significance that represent each professional that acts as an AT specialist in the school system as Figures in Appendix E clearly display differences among the different professionals that completed the study.

In addition, when participants were asked to rate their most effective methods to receive training in AT and AT services (item #21), 31 of the participants made a selection from five different options listed on Figure 9. The method selected to be the 'most effective' for the participants was the group instruction (continuing education, in-service training, conferences, and workshops) (M = 2.26, SD = 1.21). The second 'most effective' training method identified was person to person (mentoring, supervision, consultation, colleagues, list-serves) (M = 2.21, SD = 1.20), followed by online instruction (M = 1.82, SD = 1.05), intensive classroom instruction (course work) (M = 1.69, SD = 1.00), and print resources (documents, fact-sheets, newsletters, books, journals, etc.) (M = 1.51, SD = .94). These results align with adult learning theories where learning is identified as a social activity. Therefore, the identification of the top two learning methods as group instruction and person-to-person seemed to be appropriate to most of the population targeted in the study.

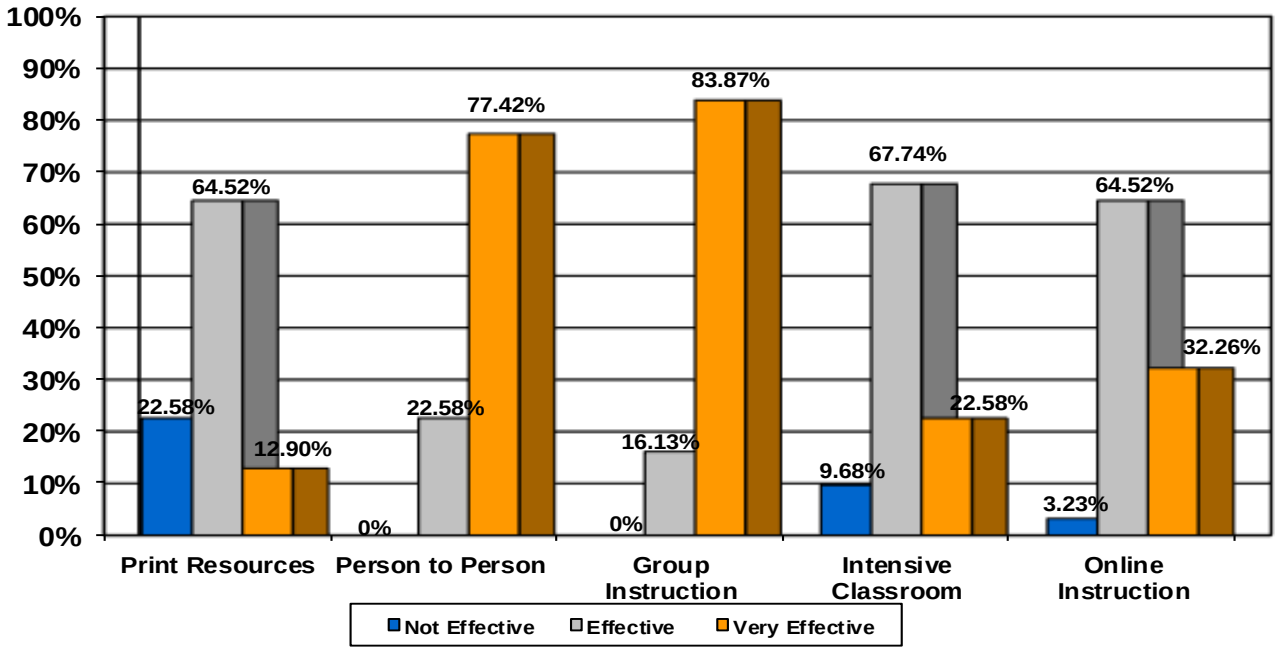

Figure 9. Most Effective Training Methods

Supplemental to the data collected in the survey about the identified most effective methods to receive AT training, Table 7 shows the result of their answers. Participants that were interviewed by phone also identified hands-on training (100%) as their preferred learning mode, which also align with adult learning theories as mentioned before. Online training was also identified as an effective learning method but mostly due to its convenience according to the time that they have to attend professional improvement activities.

Table 7

Preferred Learning Mode

Learning mode	*n*	Percentage
Hands-on training for learning and skills to be acquired better	7	100%
Online training as it is convenient	3	30%

Training Needs

Data collected regarding training needs included responses from an open-ended question (item #22a) from the online survey and question #5 of the phone interview guide. For the open-ended question, participants were asked to write about what they thought were their biggest challenges in becoming trained to provide AT. The five major themes coded under the responses collected are presented in Table 8 (M = 7.8, SD = 5.6). These challenges were identified as areas that need to be facilitated or supported in order to allow a better training in AT.

Table 8

Training Challenges

	Occurrences	Percentage
Lack of access to training	16	41.00%
Lack of administration support	13	33.30%
Training others	4	10.26%
Filtering what is available	4	10.26%
Convincing others about AT effectiveness	2	5.13%

During the semi-structured interview, participants were asked to discuss their training needs in assistive technology (M = 8.25, SD = 6.23). Six different major training themes were discovered based on the participants' responses: existing AT technologies (85.1%), formal ongoing training (57.14%), AT evaluation (57.14%), AT implementation (42.86%), AT knowledge/concepts (28.57%), and team collaboration (14.29%).

The last open-ended question posed to participants in the online survey was to identify strategies for training (item #22c). These strategies were also viewed as recommendations to better train professionals in the area of AT (Table 9). Participants' comments were coded identifying four different major themes for helpful strategies in training providers in the area of AT and AT services. The most popular training strategy identified by the participants was the use of demonstrations during training to allow hands-on opportunities with mentoring and coaching activities to discuss real cases, modeling, and brainstorming with actual students. The identification of training needs, lectures, and sources was the second most popular strategy identified, in which participants claimed the need to select training opportunities according to the role of each AT provider in the team. Participants also believed that the establishment of ongoing mentoring programs and the identification of available AT experts was very important for staff training to have a better identification of needs and to effectively implement AT into each students' educational goals. These last training strategies are in accord with DeCoste (2013), who suggested that schools should help AT staff build professional competency with the use integrated expertise programs.

Table 9

Training Strategies

	Occurrences	Percentage
Demonstrations	15	45.45%
Identification of training needs, lectures, and sources	14	42.42%
Streamline of AT needs	3	9.10%
AT integration on education curriculum	1	3.03%

Participants were also asked during the phone interview to identify the perceived barriers (Table 10) to effectively providing assistive technology services in their service area. These barriers (M = 5, SD = 2.0) represented key information discovered during the study as despite the fact that the overall number of participants perceived themselves as having 'average' expertise to 'expert' knowledge and skills in assistive technology, they revealed that they confront daily challenges that impede with their efforts to effectively deliver services to students at Florida K-12 public schools and that more training is necessary.

Table 10

Barriers to Effectively Provide AT Services

	Occurrences	Percentage
Increased work load	8	20.0%
Lack of funds	7	17.5%
AT Awareness	6	15.0%
Lack of administrative support	6	15.0%
Lack of training	5	12.5%
Lack of personnel	3	7.5%
Lack of follow up	3	7.5%
Lack of equipment	2	5.0%

These barriers have been identified in previous studies (Beard, Carpenter, & Johnston, 2011; Lee & Templeton, 2008; Naraian, & Surabian, 2014) revealing that they affect the effectiveness of AT in schools, yet they are still not resolved. According to the Center for Implementing Technology in Education (CITEd) (2015), school leadership plays a key role with these challenges, as school leaders establish guidelines, professional growth and encourage and

support staff competence. CITEd also acknowledged that it is important that school administrators work closely with district-level administrators and coordinators to ensure a proper implementation of services.

Results in the Context of the Research Questions

The conclusions drawn from the data analysis are outlined in this section. These conclusions addressed the perceived AT knowledge and AT skills of AT providers in Florida K-12 Public Schools. In addition, it addresses the training opportunities of these professionals. The conclusions addressed the research questions and common themes discovered during data analyses.

Research Question One. To what extent does the perceived level of AT knowledge differ among AT specialists from different occupations in the Florida public school setting?

Data collected from the online survey and interviews were relevant to target this question. There was valuable data collected identifying differences among AT specialists from different occupations. The occupational therapists (OTs) (M = 4.4, SD = .59) perceived themselves as having the most expertise (above average category) in a great amount of AT knowledge areas than any other profession, followed by the speech language pathologists (SLPs) (M = 4.2, SD= .22). The educators (M = 3.9, SD = .49) followed the 'average' expertise category and then the special educators (M = 3.7, SD = .35). 'Other' professionals (M = 3.2, SD = .41) were identified with the least perceived expertise in AT knowledge among the group within an 'average' expertise.

Results obtained during the semi-structured interview revealed that all professionals with the exception of the educators considered that their strongest AT knowledge area resided in the evaluation and recommendation of alternative and augmentative communication (AAC) devices

(71.43%). Thus, knowledge in the use of alternative and augmentative communication devices was one of the weakest areas identified by the special educators (14.29%) and 'other' professionals (14.29%) revealing that they perceived themselves as having the knowledge for the evaluation of AAC but lacking the knowledge for the use of the AAC devices. Another finding of the study was that the educators, OTs, SLPs, and 'other' professionals, perceived that they have strong AT knowledge about educational technologies.

An interesting finding was that the SLPs (14.29%) and 'other' professionals (14.29%) were the only ones identifying the evaluation process as a strong foundation AT knowledge. Furthermore, the educator, OTs, and special educators identified the evaluation and services to students with visual and hearing impairments as a weak AT knowledge. In addition, all of the professions with the exception of the occupational therapists perceived that their weakest AT knowledge was under the intervention area (71.43%).

Research Question Two. To what extent does the perceived level of AT skills differ among AT specialists from different occupations in the Florida public school setting?

Data collected from the online survey and interview were relevant to target this question. The occupational therapists (OTs) (M = 4.4, SD = .46) and speech language pathologists (SLPs) (M = 4.3, SD = .32) also perceived themselves as having 'above average' expertise in more AT skills areas than any other profession. The educators (M = 4.1, SD = .54) followed the 'above average' expertise category and then the special educators (M = 3.9, SD =.55). 'Other' professionals (M = 3.3, SD = .43) again identified themselves of having the least perceived expertise among the group in AT skills.

Results obtained during the semi-structured interview revealed that all professionals with the exception of the OTs considered that their strongest AT skills area fall under the use of

technologies related to AT (57.14%). On the contrary, all professionals with the exception of the educator identified that their weakest AT skills was the use of technologies in AT (57.14%). Furthermore, the other identified strong skills area was the grading and adaptation of technologies (57.14%). All participants with the exception of the special educator perceived that they have good skills grading and adapting technologies to students in the classrooms. In addition, it was revealed that the educator (14.29%) and 'other' professions (14.29%) perceived that they have poor skills in the use of AAC devices. This supports that 'other' professionals present weak AT knowledge and skills in the area of identification of evaluation and use of AAC devices than other professionals that provide AT services in the Florida K-12 schools. The last weakest AT area identified by the special educators (14.29%) was the evaluation and provision of AT for students with hearing and visual impairments.

Research Question Three. What are the AT specialists' perceptions about their AT knowledge and skill levels?

Participants revealed that their perceived knowledge and skills in assistive technology were high with major scores falling under 'above average' expertise (37.21%), followed by the 'expert' category with a 34.65%, 'average' expertise (19.27%), 'below average' expertise (6.68%) and 'no expertise' (2.20%). Despite that 91% of the AT specialists that work in Florida K-12 public schools perceived that their AT knowledge and skills expertise fall between 'average' and 'experts', it was discovered that there is 9% of the AT specialists which are currently responsible for the evaluation and recommendations of AT devices and services that perceived their AT knowledge and skills as 'below average' of with 'no expertise'. It was noticed that in both the perceived AT knowledge and AT skills categories, the expertise hierarchy resulted in the following order: occupational therapists, speech language pathologists, educators, special

educators, and 'other' professionals. This hierarchy seemed to be representative of the pre-service training received in assistive technology.

Results related to the perceived AT knowledge and AT skills of participants were higher than previous studies that examined the preparation of special education teachers in assistive technology, AT knowledge of speech language pathologists and the confidence of occupational therapists in the evaluation and selection of assistive technologies and services (Lee & Vega, 2005, Lon et al., 2007; Ratcliff, Koul, & Lloyd, 2008). During the open-ended questions and phone interviews, participants' AT knowledge and skills seemed inconsistent with survey Likert ratings. Concurrently, participants identified a considerable amount of weaknesses in the areas of AT knowledge and skills with a list of training needs. These results concur with Simpson, McBride, Spencer, Lowdermilk, and Lynch (2009) that reported that many professionals currently working with students with disabilities have not received adequate training and do not have the competence for the appropriate provision of assistive technology services in public schools.

Research Question Four. What common competency sets are needed for the AT specialist, regardless of their occupational role?

The data collected to answer this question was taken from the open-ended questions in the online survey. Participants identified the following competencies sets needed for AT specialists.

AT Knowledge. (1) knowledge about technologies, (2) knowledge about technologies, (3) AT awareness, (4) evaluation, (5) match technology with student's needs, (6) implementation, (7) team work, (8) efficient time management, and (9) legislative mandates.

AT Skills. (1) implementation, (2) evaluation, (3) training skills, (4) team work, and (5) identification of training needs.

Training. (1) AT Evaluation, (2) team work, (3) AT awareness, (4) training skills, (5) continuous training, (6) AT legislation, (7) system policies and procedures.

The identified collection of competencies that are needed in AT are required to facilitate professional competence to AT providers at schools. The lack of appropriate competencies in AT provider will affect the implementation of legal mandates that encourage the development of services and provision of equipment for individuals with disability to improve their educational outcomes and independence (Beard, Carpenter & Johnston, 2011; Hemmingsson, Lidstrom & Nygart, 2009).

Research Question Five. What are the training opportunities among AT specialists from different occupations in the Florida public schools setting?

Data collected from the online survey revealed that despite that 86.03% of the participants claimed that they received 'adequate' to 'exceptional' training in the past, 12.90% stated that their previous AT training was 'slightly less than adequate', 1.07% attested that it was 'not adequate' and 4.84% confirmed that they have not received any previous AT training in the following areas: clients with disabilities and special health care needs, service delivery systems, disabilities, working with families, collaboration with other service providers and, legislation, regulation and policy impacting AT and AT services. This data reveal that there are still many opportunities to train AT providers in the Florida school system and likewise supports previous research that reported that many professionals that recommend AT does posses adequate training in the provision of assistive technology services in public schools (Simpson, McBride, Spencer, Lowdermilk, & Lynch, 2009).

Additionally, from another question from the survey, participants recognized the value of training activities and identified the following top 10 areas as the most useful in the area of AT: (1) computer access devices (93.55%), (2) alternative and augmentative communication devices (83.87%), (3) techniques used to train or teach an individual to use AT (83.87%), (4) educational software (80.65%), (5) developing a collaborative consultation service delivery model to obtain AT and provide AT services (77.42%), (6) voice activated software (77.42%), (7) documentation (70.97%), (8) client strengths, needs and abilities related to service delivery issues assessment (67.74%), (9) impact of AT on access to education, employment, independence (64.52%), and (10) client's use of device related to service delivery issues assessment (64.52%).

Research Question Six. What types of training opportunities are essential among AT specialists from different occupations in the Florida school setting?

In addition to the identified training opportunities listed above, participants distinguished six major training areas that they perceived as essential for AT providers during the semi-structured interview. Results obtained during the semi-structured interviews revealed that professionals (85.1%) with the exception of the OTs assured that training regarding existing technologies in assistive technology is essential in order to provide AT services. In addition, participants (57.14%) with the exception of the special educators considered that formal ongoing training in AT is essential. Participants stated that with the rapid proliferation of assistive technologies, the ongoing training of technologies and assessment tools is extremely needed in the AT area. Concurrently, participants (57.14%) with the exception of the SLPs, stated that training about the AT evaluation process is critical for AT specialists that provide services in the Florida school system. Meanwhile, participants (42.86%) with the exception of the OT's and

SLP's considered that training about AT implementation is also essential for AT specialists. AT knowledge and concepts were identified as essential by the educator (14.29%) and the OT's (14.29%). Lastly, the educator group (14.29%) considered that training about team collaboration is also vital for AT specialists.

Overall, the top three training opportunities identified by the participants were computer access devices (93.55%), alternative and augmentative communication devices (93.55%) and techniques used to train or teach individuals how to use AT (83.87%). The educators identified 23 training opportunity topics that varied from basic AT overview to mobility and seating devices. The occupational therapists' top three training opportunity topics were: impact of AT on access to education, employment, independence (66.66%), client's abilities in different contexts/environments related to service delivery issues assessment (66.66%), and documentation (66.66%). It was observed that none of these topics were identified as the top three by the total amount of participants based on Table 10. The top three training opportunity topics by special educators (100%) were: alternative and augmentative communication devices, computer access devices, and educational software. It was observed that the special educators identified the same top training opportunities topics as the whole group in this category.

The top three training opportunity topics identified by the speech language pathologies were the following: computer access devices (92.86%), alternative and augmentative communication devices (78.87%), techniques used to train or teach an individual to use AT (78.87%). The following were the top three training opportunity topics identified by 100% of 'Other' professionals: alternative and augmentative communication devices, computer access devices, educational software.

Summary

In Chapter 4, the researcher presented the findings and results of the study based on the quantitative and qualitative content analysis of the online survey and semi-structured interviews of the participants. The researcher discussed and presented verbatim examples to support the established answers through the content analysis approach.

Chapter 5

Conclusions, Implications, Recommendations and Summary

Introduction

The purpose of this descriptive research study was to examine the competencies of assistive technology specialists in K-12 public schools and identify training opportunities that may have helped them achieve professional competence in the evaluation and provision of assistive technology devices and services across AT service providers from different preparation backgrounds. Studies revealed that several professional organizations and educational institutions have modified their programs and curriculums to add or increase training of specialized knowledge and skills in AT in recognition of the importance of professional competence in AT and the lack of previous training available (Brady, Long, Richards, & Vallin, 2007; Judge & Simms, 2009).

A sequential mixed quantitative and qualitative approach was used to examine the perceived competencies of assistive technology specialists in Florida K-12 public schools. The identification of training opportunities that may have helped the AT specialists achieve professional competence in the evaluation and provision of assistive technology (AT) services was also examined. This study collected data from a self-administered online survey and semi-structured phone interviews. The quantitative data were collected through the online survey. The qualitative data were collected through open-ended questions in the online survey and single semi-structured interviews with selected participants to obtain in-depth understanding of the perceived AT knowledge and skills and training needs (Kvale & Brinkmann, 2009;

Guggenberger, 2008). Both the survey and interview included questions about the participants' perceived knowledge, skills, and training in assistive technology. Data were analyzed using IBM SPSS and NVivo software.

The research questions addressed for this study were as follows:

1. To what extent does the perceived level of AT knowledge differ among AT specialists from different occupations in the Florida public school setting?
2. To what extent does the perceived level of AT skills differ among AT specialists from different occupations in the Florida public school setting?
3. What are the AT specialists' perceptions about their AT knowledge and skill levels?
4. What common competency sets are needed for the AT specialist, regardless of their occupational role?
5. What are the training opportunities among AT specialists from different occupations in the Florida public schools setting?
6. What types of training opportunities are essential among AT specialists from different occupations in the Florida school setting?

Conclusions

The overarching goal of this study was to examine and describe the perceived AT competencies and training opportunities of school AT specialists across different disciplines. In order to achieve this goal the researcher delineated two sub-goals. The first sub-goal was to describe the perceived knowledge and skill level differences among AT specialists in Florida K-12 public schools. The second sub-goal was to describe the incidence of training opportunities for educational professions providing AT services across different disciplines. Below are the

conclusion points related to the significant information exposed in this study that should help schools administrators find solutions to the identified factors that might impact the lack of competence in the provision of AT services in Florida K-12 schools:

- Study results revealed that the perceived level of AT knowledge and skill differ among AT specialists from different occupations in Florida public schools.
- The occupational therapists and the speech language pathologists in Florida public schools were the two professions with the highest perceived AT knowledge and skills, followed by the educators, special educators and 'other' professionals (assistive technology coordinator, speech language pathology assistant, assistive technology specialist, curriculum support specialist, center technology program specialist).
- AT specialists perceived themselves as having higher levels of AT skills than AT knowledge. This finding was related to the fact that most participants claimed not having the time or administrative support for training. Participants had a variety of different backgrounds and professional preparation and many of them did not have pre-service training or certifications in assistive technology. Several participants confessed using their intuitiveness in the use and application of assistive technology based on experience with equipment or learning by "doing".
- Participants felt that they are strong evaluators but that they need to increase their knowledge in the identification of the best AT solutions for their students. Challenges identified in this area were the rapid proliferation of new technologies and lack of training.
- Most participants revealed that they are knowledgeable with the use of computer systems (e.g. laptops, tables, and smartphones), grading and adapting the technology and

identifying the proper location of the technology on a wheelchair or seat to facilitate student's use. In contrast, participants also expressed that they do not feel competent in the use of high technology devices.

- The most critical AT knowledge areas were: technology knowledge, evidence based practice, AT awareness, evaluation process, matching technology and student's needs, implementation process, team work, and legislative mandates.
- The most critical AT skill areas were: implementation, evaluation, training skills, effective use of technology, teamwork and implementation.
- The most critical AT training areas were: AT evaluation, teamwork, AT awareness, training skills, continuous training and legislation and policies.
- Participants revealed a general satisfaction with the quality of previous training received but that they needed more continuous hands on workshops with mentoring approach to meet their professional needs and growth.
- Results implied that training opportunities should be coordinated and provided to the AT specialists according to their role and responsibilities in the AT team.
- The challenges identified in schools to facilitate training were the lack of access to training, lack of administration support, not knowing how to train others, lack of time, last of knowledge to identify resources, and the deviation of efforts convincing others about the AT effectiveness.

The findings presented in this study according to the results obtained from the online survey and phone interviews provided important information that can help guide future studies about the AT knowledge and skill in schools. They can also help educators, researchers and school administrators develop requirements for professional recruitment of AT specialists and

comprehensive guidelines for training to assist the educational institutions meet the students' demands and AT needs.

Implications

This study supports a critical need for ongoing formal training to all the AT providers in Florida K-12 public schools to achieve competence in the area of AT, considering the specific differences and needs among the different specialists that provide AT services. This training is vital so that they are able to meet their students' assistive technology needs, which legislation requires for students with disabilities. This is of great concern as Petcu, Yell and Fletcher (2014) identified that many school districts are not following AT obligations according to legislation. The schools districts are mainly failing for the following reasons: (1) lack of provision of AT assessments, (2) AT needs are not addressed, (3) they are not providing the AT devices o services specified in a student' IEP and (4) they are not implementing AT services properly. The identified essential competencies for AT providers in this study can contribute to the development of strict requirements for professional recruitment of assistive technology specialists in Florida K-12 public schools and the development of comprehensive guidelines for intervention and training. In addition and most importantly, the information from the current investigation may assist educational institutions in meeting their students' assistive technology needs.

Furthermore, the information from this study may enable educators, researchers and school administrators to better develop requirements for professional recruitment of AT specialists, and the development of comprehensive guidelines for training to assist the educational institutions meet the students' demands and AT needs. Educational administrators

can also create policies and augmented training programs that can assist the institutions meet legislation requirements for AT services for students with disabilities.

Recommendations

Recommendations for Future Research

Future research is imperative to understand the accurate knowledge and skills of AT providers when evaluating students with special needs and when implementing recommendations made after the evaluation for the use of assistive technologies and assistive technology services. The following are several recommendations for future research. First, systematic replication of this study is recommended with a broader sample to better explore the needs of all different professionals that provide assistive technology services in the school system. Second, it is recommended to include direct observations of participants during the evaluation and implementation process of AT.

Third, future research is recommended to include a testing section to better measure the knowledge and skills of the participants. The current data were based on self-reports and may not be fully consistent with the participants' actual knowledge and skills. This was an anticipated possible limitation of this study as proclivity of the participants to honestly respond to the survey questions was uncontrolled. The fear to honestly identify the lack of AT competency in some areas could have interfered with an accurate representation of their professional competencies. This could have resulted in them not answering the questions accurately. The use of live testing during the evaluation and implementation process might eliminate this discomfort or barrier from a future study. Fourth, future research is needed to investigate if the current AT competences of AT specialists in schools correlate to the IDEA 2004 mandate to provide AT services to meet the functional needs of students with disabilities.

Recommendations for Professional Practice

Based on the results of this study, the following recommendations are relevant to the professional practice of assistive technology in schools.

1. *Establish specific guidelines and practice standards for the evaluation and provision of assistive technology services in schools.* There is a body of AT literature related to standards and professional competence requirements in the assistive technology industry, which could be integrated into the school system standard for assistive technology (Dalton, & Rouch, 2010; Marins & Emmel, 2011; Post, 2009; RESNA, 2015; Smith et al., 2009).
2. *Establish specific guidelines for recruitment of AT providers.* Cullen, Levitt, Robertson, and Sandoff (2013) stated that hiring qualifying teachers and school personnel is a challenge for many school principals. Yet, they revealed that the schools that hired high-qualified staff appeared to be more efficient.
3. *Provide training opportunities that are accessible to the providers considering different learning styles*. To ensure successful professional training, instructors should consider differences of the learning styles and integrate adult learning theories into training opportunities (Biech, 2009).
4. *The provision of assistive technology training in schools should be provided following mostly a group instruction focus with hands-on opportunities.* Group work instruction has worked effectively to facilitate interactive learning, and cooperative effort to achieve goals (Nemati & Deltalab, 2014).
5. *Training opportunities should include demonstrations and simulations with specific guidelines to follow procedures allowing problem-solving situations*. Demonstration

based instruction has been effective in the understanding of theoretical principles and abstract information. Demonstrations have been effectively used with mentoring, peer coaching, cognitive coaching, subject-specific coaching, programmed-specific coaching, and reform-oriented coaching (Paor, 2015).

6. *Support a mentoring program with opportunities for coaching and individual professional development opportunities.* Turner and McCarthy (2015) attested that informal coaching is a valuable and effective learning and development practice, which can lead to the design of training content related to the needs identified during coaching sessions.
7. *Identification of training needs according to each provider's profession and role in the AT team.* Lester (2014) also suggested following professional competence frameworks considering individual roles within each profession.
8. *Establish formal ongoing training to AT specialists.* Lester (2014) identified that the use of professional competence standards should be an ongoing process.
9. *Allocate funds for assistive technologies.* Studies revealed that the lack of resources obstruct the use of technology in schools and affect the student's performances (Davies, 2010; Schoepp, 2005).
10. *Efficiently use funds for AT equipment and training to better meet the needs of specific schools and districts.* Consider having a lending library of equipment that could be accessible statewide. Cullen, Levitt, Robertson, and Sandoff (2013) implied that underperforming schools should provide the technology and equipment needed to students to start changing traditional paradigms that have failed to meet the students’

needs in the past so access to equipment may support school staff to better meet the students' academic needs and goals.

11. *Allocate training time and resources to train school teachers not involved directly with AT so they can better help implement the AT recommendations with their students.* Literature related to assessment claimed that there is a vital need for development of technology-assistive reading assessments in schools, yet there is a larger need to better understand the use of assistive technology in the classroom (Johnstone, Turlow, Altman, Timmons, & Kato, 2009). Educators need to be on-board with the basic knowledge about assistive technology services and devices and know their uses and educational potential in order to better screen their students' needs. Alnahdi (2014) affirmed that teachers who are not exposed to the benefits and applications of technology in education are more reluctant to use them.
12. *Promote team collaboration to facilitate provision of AT services*. Best practices should include team collaboration when identifying assistive technology needs and interventions for students with special needs (McGivern & McKevitt, 2002). Studies also revealed a correlation of inter professional collaboration and quality of services with a possible reduction of burnout and increase engagement (Martinussen, Adolfsenn, Lauritzen, & Richardsen, 2012).
13. *Coordinate a fair distribution of responsibilities to AT providers according to their roles in the team.* Gupta, Paterson, Lysaght and von Zweck (2012) conducted a study the experiences of burnout of occupational therapists and discovered that work-related stress leads to job dissatisfaction, low-organizational commitment, absenteeism, and high

turnover. These factors also affect the interpersonal functioning of teams, patient care, attrition, problems at home, and physical and mental health problems.

14. *Provide administrative support to assistive technology providers.* Administrative support is imperative to create a climate that supports the implementation of evidence-based interventions (Forman, 2015).

Summary of the Study

The overarching goal of the study was to examine and describe the AT competencies and training opportunities of school AT specialists across different disciplines. While the sample size was small and did not represent every AT provider in Florida K-12 public schools, the sample, though modest, was a good representation of the whole group targeted. This study was motivated by research results suggesting that professionals currently working with students with disabilities in public schools have not received adequate training and do not have the competence for the appropriate provision of assistive technology services (Beard, Carpenter & Johnston, 2011; Hemmingsson, Lidstrom & Nygart, 2009). This information was of great concern as the lack of personnel in schools that possess appropriate competencies in AT affects the implementation of legal mandates that encourage the development of services and provision of equipment for individuals with disability to improve their educational outcomes and independence.

Previous studies focused on the evaluation of special education teachers, speech pathologists and occupational therapists that work with assistive technology has been published (Costello, 2014; Long, et al., 2007; Marins & Emmel, 2011; Naraian, & Surabian, 2014; Zhou, Smith, Parker, & Griffin-Shirley, 2011). However, there were no studies found that evaluated the level of AT competencies of AT specialists, given the range of personnel that assume different

roles as they apply AT in their positions. This lack of information regarding known differences among these professionals was also a motivation for the implementation of this study.

The researcher additionally examined the incidence of training opportunities and needs for educational professions providing AT services across different disciplines. It was believed that the identification of training opportunities may help achieve professional competence in the evaluation and provision of assistive technology devices and services across AT service providers from different preparation backgrounds. Costello (2014), Hemmingsson, Lidstrom, and Nygart (2009) identified that the main barrier to provide provision of AT services in school is the lack of professional training. It is thought that information from this study can help educators, researchers and school administrators develop requirements for professional recruitment of AT specialists and comprehensive guidelines for training to assist the educational institutions meet the students' demands and AT needs.

The researcher used a quantitative and qualitative approach to examine the perceived competencies and training needs of assistive technology specialists (ATS) in Florida K-12 public schools. Data collection involved a self-administered online survey and a semi-structured phone interview to explore the AT knowledge and skills of assistive technology specialists in Florida K-12 public schools, and identify training opportunities that may have helped them achieve professional competence in the evaluation and provision of assistive technology devices and service. The online survey was developed from existing surveys that examine AT knowledge and skills and training of assistive technology specialists (University of Kentucky Assistive Technology, n.d.; Long et al., 2007). Conducting a mixed method approach for data analysis helped expand the survey findings. Thirty-nine (39) individuals completed the survey (seven of

whom completed the phone interview in addition to the survey), represented different professions that occupy assistive technology specialist positions in Florida public schools.

Results displayed the perceived AT knowledge and skills but also current practices in the school system. Different levels of knowledge and skills were evident throughout the study between occupational therapists, speech language pathologists, educators, special educators and other professions (e.g. assistive technology coordinator, speech language pathology assistant, assistive technology specialist, curriculum support specialist, and center technology program specialist). Participants also shared the many barriers that they encounter to provide AT services as well as challenges to gain new knowledge in the AT area to become competent in the field. Specific findings regarding the differences between the different professions represent valuable information that can be useful for school administrators when recruiting personnel and developing professional development activities.

Overall, 91% of the AT specialists that work in Florida K-12 public schools perceived that their AT knowledge and skills expertise fall between 'average' and 'experts'. Thus, 9% of the AT specialists which are currently responsible for the evaluation and recommendations of AT devices and services perceived that their AT knowledge and skills fall under 'below average' or with 'no expertise'. During the open-ended questions and phone interviews, participants revealed that most of them still feel that they possess a low level of expertise in many areas of AT, specifically in the intervention process, the identification and use of new technologies, and technologies under the category of high technologies. Participants also identified those areas as critical for the provision of quality AT services in schools.

In addition, participants identified barriers that prevented them from the provision of quality of services to follow an AT continuum and helpful strategies to train AT providers. These

barriers should be considered by administrators to establish regulations and policies to prevent them and the helpful strategies to train AT providers should be implemented in the training process when organizing training activities to the AT providers. Future research is imperative to understand the accurate knowledge and skills of AT providers when evaluating students with special needs and when implementing recommendations made after the evaluation for the use of assistive technologies and assistive technology services.

Appendix A
Online Survey

NSU
NOVA SOUTHEASTERN UNIVERSITY

A Study of Assistive Technology Competencies of Specialists in Public Schools

Assistive Technology Competencies and Training (ATCT) Survey

Introduction

Principal Investigator:
Betsy B. Burgos, EdS, MA, OTR/L, ATP
10004 Oak Quarry Dr.
Orlando, FL 32832
Tel. 239-821-4447

Co-Investigator:
Laurie Dringus, PhD
Nova Southeastern University
3100 College Avenue
Fort Lauderdale, FL 33314-4416
Tel. 954-262-2073

For further questions related to your research rights, please contact:
Human Research Oversight Board (Institutional Review Board)
Nova Southeastern University
954-262-5369/Toll Free: 866-499-0790
IRB@nsu.nova.edu

What is the study about?
You are invited to participate in a research study. The goal of this study is to examine and describe the assistive technology (AT) competencies and training opportunities of school AT specialists across different disciplines.

Why are you asking me?
You have been invited to participate because you are one of the assistive technology professionals that provide AT services in K-12 public schools in Florida.

What will I be doing if I agree to be in the study?
You will be asked to complete a survey with questions related to the assistive technology knowledge and skills that you possess, and your training experience and needs. The survey consists of three sections containing multiple-choice and multi-pronged questions in Likert-type scale, and open-ended questions which will take you approximately 40-45 minutes to complete.

Any information collected during the study will be saved for our record for 36 months after the study has concluded. After this time, all data will be deleted from all electronic storage devices and all paperwork will be shredded.

What are the dangers to me?
To the best of our knowledge, there are no physical or psychological risks associated with the procedures in this study. Only three possible discomforts were identified. The first one is the possible perception of loss of time from the participants during the completion of the phone interview. To minimize loss of time, the online survey will be available at any time to prevent interference with daily job related activities.

The second discomfort is the proclivity of the participants to honestly respond to the interview questions as they might identify that their responses related to their AT competencies might be below average and consider that their responses might affect their jobs. The intentions of the study are to describe the AT competencies and training opportunities of school AT specialists across different disciplines and not to affect any participant's job as this information will be kept confidential. The third risk or discomfort is the loss of confidentiality. As stated before, the participant's name will not be associated with their records.

If you have questions about the research, your research rights, or if you experience an injury because of the research please contact Mrs. Burgos at (239) 821-4447. You may also contact the IRB at the numbers indicated above with questions about your research rights.

Are there any benefits for taking part in this research study?
There are no benefits to you for participating.

Will I get paid for being in the study? Will it cost me anything?
There are no costs to you or payments made for participating in this study. However, participants in the study will have the opportunity to participate in a raffle for an Apple iPod Touch (8 GB). Those participants who complete the interview will be added twice for an additional opportunity for the drawing. The estimated value of the price is $129.00.

How will you keep my information private?
All information obtained in this study is strictly confidential unless disclosure is required by law. The IRB, regulatory agencies, or Dr. Dringus may review research records.

What if I do not want to participate or I want to leave the study?
You are completely free to stop participating in the study

*1. Agreement to participate in the study

○ I understand that completion of this survey implies my consent to participate.

Next

Demographic Information

***2. What percentage of your current job responsibilities are directly related to AT and/or AT Services?**

- ○ 0-10%
- ○ 11-30%
- ○ 31-60%
- ○ 61-90%
- ○ 91-100%

***3. What is your current professional discipline? Please check only one.**

- ○ Audiologist
- ○ Educator
- ○ Occupational Therapist
- ○ Physical Therapist
- ○ Special Educator
- ○ Speech Language Pathologist
- ○ Rehabilitation Engineer
- ○ Vocational Counselor
- ○ Other

Please specify

***4. In which geographic area(s) do you provide assistive technology services in Florida?**

- ☐ Panhandle
- ☐ North East
- ☐ East Central
- ☐ West Central
- ☐ South

***5. How many years have you been practicing in your current profession?**

- ○ Less than 1 year
- ○ 1-2 years
- ○ 3-5 years
- ○ 6-10 years
- ○ 11 years or longer

***6. Have you had formal training in assistive technology?**

- ○ No
- ○ Yes

Please specify

***7. Do you possess any certifications in assistive technology?**

- ○ No
- ○ Yes

Which one(s) (please specify)

***8. How many years of experience do you have in assistive technology?**

- ○ Less than 1 year
- ○ 1-2 years
- ○ 3-5 years
- ○ 6-10 years
- ○ 11 years or longer

***9. In which assistive technology areas you provide services at the schools assigned?**

- ☐ Activities of daily living
- ☐ Behavior
- ☐ Cognition
- ☐ Verbal Communication
- ☐ Written Communication
- ☐ Mobility
- ☐ Seating
- ☐ Vision
- ☐ Hearing
- ☐ Sensory Processing
- ☐ Academic Achievement
- ☐ Other

Please specify

***10. Please identify all the age ranges of the clients/students you serve.**

- ☐ a. Birth to 3 years
- ☐ b. 3 to 5 years
- ☐ c. 5 to 13 years
- ☐ d. 14 to 21 years
- ☐ e. 21 to 24 years

***11. In which of the following areas does the population you serve have problems?**

- [ ] Activities of daily living
- [ ] Behavior
- [ ] Cognition
- [ ] Verbal Communication
- [ ] Written Communication
- [ ] Mobility
- [ ] Seating
- [ ] Vision
- [ ] Hearing
- [ ] Sensory Processing
- [ ] Academic Achievement
- [ ] Other:

Please specify

***12. What is your highest earned academic degree?**

- ○ Doctorate
- ○ Master's
- ○ Bachelor's
- ○ Other:

Please specify

***13. What is your highest earned professional preparation degree?**

- ○ Doctorate
- ○ Master's
- ○ Bachelor's
- ○ Associate
- ○ Certificate

***14. You are:**

- ○ Female
- ○ Male

***15. What best describes your race/ethnicity?**

- ○ White/ Caucasian
- ○ Black/ African American
- ○ Asian, Pacific Islander, Native Hawaiian
- ○ Hispanic
- ○ Native American, American Indian, Alaskan Native
- ○ Multiracial
- ○ Other:

Knowledge and Skills

***16. Please rate your level of expertise in each of the following areas. A rating of "1" indicates no expertise and "5" indicates that you are an expert in that area.**

	1	2	3	4	5
Concepts and issues related to the use of technology in education and other aspects of our society.	○	○	○	○	○
Articulate a personal philosophy and goals for using technology in special education.	○	○	○	○	○
Use technology-related terminology in written and oral communication.	○	○	○	○	○
Describe legislative mandates and governmental regulations and their implications for technology in special education.	○	○	○	○	○
Impact of technology at all stages of development on individuals with exceptional learning needs.	○	○	○	○	○
Issues in diversity and the use of technology.	○	○	○	○	○
Identify and operate instructional and assistive hardware, software, and peripherals.	○	○	○	○	○
Provide technology support to individuals with exceptional learning needs who are receiving instruction in the general education setting.	○	○	○	○	○
Arrange for demonstrations and trial periods with potential assistive or instructional technologies prior to making purchase decisions.	○	○	○	○	○

Procedures for the organization, management, and security of technology.	○	○	○	○
Ergonomic principles to facilitate the use of technology.	○	○	○	○
Evaluate features of technology systems.	○	○	○	○
Use technology to foster social acceptance in inclusive settings.	○	○	○	○
Identify the demands of technology on the individual with exceptional learning needs.	○	○	○	○
Procedures for evaluation of computer software for their potential application in special education.	○	○	○	○
Use communication technologies to access information and resources electronically.	○	○	○	○
Procedures for evaluation of other technology materials for their potential application in special education.	○	○	○	○
Funding sources and processes of the acquisition of assistive technology devices and services.	○	○	○	○
National, state, or provincial PK-12 technology standards.	○	○	○	○
Assist the individual with exceptional learning needs in clarifying and prioritizing functional intervention goals regarding technology-based evaluation results.	○	○	○	○

Identify elements for the curriculum for which technology applications are appropriate and ways they can be implemented.	○	○	○	○	○
Identify and operate software that meets educational objectives for individuals with exceptional learning needs in a variety of educational environments.	○	○	○	○	○
Design, fabricate, and install assistive technology materials and devices to meet the needs of individuals with exceptional leaning needs in a variety of educational environments.	○	○	○	○	○
Provide consistent, structured training to individuals with exceptional learning needs to operate instructional and adaptive equipment and software until they have achieved mastery.	○	○	○	○	○
Verify proper implementation of mechanical and electrical safety practices in the assembly and integration of the technology to meet the needs of individuals with exceptional learning needs.	○	○	○	○	○
Develop and implement contingency plans in the event that assistive or instructional technology devices fail.	○	○	○	○	○
Develop specifications and/or drawings necessary for technology acquisitions.	○	○	○	○	○

Write proposals to obtain technology funds.	○	○	○	○	○
Use of technology in the assessment, diagnosis, and evaluation of individuals with exceptional learning needs.	○	○	○	○	○
Match characteristics of individuals with exceptional learning needs with technology product or software.	○	○	○	○	○
Use of technology to collect, analyze, summarize and report student performance data to aid instructional decision-making.	○	○	○	○	○
Identify functional needs, screen for functional limitations and identify if the need for a comprehensive assistive or instructional technology evaluation exists.	○	○	○	○	○
Monitor outcomes of technology-based interventions and reevaluate and adjust the system as needed.	○	○	○	○	○
Assist the individual with exceptional learning needs in clarifying and prioritizing functional intervention goals regarding technology-based evaluation results.	○	○	○	○	○
Work with team members to identify assistive and instructional technologies that can help individuals meet the demands placed upon them in their environments.	○	○	○	○	○

Identify placement of devices and positioning of the individual to optimize the use of assistive or instructional technology.	○	○	○	○	○
Examine alternative solutions prior to making assistive or instructional technology decisions.	○	○	○	○	○
Make technology decisions based on a continuum of options ranging from no technology to high technology.	○	○	○	○	○
Equity, ethical, legal, and human issues related to technology use in special education.	○	○	○	○	○
Organizations and publications relevant to the field of technology.	○	○	○	○	○
Maintain ongoing professional development to acquire knowledge and skills about new developments in technology.	○	○	○	○	○
Adhere to copyright laws about duplication and distribution of software and other copyrighted technology materials.	○	○	○	○	○
Advocate for assistive or instructional technology on individual and system change levels.	○	○	○	○	○
Participate in activities of professional organizations relevant to the field of technology.	○	○	○	○	○
Roles that related services personnel fulfill in providing technology services.	○	○	○	○	○

Guidelines for referring individuals with exceptional learning needs to another professional.					
Conduct in-service training in applications of technology in special education.					
Refer team members and families to assistive and instructional technology resources.					
Collaborate with other team members in planning and implementing the use of assistive and adaptive devices.					
Instruct others in the operation of technology, maintenance, warranties, and trouble-shooting techniques.					

***17. Please let us know what you think are the most critical knowledge areas needed regarding AT and AT services.**

***18. Please let us know what you think are the most critical skills areas needed regarding AT and AT services.**

Prev Next

Training Needs

***19. Please rate how adequate your training was in AT/AT Services from these choices. If you have not received training about AT or AT Services in any of these areas please check the box indicating no training:**

	Not Adequate	Slightly Less than Adequate	Adequate	More than Adequate	Exceptional	No Training
Clients with disabilities and special health care need	○	○	○	○	○	○
Service Delivery Systems	○	○	○	○	○	○
Disabilities	○	○	○	○	○	○
Working with families	○	○	○	○	○	○
Collaborating with other service provider	○	○	○	○	○	○
Legislation, regulation and policy impacting AT and AT Services	○	○	○	○	○	○

***20. Below is a list of topics that could be included in training activities. Please indicate how useful each of the following topics would be to you in your practice and provision of AT and AT services**

	Not Useful	Somewhat Useful	Very Useful
Overview of AT (principles of AT, human-device interface, software-hardware interface)	○	○	○
Impact of AT on access to education, employment, independence	○	○	○
Principles of fabrication, modification of AT	○	○	○
Repair and maintenance of AT	○	○	○
Types of disabilities	○	○	○
Mobility devices	○	○	○
Devices used for activities of daily living	○	○	○
Positioning devices	○	○	○
Environmental control devices	○	○	○
Seating devices	○	○	○

Alternative and augmentative communication devices	○	○	○
Computer access devices	○	○	○
Educational software	○	○	○
Voice activated software	○	○	○
Client strengths, needs, and abilities related to service delivery issues assessment	○	○	○
Client's abilities in different contexts/environments related to service delivery issues assessment	○	○	○
Client's use of device related to service delivery issues assessment	○	○	○
Developing a collaborative consultation service delivery model to obtain AT and provide AT services	○	○	○
Negotiation strategies	○	○	○
Clinical decision-making and AT	○	○	○
Documentation	○	○	○
Techniques used to train or teach an individual to use AT	○	○	○
Legislation, regulation and policy impacting AT and AT Services	○	○	○
Funding sources	○	○	○
Service delivery systems	○	○	○
Working with families	○	○	○
The influence of culture on use of AT and AT Services	○	○	○

***21. Please rate the following methods of training that you think would be the most effective to receive training in AT and AT Services.**

	Not Effective	Effective	Very Effective
Print Resources (documents, fact-sheets, newsletters, books, journals, etc)	○	○	○
Person to Person (mentoring, supervision, consultation, colleagues, list-serves)	○	○	○
Group Instruction (continuing education, in-service training, conferences, workshops)	○	○	○
Intensive Classroom Instruction (course work)	○	○	○
Online Instruction	○	○	○

***22. Your insight in this issue will be valuable to us. We would appreciate it if you take a few minutes to tell us your thoughts on assistive technology training.**

What is your biggest challenge in becoming trained to provide AT/AT services to the population you serve?

Share with us what you feel are helpful strategies in training providers in the area of AT and AT services.

Please let us know what you think is the most critical training need regarding AT and AT services.

Prev Next

NSU
NOVA SOUTHEASTERN UNIVERSITY

A Study of Assistive Technology Competencies of Specialists in Public Schools

Thank you for completing the survey!!!!

23. Thank you!! The submission of a completed survey will make you eligible of an Apple iPod Touch (8GB) at the end of the study.

If you will be able to complete a phone interview with the investigator, please complete the following information. Your participation on the interview process will add an additional opportunity for the iPod drawing.

The approximate time allotted for the interview is 25 minutes. A maximum of 10 participants will be selected to complete the phone interview.

Name:	
Address:	
Address 2:	
City/Town:	
State:	-- select state --
ZIP:	
Country:	
Email Address:	
Phone Number:	

Prev Done

Appendix B

Interview Guide
Assistive Technology Competencies and Training

Introduction:

Thank you for agreeing to be part of this interview. Your identity will be kept in strict confidentiality. The information that you provide in this interview will be used to describe and better understand the level of AT knowledge and skills of AT specialists as well as their training needs. The interview will be audio-recorded and will take about 25 minutes.

Name: (pseudonym) __ **Profession:** _____
Date: _____ **Sex:** ☐ Female ☐ Male

Questions:

1. Please describe your current training in assistive technology.
    a. Pre-service training
    b. Continuing education
    c. Certifications
    d. Expertise area
    e. Years of experience

2. Please describe how your assistive technology knowledge has helped or prevented you to complete assistive technology services.
    a. What are your strongest AT knowledge areas?
    b. What are your weakest AT knowledge areas?

3. Please describe how your assistive technology skills have helped or prevented you to complete assistive technology services.
    a. What are your strongest AT skills areas?
    b. What are your weakest AT skills areas?

4. What do you perceive are barriers to effectively provide assistive technology services in your service area?

5. What do you consider to be your training needs?
    a. What is the best way to obtain this training (e.g. hands-on training, books, online courses)

6. Is there anything else that you would like to share about assistive technology services, training, etc.?

Appendix C
IRB Approval Letters

NOVA SOUTHEASTERN UNIVERSITY

MEMORANDUM

To: Betsy B. Burgos, Ed.S., M.A., OTR/L, ATP
Graduate School of Computer and Information Sciences

From: David Thomas, M.D., J.D.
Chair, Institutional Review Board

Date: September 5, 2013

Re: *A Study of Assistive Technology Competencies of Specialists in Public Schools*
Research Protocol No. 022001318Exp.

I have reviewed the revisions to the above-referenced research protocol by an expedited procedure. On behalf of the Institutional Review Board of Nova Southeastern University, *A Study of Assistive Technology Competencies of Specialists in Public Schools* is approved in keeping with expedited review categories #6 and #7. Your study is approved on **September 5, 2013** and is approved until **September 4, 2014.** You are required to submit for continuing review by **August 31, 2014.** As principal investigator, you must adhere to the following requirements:

1) CONSENT: You must use the stamped (dated consent forms) attached when consenting subjects. The consent forms must indicate the approval and its date. The forms must be administered in such a manner that they are clearly understood by the subjects. The subjects must be given a copy of the signed consent document, and a copy must be placed with the subjects' confidential chart/file.

2) ADVERSE EVENTS/UNANTICIPATED PROBLEMS: The principal investigator is required to notify the IRB chair of any adverse reactions that may develop as a result of this study. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, consent forms, investigators, etc.) must be approved by the IRB prior to implementation.

4) CONTINUING REVIEWS: A continuing review (progress report) must be submitted by the continuing review date noted above. Please see the IRB web site for continuing review information.

5) FINAL REPORT: You are required to notify the IRB Office within 30 days of the conclusion of the research that the study has ended via the IRB Closing Report form.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: Dr. Ling Wang
Dr. Laurie Dringus
Dr. Jennifer Dillon

Institutional Review Board
3301 College Avenue • Fort Lauderdale, Florida 33314-7796
(954) 262-5369 • Fax: (954) 262-3977 • Email: *irb@nsu.nova.edu* • Web site: *www.nova.edu/irb*

NOVA SOUTHEASTERN UNIVERSITY

MEMORANDUM

To: Betsy B. Burgos, Ed.S., M.A., OTR/L, ATP
Graduate School of Computer and Information Sciences

From: David Thomas, M.D., J.D. PD Dr BT
Chair, Institutional Review Board

Date: August 25, 2014

Re: *A Study of Assistive Technology Competencies of Specialists in Public Schools*—NSU IRB Protocol No. 022001318Exp.

I have reviewed the above-referenced research protocol in keeping with Continuing Review requirements by an expedited procedure. On behalf of the Institutional Review Board of Nova Southeastern University, *A Study of Assistive Technology Competencies of Specialists in Public Schools* is approved. Your study is approved on **August 25, 2014** and is approved until **August 24, 2015.** You are required to submit for continuing review by **July 24, 2015.** As principal investigator, you must adhere to the following requirements:

1) CONSENT: You must use the stamped (dated consent forms) attached when consenting subjects. The consent forms must indicate the approval and its date. The forms must be administered in such a manner that they are clearly understood by the subjects. The subjects must be given a copy of the signed consent document, and a copy must be placed with the subjects' confidential chart/file.

2) ADVERSE EVENTS/UNANTICIPATED PROBLEMS: The principal investigator is required to notify the IRB chair of any adverse reactions that may develop as a result of this study. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, consent forms, investigators, etc.) must be approved by the IRB prior to implementation.

4) CONTINUING REVIEWS: A continuing review (progress report) must be submitted by the continuing review date noted above. Please see the IRB web site for continuing review information.

5) FINAL REPORT: You are required to notify the IRB Office within 30 days of the conclusion of the research that the study has ended via the IRB Closing Report form.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: Dr. Laurie Dringus
Dr. Ling Wang
Mr. Randy Denis

Institutional Review Board
3301 College Avenue • Fort Lauderdale, Florida 33314-7796
(954) 262-5369 • Fax: (954) 262-3977 • Email: *irb@nsu.nova.edu* • Web site: *www.nova.edu/irb*

Appendix D

Consent Form for Participation in the Research Study Entitled A Study of Assistive Technology Competencies of Specialists in Public Schools

Funding Source: None.

IRB protocol #: 0220131Exp.

Principal investigator:
Betsy B. Burgos, EdS, MA, OTR/L, ATP
10004 Oak Quarry Dr.
Orlando, FL 32832
Tel. 239-821-4447

Co-investigator:
Laurie Dringus, PhD
Nova Southeastern University
3100 College Avenue
Fort Lauderdale, FL 33314-4416
Tel. 954-262-2073

For further questions related to your research rights, please contact:
Human Research Oversight Board (Institutional Review Board)
Nova Southeastern University
954-262-5369/Toll Free: 866-499-0790
IRB@nsu.nova.edu

Site Information: Phone Interviews

What is the study about?
You are invited to participate in a research study. The goal of this study is to examine and describe the assistive technology (AT) competencies and training opportunities of school AT specialists across different disciplines.

Why are you asking me?
You have been invited to participate because you are one of the assistive technology professionals that provide AT services in K-12 public schools in Florida. In addition, you have been one of the participants that completed the online survey related to the study. There will be a total of 10 participants that will complete the semi -structure interview.

What will I be doing if I agree to be in the study?
You will be asked to complete a semi-structured phone interview with questions related to the assistive technology knowledge and skills that you possess, and your training experience and needs. Approximately 25 minutes will be required to complete the phone interview. There are no costs to you or payments made for participating in this study.

Initials: _____ Date: _____

Is there any audio or video recording?
This research project will include audio recording of the phone interview. This audio recording will be available to be heard by the researcher, Betsy B. Burgos, personnel from the Institutional Review Board (IRB), and the dissertation chair, Dr. Laurie Dringus. The recording will be transcribed by Betsy B Burgos. An assigned participant number will identify your responses. The recordings will then be saved into an electronic word document to be analyzed by Mrs. Burgos. The recordings will be kept securely in a locked cabinet owned by Mrs. Burgos to ensure security and confidentiality of the participants.

Any information collected during the study will be saved for our record for 36 months after the study has concluded. After this time, all data will be deleted from all electronic storage devices and all paperwork will be shredded. Because your voice will be potentially identifiable by anyone who hears the recording, your confidentiality for things you say on the recording cannot be guaranteed although the researcher will try to limit access to the tape as described in this paragraph.

What are the dangers to me?
To the best of our knowledge, there are no physical or psychological risks associated with the procedures in this study. Only three possible discomforts were identified. The first one is the possible perception of loss of time from the participants during the completion of the phone interview. To minimize loss of time, the phone interviews will be held at a time convenient for the participants to prevent interference with daily job related activities.

The second discomfort is the proclivity of the participants to honestly respond to the interview questions as they might identify that their responses related to their AT competencies might be below average and consider that their responses might affect their jobs. The intentions of the study are to describe the AT competencies and training opportunities of school AT specialists across different disciplines and not to affect any participant's job as this information will be kept confidential. The third risk or discomfort is the loss of confidentiality. As stated before, the participant's name will not be associated with their records.

If you have questions about the research, your research rights, or if you experience an injury because of the research please contact Mrs. Burgos at (239) 821-4447. You may also contact the IRB at the numbers indicated above with questions about your research rights.

Are there any benefits for taking part in this research study?
There are no benefits to you for participating.

Will I get paid for being in the study? Will it cost me anything?
There are no costs to you or payments made for participating in this study. However, participants in the study will have the opportunity to participate in a raffle for an Apple iPod Touch (8 GB). Those participants who complete the interview will be added twice for an additional opportunity for the drawing. The estimated value of the price is $129.00.

Initials: _____ Date: _____

How will you keep my information private?
During the semi-structure interview, the researcher will not ask you for any information that could be linked to you. The transcripts of the audio will not have any information that could be linked to you. As mentioned, the audio will be destroyed 36 months after the study ends. All information obtained in this study is strictly confidential unless disclosure is required by law. The IRB, regulatory agencies, or Dr. Dringus may review research records.

What if I do not want to participate or I want to leave the study?
You are completely free to stop participating in the study at any time. If you do decide to leave or you decide not to participate, you will not experience any penalty or loss of services you have a right to receive. If you choose to withdraw, any information collected about you before the date you leave the study will be kept in the research records for 36 months from the conclusion of the study and may be used as a part of the research. If significant new information relating to the study becomes available, which may relate to your willingness to continue to participate, this information will be provided to you by the investigators.

If you have any questions about the research, your research rights, or research-related injury, please contact Betsy B. Burgos or Dr. Laurie Dringus. You may also contact the IRB at the numbers indicated above with questions as to your research rights.

Other Considerations:
If the researchers learn anything that might change your mind about being involved, you will be told of this information.

Voluntary Consent by Participant:
By signing below, you indicate that

- this study has been explained to you
- you have read this document or it has been read to you
- your questions about this research study have been answered
- you have been told that you may ask the researchers any study related questions in the future or contact them in the event of a research-related injury
- you have been told that you may ask Institutional Review Board (IRB) personnel questions about your study rights
- you are entitled to a copy of this form after you have read and signed it
- you voluntarily agree to participate in the study entitled "A Study of Assistive Technology Competencies of Specialists in Public Schools."

Participant's Signature: _____ Date: _____

Participant's Name (Print): _____ Date: _____

Signature of Person Obtaining Consent: _____

Date: _____

Initials: _____ Date: _____

Appendix E
Training Usefulness

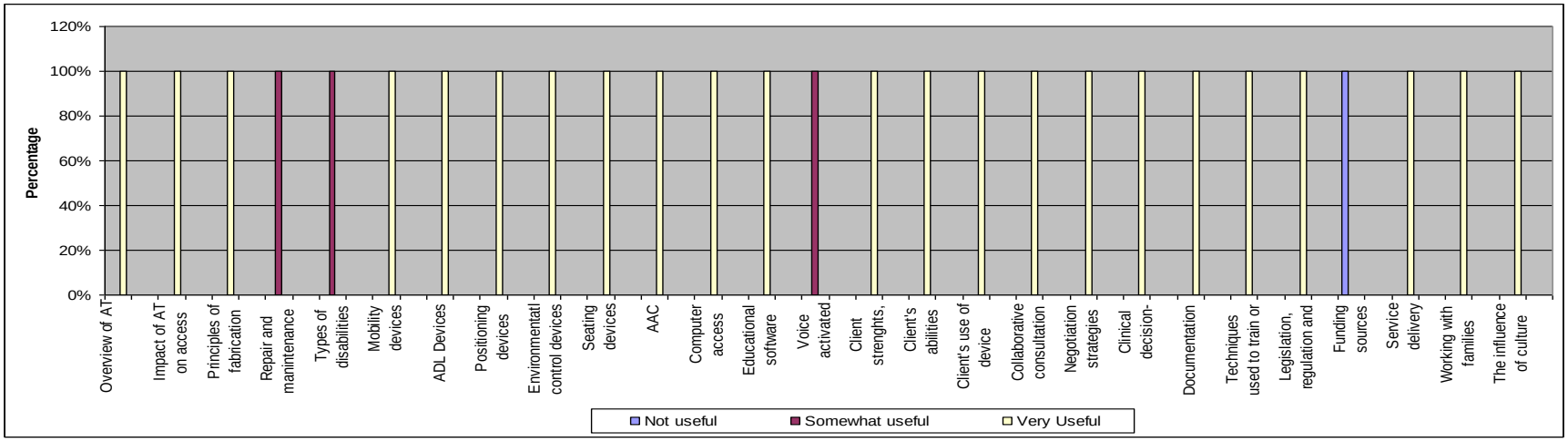

Figure 1. Training Usefulness per Educators

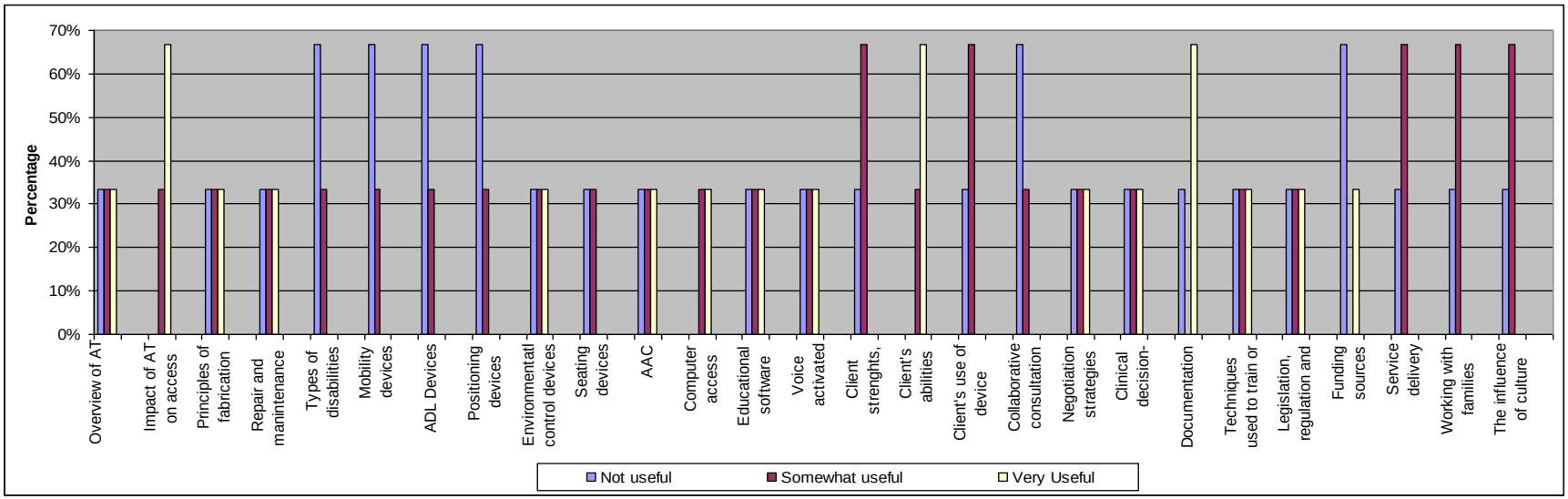

Figure 2. Training Usefulness per Occupational Therapists

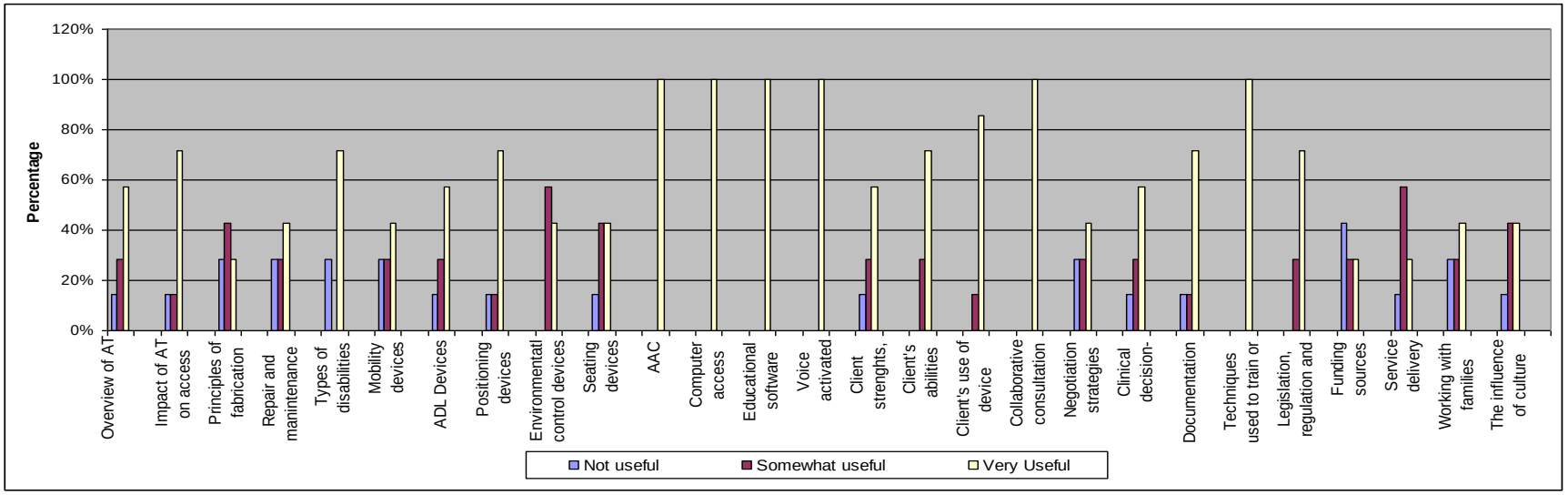

Figure 3. Training Usefulness per Special Educators

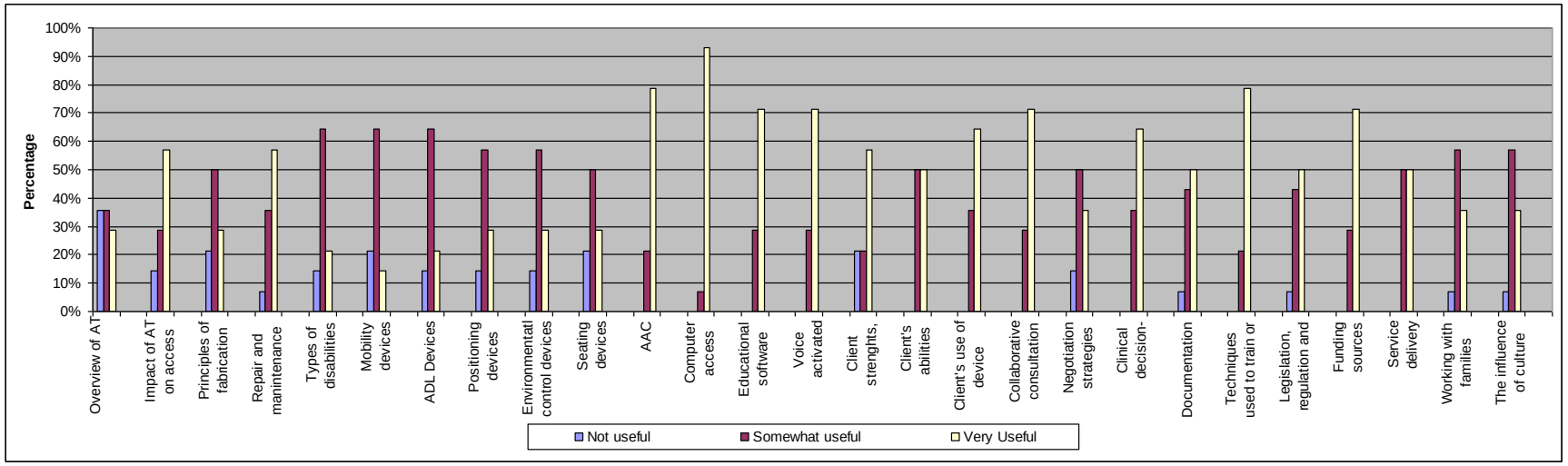

Figure 4. Training Usefulness per Speech Language Pathologists

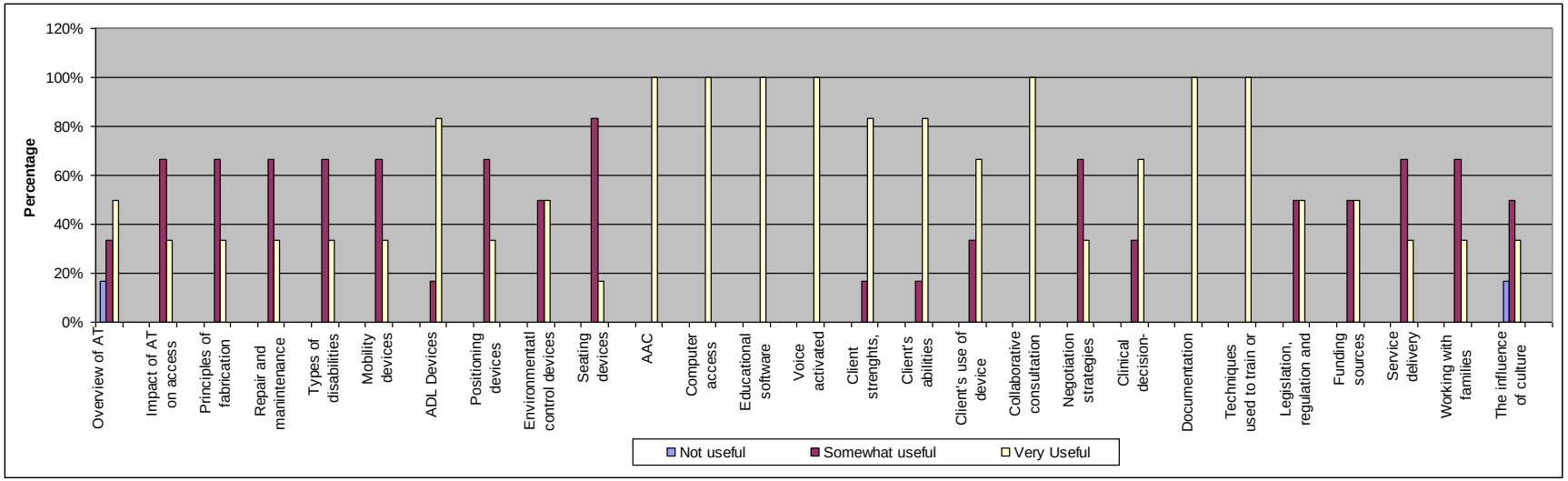

Figure 5. Training Usefulness per 'Other' Profession

References

Alnahdi, G. (2014). Assistive technology in special education and the universal design for learning. *The Turkish Online Journal of Education Technology, 13*(2), 18-23.

Alper, S. & Raharinirina, S. (2006). Assistive technology for individuals with disabilities: A review and synthesis of the literature. *Journal of Special Education Technology, 21*(2), 47-64.

American Speech-Language-Hearing Association (2014). Standards and implementation procedures for the certificate of clinical competence in speech-language pathology. Retrieved from http://www.asha.org/Certification/2014-Speech-Language-Pathology-Certification-Standards/.

American Occupational Therapy Association (2007a). Accreditation standards for an educational program for the occupational therapy assistant. *The American Journal of Occupational Therapy, 61*(6), 662-671.

American Occupational Therapy Association (2007b). Accreditation standards for the doctoral-degree-level educational program for the occupational therapist. *The American Journal of Occupational Therapy, 61*(6), 641-651.

American Occupational Therapy Association (2007c). Accreditation standards for a master's-degree-level educational program for the occupational therapist. *The American Journal of Occupational Therapy, 61*(6), 652-661.

Agran, M. & Alper, S. (2000) Curriculum and instruction in general education: Implications for service delivery and teacher preparation. *The Journal of the Association for Persons with Severe handicaps, 25(*3), 167-174.

Akpan, J., Beard, L. & McGahey, J. (2014). Assistive Technology Enhances Academic Outcomes of all students. In M. Searson & M. Ochoa (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2014* (pp. 1796-1801). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE). Retrieved December 29, 2014 from http://www.editlib.org/p/131037.

Assistive Technology Act of 2004, P.L. 108-364, 108 Cong., 118 Stat. 1707. (2004).

Barbetta, P. M. & Spears-Bunton, L. A. (2007). Learning to write: Technology for students with disability in secondary inclusive classroom. *The English Journal, 96*(4) 86-93.

Bausch, M. E., Jones, M., Evmenova, A. S., & Behrmann, M. M. (2008). Going beyond AT devices: Are AT services being considered? *Journal of Special Education Technology, 23*(2), 1-16.

Beard, L. A. Carpenter, L. B., & Johnston, L. (2011). Assistive technology: Access for all students. Electronic Book: Merill. ISBN-13: 9780137056439

Biech, E. (2009). *10 steps to successful training.* Alexandria: American Society for Training and Development. ISBN: 978-1-60728-270-9

Brady, R., Long, T. M., Richards, J., & Vallin, T. (2007). Assistive technology curriculum structure and content in professional preparation service provider training programs. *Journal of Allied Health, 36*(4), 183-192.

Bouffard, M. & Reid, G. (2012). The good, the bad, and the ugly of evidence-based practice. *Adapted Physical Activity Quarterly, 29*, 1-24.

Bouck, E. C., Flanagan, S., Joshi, G. S., Sheikh, W, & Scheppenback, D. (2011). Speaking math-a voice input, speech output calculator for students with visual impairments. Journal of *Special Education Technology, 26*(4), 1-14.

Bronson, D. E. & Davis, T. S. (2012). *Evaluating and evaluating evidence: Systematic reviews and evidence-based practice.* New York: Oxford University Press, Inc.

Brosky, J. A. & Scott, R. (2007). Professional competence in physical therapy. *Journal of Allied Health, 36*(2), 113-118.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York, NY; The Guild Press, Inc.

Burns, M. K. & Ysseldyke, J. E. (2003) Reported Prevalence of Evidence-Based Instructional Practices in Special Education. *The Journal of Special Education, 23*(1), 3-11.

Center for Implementing Technology in Education (2015). Technology implementation in schools: Key factors to consider. Retrieved from http://www.cited.org/index.aspx?page_id=187

Coates, R. (2010). Noisemakers to music makers: Developing a school band for students who are visually impaired. *Journal of Visual Impairment & Blindness, 104*(1), 8-11.

Cole, J. & Swinth, Y (2004). Comparison of the TouchFree switch to a physical switch; Children's abilities and Preferences: A pilot study. *Journal of Special Education Technology, 19*(2), 19-30.

Cook, A. M., Adams, K., Volden, J., Harbottle, N., & Harbottle, C. (2011). Using lego robots to estimate cognitive ability in children who have severe physical disabilities. *Disability and Rehabilitation: Assistive Technology, 6*(4), 338-346.

Cook, A. M. & Polgar, J. M. (2014). *Cook and Hussey's assistive technologies: Principles and practice (4th ed.).* St. Louis, MO: Mosby/Elsevier Health Sciences. ISBN: 978-0-323-29101-9.

Costello, A. (2014). *An Investigation of the Assistive Technology Supports and Transition from a Third-Level Environment to the Workplace* (Doctoral dissertation, Dublin Institute of Technology).

Creswell, J. W. (2013). *Qualitative inquiry and research design: choosing among five approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Criswell, C. (2014). Assistive technology for special needs students in the music classroom. *Teaching Music, 22*(2), 22.

Cullen, J. B., Levitt, S. D., Robertson, E., & Sadoff, S. (2013). What can be done to improve struggling high schools?. *Journal of Economic Perspectives, 27*(2), 133- 52.

Cullen, J. & Richards, S. B. (2008). Using software to enhance the writing skills of students with special needs. *Journal of Special Education Technology. 23*(2), 33-44.

Dalton, E. M. & Rouch, S. E. (2010). Assistive and educational technology standards and teacher competencies in relation to evidence-based practice: Identification and classification of the literature. *Journal of Special Education Technology, 25*(2), 13-30.

Davis, F. D. (1993). User acceptance of information technology: Systems characteristics, user perceptions and behavioral impacts. *International Journal of Man-machine Studies*, 38, 475-487.

Davies, P. M. (2010). On school educational technology leadership. *Management in Education, 24*(2), 55–61.

Davis, T. N., Barnard-Brak, L. & Arredondo, P. L. (2013). Assistive technology: Decision-making practices in public schools. *Rural Special Education Quarterly, 32*(4), 15-23.

DeCoste, D. (2013). The changing roles of assistive technology teams in public school settings. *Perspectives on Language and Literacy, 39*(4), 19-23.

Dell, A. G., Newton, D. A. & Petroff, J. G. (2012). *Assistive technology in the classroom: Enhancing the school experiences of students with disabilities.* New Jersey: Pearson Education, Inc.

Dyal, A., Carpenter, L. B., & Wright, J. V. (2009). Assistive technology: What every school leader should know. *Education, 129*(3), 556-560.

Edyburn, D. L. (2009). Hindsight, understanding what we got wrong, and changing directions. *Journal of Special Education Technology, 24*(1), 61-4.

Epstein, R. M. & Hundert, E. M. (2002). Defining and assessing professional competency. *Journal of American Medical Association, 287*(2), 226-235.

Fasick, F. A. (2001). Some uses of untranscribed tape recordings in survey research. *Public Opinion Quarterly, 41*, 549-552.

Florida Department of Education (2011). Florida statutes and state board of education rules: Excerpts related to exceptional student education. Retrieved http://www.fldoe.org/ese/pdf/1b-stats.pdf

Forman, S. G. (2015). Organizational characteristics and structures that support implementation. *Implementation of mental health programs in schools: A change agent's guide.* (pp. 103-118) American Psychological Association, Washington, DC.

Fouad, N. A., Grus, C. L., Hatcher, R. L., Kaslow, N. J., Hutchings, P. S., Madson, M. B., … Crossman, R. E. (2009). Competency benchmarks: A model for understanding and measuring competence in professional psychology across training levels. *Training and Education in Professional Psychology, 3*(4), S5- S26.

Fowler, F. J. (1988). Survey research methods. Newbury Park: Sage Publications.

Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Educational research: An introduction* (7th ed). Boston, MA: Allyn and Bacon.

Ganz, J. B., Earles-Vollrath, T. L., Heath, A. K., Parker, R. I., & Rispoli, M. J., Duran, J. (2012). A meta-analysis of single case research studies on aided augmentative and alternative communication systems with individuals with autism spectrum. *Journal of Autism and Developmental Disorders, 42(*1), 60-74.

Gotoh, T., Minamikawa, R. & Tamura, N. (2008). A web-based Braille translation for digital music scores. *Proceedings of the 10th International ACM SIGACCESS Conference on Computers and Accessibility*. Nova Scotia: Canada, 259-260.

Goodman, K. W. (2003). *Ethics and evidence-based medicine: Fallibility and responsibility in clinical science.* New York: Cambridge University Press.

Govaerts, M. J. (2008). Educational competencies or education for professional competence?. *Medical Education, 42,* 234-236.

Grol, R. & Grimshaw, J. (2003). From best evidence to best practice: Effective implementation of change in patients' care. *The Lancet, 362*(9391), 1225-1230.

Guggenberger, B. (2008). *Attitudes of Indiana special education teachers towards the use and implementation of assistive technology* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses database. (UMI No. 3351385).

Gupta, S., Paterson, M. L., Lysaght, R. M., & von Zweck, C.,M. (2012). Experiences of burnout and coping strategies utilized by occupational therapists. *The Canadian Journal of Occupational Therapy, 79*(2), 86-95.

Hecimovich, M. & Volet, S. (2011). Development of professional confidence in health education: Research evidence of the impact of guided practice into the profession. *Health Education, 111*(3), 177-197.

Hemmingsson, H., Lidstrom, H., & Nygart, L. (2009). Use of assistive technology devices in mainstream schools: Student's perspective. *American Journal of Occupational Therapy, 63*, 463-472.

Hobbs, D. & Worthington-Eye, B. (2008). The efficacy of combining augmented reality and music therapy with traditional teaching: Preliminary results. *Proceedings of the 2nd International Convention on Rehabilitation Engineering & Assistive Technology*, Singapore, 241-244.

Isaac, S., & Michael, W. (1997). *Handbook in research and evaluation*. San Diego: Educational and Industrial Testing.

Ivankova, N. V., Creswell, J. W., & Stick, S. L. (2006). Using mixed methods sequential explanatory design: From theory to practice. Fields Methods, 18(1), 3-20.

Johnstone, C., Thurlow, M., Altman, J., Timmons, J. & Karo, K. (2009). Assistive technology approaches for large-scale assessment: Perceptions of teachers of students with visual impairments. *Exceptionality, 17*(2), 66-75.

Judge, S. & Simms, K. A. (2009) Assistive technology training at the pre-service level: A national snapshot of teacher preparation programs. *Teacher Education and Special Education, 32*(1), 33-44.

Kaiser, A. P., & Roberts, M. Y. (2011). Advances in early communication and language intervention. *Journal of Early Intervention, 33*(4), 298-309.

Lahm, E. A. (2003). Assistive technology specialists. *Remedial and Special Education, 24*(3), 141-153.

Landau, S., Russell, M., Gourgey, K., Erin, J. N. & Cowan, J. (2003). Use of Talking Tactile Tablet in mathematics testing. *Journal of Visual Impairment and Blindness, 97*(2), 85-96.

Lazarus, S. S., Thurlow, M. L., Lail, K. E., Eisenbraun, K. D. & Kato, K. (2006). *2005 state policies on assessment participation and accommodations for students with disabilities* (Syntheses Report 64). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.

Lee, H. & Templeton, R. (2008). Ensuring equal access to technology: Providing assistive technology for students with disability. *Theory Into Practice, 47*, 212-219.

Lee, Y. &Vega, L. A. (2005). Perceived knowledge, attitudes, and challenges of AT use in special education. *Journal of Special Education Technology, 20*(2), 60-62.

Lester, S. (2014) Professional competence standards and frameworks in the United Kingdom, *Assessment & Evaluation in Higher Education, 39*(1), 38-52, DOI: 10.1080/02602938.2013.792106

Leung, B., Brian, J. A., & Chau, T. (2013). Learning and mastery behaviours as risk factors to abandonment in a paediatric use of advanced single-switch access technology. *Disability and Rehabilitation: Assistive Technology, 4*(5), 426-433.

Long, T. M., Woolverton, M., Perry, D. F., & Thomas, M. J. (2007). Training needs of pediatric occupational therapists in assistive technology. *American Journal of Occupational Therapy, 61*, 345–354.

Luft, P., Bonello, M., & Zirzow, N. K. (2009). Technology skills assessment for deaf and hard of hearing students in secondary school. *American Annals of Deaf, 154*(4), 389-399.

MacArthur, C. A., Graham, S., Haynes, J. B., & DeLaPaz, S. (1996). Spelling checkers and students with learning disabilities: Performance comparisons and impacts in spelling. *The Journal of Special Education,* 30, 35-57.

Marins, S. & Emmel, M. (2011). Capacitation of the occupational therapist: Accessibility and technologies. *Cadernos de Terapia Ocupacional da UFSCar, 19*(1), 37-52.

Martinussen, M., Adolfsen, F., Lauritzen, C., & Richardsen, A. M. (2012). Improving interprofessional collaboration in a community setting: Relasionships with burnout, engagement and service quality. *Journal of Interprofessional Care, 26*(3), 219-225.

McCray, E. D., Brownell, M. T., & Lignugaris, B. (2014). *Handbook of research on special education teacher preparation*. Routledge.

McGaghie, W. C. (1991). Professional competence evaluation. *Educational Researcher*, *20*(1), 3-9.

McGivern, J. E., & McKevitt, B. C. (2002). Best practices working with students using assistive technology. *Best practices in school psychology IV (vol. 1, vol. 2).* (pp. 1537-1553) National Association of School Psychologists, Washington, DC.

Mellman, L. M., DeThorned, L. S., & Hengst, J. A. (2010). "Shhhh! Alex has something to say": AAC-SGD use in the classroom setting. *Augmentative and Alternative Communication, 19*(4), 108-114.

Michaels, C. A. & McDermott, J. (2003). Assistive technology integration in special education teacher preparation: Program coordinators' perceptions of current attainment and importance. *Journal of Special Education Technology, 18*(3), 29-41.

Mittler, J. (2007). Assistive technology and IDEA. In C. Warger (Ed.), *Technology integration: Providing access to the curriculum for students with disabilities.* Arlington, VA: Technology and Media Division (TAM).

Moraiti, A., Abeele, V. V., Vanroye, E., & Geurts, L. (2015). Empowering occupational therapists with a DIY-toolkit for smart soft objects. *Proceedings of the 9th International Conference on Tangible, Embedded, and Embodied Interaction*. California, United States, 387-394.

Morrison, T. & Roberts, L. (2011). The influences of new graduates' ability to implement evidence-based practice: A review of the literature. *New Zealand Journal of Occupational Therapy, 58*(2), 37-40.

Naraian, S., & Surabian, M. (2014). New Literacy Studies: An Alternative Frame for Preparing Teachers to Use Assistive Technology. *Teacher Education & Special Education, 37*(4), 330-346. doi:10.1177/0888406414538843

Nass, C. (1994). Knowledge or skills: Which do administrator learn from experience? *Organization Science, 5*(1), 38-50.

National Institute on Deafness and Other Communication Disorders (2015). Statistics on Voice, Speech and Language. Retrieved from http://www.nidcd.nih.gov/health/statistics/pages/vsl.aspx#3

Nelson, H. D., Nygren, P., Walker, M., & Panoscha, R. (2006). Screening for speech and language delay in preschool children: Systematic evidence review for the US preventive services task force. *Pediatrics*, 117, 298-319.

Nemati, A. & Deltalab, J. (2014). The effect of group instruction on wh-question making. *Modern Journal of Language Teaching Methods, 4*(1), 133-145.

New York State Education Department (n.d.). Requirements for teachers' certificates applied for on or after February 2, 2004. Retrieved from http://www.highered.nysed.gov/tcert/part80-3.html

North Oxford American Dictionary (3rd ed.). (2010). New York, NY: Oxford University Press.

Ortega-Tudela and Gomez-Ariza (2006). Computer-assisted teaching and mathematical learning in Down Syndrome children. *Journal of Computer Assisted Learning, 22*(4), 298-307.

Pakos, W. (2010, December). An evidence-based approach to creating staff development program for school-based therapists. *Early Intervention & School Special Interest Section Quarterly, 17*(4), 1-4.

Paor, C. (2015). The use of demonstration lessons to support curriculum implementation: Invitation or intrusion? *Professional Development in Education, 41*(1), 96-108.

Parette, H. P., Blum, C., & Boeckmann, N. M. (2009). Evaluating assistive technology in early childhood education: The use of a concurrent time series probe approach. *Early Childhood Education Journal, 37*, 5-12.

Parette H. P., Hourcade, J., Blum, C., Watts, E., Stoner, J., Wojcik, B., & Chrismore, S. (2013). Technology user groups and early childhood education: A preliminary study. *Early Childhood Education Journal, 41*(3) 171-179.

Petcu, S. D., Yell, M., & Fletcher, T. (2014). Assistive technology: Legislation and legal issues. *Exceptionality, 22*(4), 226-236.

Post, K. M. (2009, September). Advancing your knowledge and skills in assistive technology. *Technology Special Interest Section Quarterly, 19*(3), 1–4.

Rackensperger, T. (2012). Family influences and academic success: The perceptions of individuals using AAC. *Augmentative and Alternative Communication, 28*(2), 106-116.

Raskind, M. H. & Higgins, E. L. (1999). The effects of speech recognition technology on the reading and spelling performance of children with learning disabilities. *Annals of Dyslexia, 49*, 251-2281.

RESNA (2015). *RESNA certification*. Retrieved from http://www.resna.org/certification

Ratcliff, A., Koul, R., & Lloyd, L. L. (2008). Preparation in augmentative and alternative communication: An update for speech-language pathology training. *American Journal of Speech-Language Pathology, 17*(1), 48-59.

Reed, P., & Bowser, G. (2005). Assistive technology and the IEP. In D. Edyburn, K. Higgins, & R. Boone, (Eds.), *Handbook of special education technology research and practice* (pp. 61-75). Whitefish Bay, WI: Knowledge by Design.

Retter, S., Anderson, C. & Kieran, L. (2013). iPad use of accelerating gains in reading skills of secondary students with learning disabilities. *Journal of Educational Multimedia and Hypermedia, 22*(4), 443-463.

Riemer-Reiss, M. L., & Wacker, R. R. (2000). Factors associated with assistive technology discontinuance among individuals with disabilities. *Journal of Rehabilitation, 66*(3), 44-50.

Roach, A. T. & Frank, J. L. (2007). Large –scale assessment, rationality, and scientific management: The case of No Child Left Behind. *Journal of Applied School Psychology, 23*(2), 7-25.

Sharpe, M. E. (2010). *Assistive technology attrition: Identifying why teachers abandon assistive technologies* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses database. (UMI No. 3413620).

Schoepp, K. (2005). Barriers to technology integration in a technology-rich environment. *Learning and teaching in Higher Education: Gulf Perspectives, 2*(1), 1–24.

Siegenthaler, E., Wurtz, P., & Groner, R. (2011). Improving the usability of e-book readers. *Journal of Usability Studies, 6*(1), 25-38.

Simpson, C. G., McBride, R., Spencer, V. G., Lowdermilk, J., & Lynch, S. (2009) Assistive technology: Supporting learners in inclusive classrooms. *Kappa Delta Pi Record, 45(*4), 172-175.

Smarkola, C. (2008). Efficacy of a planned behavior model: Beliefs that contribute to computer usage intentions of student teachers and experienced teachers. *Computers in Human Behavior, 24*(3), 1196-1215.

Smeak, R. (2014). Utilizing 21st Technology to Improve Educational Opportunities for Special Needs Individuals: A Review of Literature. In M. Searson & M. Ochoa (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2014* (pp. 1817-1821). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Smith, D. W., Kelley, P. K., Maushak, N. J., Griffin-Shirley, N., & Lan, W. Y. (2009). Assistive technology competencies for teachers of students with visual impairments. *Journal of Visual Impairments & Blindness, 103*(8), 457-469.

Smith, D. W. & Kelley, P. (2007). A survey of assistive technology and teacher preparation programs for individuals with visual impairments. *Journal of Visually Impairment & Blindness, 101* (7), 429-433.

Turner, C. & McCarthy, G. (2015). Coachable moments: Identifying factors that influence managers to take advantage of coachable moments in day-to-day management. *International Journal of Evidence-Based Coaching and Mentoring, 113*(1), 1-13.

U.S. Department of Education (n.d.). *Assistive technology: Legislation, regulations and guidance.* Retrieved from http://www2.ed.gov/programs/atsg/legislation.html

University of Kentucky Assistive Technology (n.d.). *University of Kentucky Assistive Technology Toolkit.* Retrieved from http://serc.gws.uky.edu/www/ukatii/sample/index.html

Van Laarhoven, T. et al, (2008). The effectiveness of video tutorial for teaching preserve educators to use assistive technologies. *Journal of Special Education Technology, 23*(4), 31-45.

Verza, R., Lopes, M. L., Battaglia, M. A., & Uccelli, M. M. (2006). An interdisciplinary approach to evaluating the need for assistive technology reduces equipment abandonment. *Multiple Sclerosis, 12,* 88-93.

Watson, A. H., Ito, M., Smith, R. O., & Andersen, L. T. (2010). Effect of assistive technology in a public setting. *American Journal of Occupational Therapy, 64,* 18-29.

Wisdom, H. P., White, N., Goldsmith, K., Bielavitz, S., Rees, A., & Davis, C. (2007). Systems limitations hamper integration of accessible technology in northwest U. S. K-12 schools. *Educational Technology & Society, 10*(3), 222-232.

Wollak, B. A. & Koppenhaver, D. A. (Summer, 2011). Developing technology-supported, evidence-based writing instruction for adolescents with significant writing disability. *Assistive Technology Outcomes and Benefits, 7*(1), 1-23.

Wright, K. B. (2005). Researching internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of Computer-Mediated Communication, 10*(3). DOI: 10.1111/j.1083-6101.2005.tb00259.x

Zhang, Y. (2000). Technology and the writing skills of students with learning disabilities. *Journal of Research on Computing in Education, 32*(4), 467-479.

Zhou, L., Smith, D. W., Parker, A. T., & Griffin-Shirley, N. (2011). Assistive technology competencies of teachers of students with visual impairments: A comparison of perceptions. *Journal of Visual Impairment & Blindness, 105*(9), 533-547.