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IEP Team's Knowledge about Student Characteristics, Legislation, AT Devices and AT Services for Considering Assistive Technology in the IEP Development for 3rd to 5th Grade Students with Learning Disabilities in Reading and Writing

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by

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To my dearest parents, my brother and my sister

for their love and support

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IEP Team's Knowledge about Student Characteristics, Legislation, AT Devices and AT Services for Considering Assistive Technology in the IEP Development for 3rd to 5th Grade Students with Learning Disabilities in Reading and Writing

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Across grade levels, students with learning disabilities (LD) experience challenges with aspects of their academic learning in terms of reading and writing. In many cases, these challenges can be addressed by utilizing assistive technology (AT) applications as a potential solution. According to the reauthorization of the Individuals with Disabilities Education Act in 2004, AT should be "considered" in the development of the Individualized Education Program (IEP) to meet the requirement of providing a free and appropriate public education (FAPE) and to assist students in accessing the general education curriculum.

The law requires IEP teams to consider AT to determine whether AT devices and services are necessary; therefore, IEP team members play an important role for considering AT and how AT should be specified in the IEP (Golden, 1998). The IEP team members include school administrators, teachers, and professionals who are responsible for developing, reviewing, and revising the IEP for students with disabilities. Thus, the IEP team members should have essential knowledge to inform AT decision-making (Bowser, 2003). The Technology and Media Division (TAM) of the Council of Exceptional Children (CEC) lists standards and teacher competencies regarding knowledge and skills of AT for practitioners and related professionals to follow. The standards include obtaining knowledge about AT legal foundations, students' characteristics, instructional content, technology applications, and related services for providing technology.

In order to know whether IEP team members possess knowledge for considering AT for students with LD, the purpose of this study was to examine IEP team members' knowledge regarding characteristics of students with LD, AT legislation, AT devices, and AT services for considering assistive technology in the IEP development for 3rd grade to 5th grade students who have been identified as having learning disabilities in reading and writing. Participants (N=1050) including school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists from three school districts in a southern state were surveyed. Multivariate Analysis of Variance (MANOVA) was used to analyze the data. The results showed that participants were somewhat knowledgeable about the characteristics of students with LD, AT

legislation, AT devices, and AT services when considering AT in the IEP development. Training in terms of quality and quantity was suggested by researchers to provide IEP team members who are serving students with LD better preparing for considering AT in the IEP team meetings. Future research should focus on conducting a similar study with different IEP team members and with different disability groups rather than just learning disability.

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CHAPTER 1

INTRODUCTION

Context of the Problem

In the past decade, assistive technology (AT) has gained attention as a potential solution that will allow people with disabilities to live independently and increase their accessibility, inclusion, and quality of life in society. Research has demonstrated that students with learning disabilities (LD) can benefit from using AT, if appropriate AT devices and/or services are being used (Boone & Higgins, 1993; Higgins & Boone, 1991; MacArthur, 1996; MacArthur, Schwartz, & Graham, 1991; Okolo et al., 1993; Wise & Olson, 1994). For example, specialized computer programs can support students with learning disabilities to access the general curriculum in reading and writing (Graham & MacArthur, 1988; MacArthur & Schwartz, 1990; MacArthur, et al., 1991; Wise & Olson, 1994; Woodward & Rieth, 1997). Although many AT options are available, there is no guarantee that students with LD will receive appropriate devices and services to support their learning unless AT is considered as part of the Individualized Education Program (IEP) development. Many factors potentially impact the process of deciding which AT devices and services should be provided, if any. Among these factors, "knowledge" of AT is important. Members of the IEP team who consider the AT needs of individuals with disabilities should be informed about the student and AT (e.g., tasks, students' abilities and disabilities, environments, available AT options) to allow them to make informed decisions regarding devices and services provided. The following discusses assistive technology.

Assistive Technology

Assistive technology is “any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities” (§ 300.5, Technology-Related Assistance Act of 1988). When AT devices are provided to students with disabilities, support services that provide training and maintenance on these devices are necessary. The “Tech Act,” as the Technology-Related Assistance Act is also known, defines an assistive technology service as “any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device” (§ 300.6).

Although typically associated with computers or any other specific sophisticated electronic devices, AT includes a wide range of possible options that can assist people with disabilities both young and old in various fields. Lewis (1998) stated “It is a mistake to think too narrowly about assistive technology” (p.16). Assistive technology includes “no,” “low-,” and “high-” technologies. For example, “no tech” options such as symbols or pictures can help students with LD express their ideas; “low tech” devices such as modified pencils or paper with wide lines can help students with LD write effectively; and “high tech” computer software may help students with LD check their spelling. It is also worthwhile to make a distinction between assistive technology and educational or instructional technology. The latter is used to support anyone. Technology become assistive when they are used to help people with disabilities access their environment

(Bryant & Bryant, 2003). The next section discusses the legal requirements for assistive technology.

Legal Requirements

Assistive technology devices and services are broadly addressed in the Technology-related Assistance for Individual with Disabilities Act to encourage professionals or practitioners to assist people with disabilities. The reauthorization of the Individuals with Disabilities Education Act (IDEA) in 2004 further stated that, "(a) Each public agency must ensure that assistive technology devices or assistive technology services, or both, […], are made available to a child with a disability if required as a part of the child's special education, related services, or supplementary aids and services. (b) On a case-by-case basis, the use of school-purchased assistive technology devices in a child's home or in other settings is required if the child's IEP Team determines that the child needs access to those devices in order to receive FAPE" (Subpart B—State Eligibility, IDEA of 2004, http://idea.ed.gov/explore/view/p/). Therefore, it is clear that when developing IEPs for students with disabilities, each IEP team member is required to "consider" whether or not the student needs assistive technology devices and services to obtain a free appropriate public education (FAPE) in the least restrictive environment (LRE). If any AT device or service is necessary to assist the student with disabilities in his or her school learning, the school district is responsible for providing the device or services (Bowser & Reed, 1995). AT consideration is further addressed in the following.

AT Consideration

"Consideration" is defined by the Merriam-Webster Dictionary as (a) continuous and careful thought, (b) a matter weighed or taken into account when formulating an option or plan, […], (c) thoughtful and sympathetic regard, and (d) an opinion obtained by reflection. A group of professionals from Wisconsin Assistive Technology Initiatives (WATI, 2003) indicated "in considering 'consideration' some things are pretty clear. One is that consideration is a brief process that can take place within every IEP meeting. The other is that in order to consider the need for assistive technology, at least one person on the IEP team must have some knowledge about assistive technology. You cannot 'consider' something about which you know nothing" (WATI, 2003, AT consideration, ¶1). Similarly, the National Council on Disability (2000) also reported "It is impossible for an IEP team to 'consider' assistive technology effectively when no team member is familiar with the range of AT available to address desired goals" (Federal policy barriers to assistive technology, ¶1). Therefore, it is critical that IEP team members possess knowledge needed to consider AT for students with disabilities. Assistive technology consideration, then, can be viewed as a matter that needs to be carefully thought through by IEP team members when developing the IEP.

The requirement of "considering" AT in the IEP development applies to students with LD as well as to students with other types of disabilities. Edyburn (2000) reported that historically, IEP teams have provided more assistive technology for students who have physical disabilities, sensory impairments, and moderate or severe needs than they have for students with LD. Very little attention has been focused on the assistive

technology needs of students with high incidence disabilities, including learning disabilities (Edyburn, 2000; Hartsell, 1998; Okolo, Bahr, & Rieth, 1993; Raskind & Higgin, 1995). A report published by the Texas Assistive Technology Network (2004) showed that there is a significant gap between the numbers of students with LD who are currently using assistive technology and the numbers of students who could be expected to use assistive technology. Thus, there is a need to narrow that gap by better studying the assistive technology consideration process in the IEP development for students with learning disabilities. Therefore, the knowledge needed for effective AT consideration becomes important to understanding this process when developing students' IEPs.

Knowledge Needed for AT Consideration

We know that considering assistive technology in the IEP development process is addressed in the laws. We also know that AT is beneficial to students if appropriate actions are to be taken in the identification of AT that meets student needs. WATI (2003) suggested that IEP teams should consider AT carefully when planning an IEP because team members reflect their knowledge and opinions about AT options and selection (AT consideration, ¶1). However, "consideration" requires that IEP team members are knowledgeable about AT, otherwise they cannot properly consider it (Lahm, 2003). Although each IEP team member plays a different role (e.g., administrator, teacher or therapist), he or she can consider AT for the student with disabilities from different the perspectives related to each team member's position and experiences. It is suggested that each IEP team member should be knowledgeable about AT consideration specifically related to his or her own position (Reed, P. personal communication, April, 7, 2005). For

example, school administrators should know about legal requirements regarding AT in the IEP development; teachers should have knowledge about students' learning characteristics for integrating AT into their curriculum; therapists should be knowledgeable about the applications of AT devices and services for making AT recommendations in the decision-making process. When team members bring pieces of information into the IEP meeting, they should be able to discuss the issues and arrive at appropriate decisions for their student. The QIAT Consortium (a leadership group formed to initiate nationwide communication regarding the quality of providing assistive technology services) indicated that, unfortunately, one common error for AT consideration is that "no one on the IEP team is knowledgeable regarding AT" (p.32). Another common error for documenting AT in the IEP is that "IEP teams do not know how to include assistive technology in IEPs" (p.33) (QIAT, 2000). WATI stated on their website, "one can't consider something without knowing it." Obviously, it is extremely important that IEP teams possess the necessary knowledge, with each member within the IEP being knowledgeable about the content related to his position when considering AT in the IEP, in order to meet the needs of students with LD.

IDEA (2004) requires assistive technology consideration in the IEP development, but unfortunately, specific guidelines are not provided for IEP teams to follow. The Technology and Media Division (TAM) of Council for Exceptional Children (CEC) has identified standards and teacher competences on knowledge and skills of assistive technology for practitioners and related professionals to follow. The standards state that educators or professionals should obtain knowledge about the AT legal foundation,

students' characteristics, instructional content, technology applications, and related services for technology (Lahm & Nickels, 1999). QIAT (2000) provides six quality indicators for "Consideration of Assistive Technology Needs in the IEP" for students who are qualified for services under legislation. The six quality indicators are:

(1) Assistive technology devices and services are considered for all students with disabilities regardless of type or severity of disabilities;

(2) The IEP team has the knowledge and skills to make informed assistive technology decisions;

(3) The IEP team uses a collaborative decision making process based on data about the student environment and tasks to determine assistive technology needs;

(4) A continuum of assistive technology devices and services is explored;

(5) Decisions regarding the need for assistive technology devices and services are made based on access to the curriculum and the student's IEP goals and objectives; and

(6) Decisions regarding the need for assistive technology devices and services and supporting data are documented.

Despite these guidelines, members in the IEP teams are often unprepared to "consider" AT effectively and school districts are often unprepared to provide assistive technology support to IEP teams (Bowser & Reed, 1995; Chamber, 1997; Hartsell, 1998; Huntinger, Johnson, & Stineburner, 1996; Todis & Walker, 1993; Zabala, 1995). Many school districts and IEP teams are still not sure about the best way to consider the need

for assistive technology and appropriate services regarding assistive technology consideration in the IEP (Bowser & Reed, 1995; QIAT, 2000). In fact, it is still questionable whether teachers possess knowledge to select AT devices and services and have knowledge about possible AT tools. It is also a question whether teachers have the necessary resources or have sufficient knowledge to develop evaluation criteria for the selection and use of AT (Puckett, 2002). School administrators, also members of the IEP team, are usually found lacking in sufficient knowledge for participating in IEP meetings (Judge, 2002; Parrett & Hourcade, 1997; Parette & McMahan, 2002).

Although some researchers have demonstrated that AT knowledge of pre-service and in-service teachers improves the effective implementation of AT training programs (Maushak, Kelley, & Blodgett, 2001; Puckett, 2002), the current status of IEP teams' level of knowledge regarding legislation, students' learning characteristics, AT devices, and AT services in the IEP development remains unknown. Although practitioners have said that most AT consideration in the IEP development is done by professionals such as diagnosticians or speech pathologists, most school administrators have limited knowledge for AT consideration (Abete, C. personal communication, January, 28, 2005). It is still unknown what level of knowledge each IEP team member has for considering AT for their students with LD in the IEP development; thus, there is a need to identify the level of knowledge of IEP team members for AT legislation, students' learning characteristics, AT devices, and AT services for considering assistive technology in the development of the IEP. With all the knowledge needed for AT consideration, IEP team members also

need to know about AT use by students with LD, which is discussed in the following section.

AT Use by Students with Learning Disabilities

Reading and writing are the basic knowledge and skills that students need to learn and use throughout their life, and normally students start learning these knowledge and skills in their elementary school years. For many students with LD, learning these knowledge and skills could be difficult because of their nature of disability which forced them to face many challenges with academic curricula (Bryant & Bryant, 2003). They encounter problems in reading and writing and typically fail to meet the expectations of their teachers. They often have limited learning skills and need additional time and assistance for completing their tasks. With low self-confidence and poor achievement in school, students with LD often find academic demands overwhelming. Some of them even drop out of school before completing the requirements for graduation because of frustration and school failure (Coordinated Campaign for Learning Disabilities, 1998).

The initial IEP for the student with LD is likely to be developed in his/her elementary school years. When IEP team members design the student's IEP, AT devices and related services are required to be considered for the student. It is critically important whether AT devices and related services have been considered, and what has been decided in the initial IEP. Assistive technology is developed to compensate for the difficulties of students with learning disabilities, not to make them feel frustrated. These students can benefit from using assistive technology to perform everyday activities, and assistive technology tools can help them gain access to the curriculum readily (Bryant &

Bryant, 2003; Edyburn, 2000; Gillette, 2006; Higgins & Boone, 1993; Lewis, 1998). Assistive technology helps students with LD engage in academics, giving them greater freedom and independence in their school learning (Anderson-Inman, 1999; Coordinated Campaign for Learning Disabilities, 1998). Reading with AT and writing with AT are discussed in the following.

Reading with AT. Reading and comprehending print can be particularly challenging for students with LD. In a review of literature on the use of computer-based instruction (CBI) in special education, Okolo et al. (1993) concluded that research has demonstrated that CBI can improve skills in two areas, word recognition and decoding. Higgins and Boone (1993) agreed but added that traditional reading software can be less effective for improving comprehension. Further developed technology features such as speech-enhanced text and hypermedia-enhanced text seem to support the readers. Speech is useful when it is incorporated into reading software (Wise & Olson, 1994). Hypermedia-enhanced text also seems to improve reading performance. Positive results had been reported for low-achieving students using hypermedia basal readers (Boone & Higgins, 1993; Higgins & Boone, 1991) and for students with learning disabilities using hypermedia study guides in social studies (Higgins & Boone, 1990). Besides the field of reading, AT devices also have a positive impact on supporting students with LD in writing.

Writing with AT. Computers change the writing process by making it easier to develop writing ideas, to edit ideas, to publish, and to share with others. Different technology supports are useful during different phases in the writing process. Assistive

technology provides many benefits by facilitating writing for students with LD who find writing difficult (MacArthur, 1996). When students have the opportunity to circumvent writing challenges, they are more successful in the general education classroom. For students with LD, technology can be a compensatory tool to gain more access to the writing process. Technology provides the support needed to accomplish a task. For example, word processing assists students with LD in improving writing. Computers offer additional writing support to motivate reluctant writers by facilitating motor actions, providing spelling assistance, helping with revising and editing, and producing a document that is legible. MacArthur et al. (1991) concluded that when computers are combined with effective instruction in revision, word processing benefits students with written language disabilities.

Statement of the Problem

Reading and writing are basic knowledge and skills that students learn in elementary school, but many students with LD struggle with these skills, thus an IEP is developed. IDEA (2004) requires IEP teams to consider AT for students with disabilities during the IEP development process to provide a free, appropriate public education (FAPE) and to assist students with disabilities in accessing the general education curriculum. IEP team members may have different levels of knowledge for AT consideration in the IEP, yet they are expected to "consider" if AT is necessary and how it should be considered to help students with LD. Often times an IEP team struggles with identifying technology best fit the needs of the student with LD. It is very common that IEP team members assume that only special education teachers or school professionals

such as speech or occupational specialists have the knowledge and expertise to make the decision on the use of AT.The result is that the IEP team choose the technology based on the expertise of one individual,without other team members' input (Lankutis, 2004). Limited research has been done to examine IEP team members' levels of knowledge for considering AT in the IEP development of third grade to fifth students with LD in reading and writing. It remains unknown whether IEP team members are knowledgeable about AT consideration in the IEP. Whether AT training is enough or more AT training is needed for which groups of school professionals is also questionable.

Significance of the Problem

There is no doubt that IEP team members should be knowledgeable about AT to consider assistive technology as part of the IEP development for students with LD. Each team member should have sufficient knowledge from his or her perspective regarding AT consideration in the IEP. The findings of this study are expected to provide information about IEP team members' self perceived level of knowledge about the characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services for considering AT in the development of the IEP. These findings can inform higher education and AT training units about potential AT training needs for different groups of school professionals.

Purpose of the Study

The purpose of this study is to identify the level of knowledge of IEP team members (school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists) regarding students with LD in reading and writing, AT legislation, AT devices, and AT services for considering assistive technology in the development of the IEP of third grade to fifth grade students who have been identified as having learning disabilities in reading and/or writing.

Research Questions

The research questions in this study focus on the characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services because they are considered as important elements when considering AT in the IEP development. The researcher would like to know IEP team members' level of knowledge on those aspects. The research questions that guided this study were:

1. What is the level of knowledge of IEP team members (school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists) about the characteristics of students with LD when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning the characteristics of students with LD?
2. What is the level of knowledge of IEP team members about AT legislation when developing IEPs for students in Grades 3 to 5 who have been identified as having

learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT legislation?

3. What is the level of knowledge of IEP team members about AT devices when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT devices?
4. What is the level of knowledge of IEP team members about AT services when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT services?

Hypotheses

There are four hypotheses in this study.

1. There are differences among IEP team members (school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists) in their level of knowledge about the characteristics of students in Grade 3 to 5 who have learning disabilities in reading and/or writing as they pertain to the use of AT in the IEP development.
2. There are differences among IEP team members in their level of knowledge about AT legislation when developing IEPs for students in Grade 3 to 5 who have been identified as having learning disabilities in reading and/or writing.

3. There are differences among IEP team members in their level of knowledge about AT devices when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing.
4. There are differences among IEP team members in their level of knowledge about AT services when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing.

CHAPTER 2

REVIEW OF LITERATURE

Assistive Technology

We know that assistive technology could provide tools for supporting students with learning disabilities to access the general curriculum. We also know that IEP teams play an important role in considering assistive technology in the IEP development for students. This section reviews the literature regarding legislation on AT, AT knowledge for IEP team members, AT consideration, and AT in IEP documentation.

AT Legislation

Technology-Related Assistance of Individuals with Disabilities Act. A slogan used by International Business Machines (IBM, 1991; as cited in Bryant & Seay, 1998) says that, “For most people, technology makes things easier. For persons with disabilities, technology makes things possible.” (p.2.) Congress acknowledged that AT has potential for assisting persons with disabilities to access various general environment settings, and so the Technology-Related Assistance of Individuals with Disabilities Act of 1988 (better know as the Tech Act) was passed. The overall purpose of the Tech Act was to provide financial assistance to states to assist in developing consumer-responsive, cross-age, and cross-disability programs of technology-related assistance (Rehabilitation Engineering and Assistive Technology Society of North America, 1992). Although financial resources were provided to states are to establish statewide projects for improving each state’s AT service delivery system, there were issues with timely acquisition of AT devices and services by people with disabilities. For this reason, the Tech Act was revised in 1994.

According to Bryant and Seay (1998), the Tech Act of 1994 contains five titles that provide the framework for developing a nationwide system for consumers to access when needing assistive technology devices and services. Title I provides grants to states for developing and implementing statewide assistive technology programs that are consumer responsive. Title II provides the development of a national classification system to obtain data on assistive technology devices and services across public programs and information and referral networks. Title III is intended to stimulate the development of alternative funding mechanisms by supporting such services as low-interest loans and recycling programs. Title IV provides information pertaining to amendments in the Individuals with Disabilities Education Act and the Rehabilitation Act of 1973. Title V provided a starting date for the Tech Act Amendments. According to Golinker (1994, as cited in Bryant and Seay, 1998), when Congress passed the Tech Act of 1994, it focused the purposes of the Tech Act on systems change and advocacy. As a result, some of the goals in the act which influence AT service delivery in schools are: (a) to enhance the skills and competencies of individuals involved in providing assistive technology devices and assistive technology services; and (b) to increase awareness and knowledge of the efficacy of assistive technology devices and assistive technology services among educators and related services personnel, and individuals who work for public agencies or private entities that have contact with individuals with disabilities, or other experts, including therapists (p.4).

Individuals with Disabilities Education Act. IDEA of 2004 mandates that schools need to consider each student's needs to use assistive technology devices and/or services

during the IEP process (Chambers, 1997). The terms “assistive technology device” and “assistive technology service” were directly taken from the Tech Act of 1988. According to the reauthorized IDEA in 1997, AT devices and services must be considered whether or not the student needs it. In the past, AT devices and services were only considered when any IEP team member raised the issue at an IEP meeting. After 1997, the new requirement asks schools to follow the law that they should consider AT for the student each time in the IEP development, even though AT is not needed. If the IEP team does not adequately consider the student’s need for AT, parents of the student can seek an independent evaluation at the school’s expense (Chambers, 1997).

AT Knowledge for IEP Team Members

In the past few years, the knowledge and skills subcommittee of CEC’s professional standards and practice standing committee has been developing and validating knowledge and skills statements to serve as competencies in all areas of disabilities. The subcommittee has written knowledge and skill statements for assistive technology and validated these statements for CEC’s Technology and Media Divisions (TAM) (Lahm & Nickels, 1999). In the categories of assistive technology competencies, the five items of essential knowledge and skills are described in the following. First, educators are expected to learn AT philosophical, historical, and legal foundations of special education, including legislation and regulations related to technology and their implications for special education. Second, regarding learner characteristics, an educator’s knowledge about the characteristics of exceptional learners influences the decision making of technology use, and impact of technology on exceptional learners.

Therefore, educators should have knowledge about their students. Third, as far as instructional content and practice is concerned, educators should know about the procedures for evaluating computer software and other technology materials for their potential application in special education programs. Fourth, persons who are in related services should have knowledge and skills in communicative and collaborative partnerships when providing technology services to special education students. Fifth, educators should be familiar with professionalism and ethical practices, including confidentiality of information, and educators should be aware of the resource information (Lahm & Nickels, 1999). Teachers not only need to be competent in AT, but also need to meet the same technology competencies as general educators. When special education professionals lack basic knowledge and skills, they have more difficulty meeting the AT needs specified in IDEA (Lahm, 2003). If teachers become more knowledgeable and confident in instructional and assistive technology, they will make better choices regarding the use of it. IEP teams are more likely to make better decisions and the quality of AT consideration in the IEP is more likely to be improved.

Assistive Technology Consideration

The IDEA of 1997 makes it very clear that whether or not the child is found to need assistive technology, it has to be considered when planning IEP (Texas Assistive Technology Network, 2003). Once the team decides the student needs AT to achieve his/her learning goals, the school district has to provide assistive technology to the child in order to meet the legal requirement of providing FAPE. However, the IDEA of 1997 does not provide specific guidelines or procedures for IEP teams to follow when

considering assistive technology for students with disabilities (Chamber, 1997; Hartsell, 1998; Zabala, 1995). As a result, many researchers and practitioners have developed models or frameworks that provide guidelines to help IEP teams make decisions on the needs forAT devices and services for students with disabilities. For example, Bryant and Bryant (1998) developed the AT Adaptations Framework, and Zabala (1995) developed the SETT framework. In addition, more AT consideration guides were developed by four state-wide institutes: Wisconsin Assistive Technology Initiative, Oregon Project of Assistive Technology, Texas Assistive Technology Network, and Georgia Project of Assistive Technology. All of these frameworks or guides were developed for considering AT for students with disabilities in all categories, including learning disabilities. The following section will discuss the models and frameworks in order to provide a clear explanation of how AT is considered in IEP development. These models or frameworks are discussed here because they are notable nationally and are being used widely in the AT field.

AT adaptations framework. Bryant and Bryant (1998) designed an Adaptations Framework (Table 2.1) for considering whether a person with a disability can benefit from adaptations. The framework starts with examining the setting-specific demands, which include deciding appropriate tasks and requisite abilities for the person, and then considering student-specific characteristics of the person, such as functional capabilities and limitations. Based on this information, simple to complex adaptations including assistive technology are proposed. In each section of the framework, a series of questions

are asked for facilitating the consideration of each element when AT Adaptations Framework is implemented (Table 2.2).

Table 2.1

AT Adaptation Framework

Setting-Specific Demands		Person-Specific Characteristics		Proposed Adaptations
Task	Requisite Abilities	Functional Strengths	Functional Limitations	Simple to Complex

SETT framework. The SETT Framework was designed to help the process of gathering, organizing, and analyzing data for considering assistive technology and appropriate educational services for students with disabilities (Zabala, 1995). Information is gathered in four areas regarding students' abilities and needs, the environments, the tasks to accomplish, and the tools needed for completing the tasks. In each section of the SETT framework, IEP teams answer questions according to the obtained information from students. This process guides their procedures. Example questions in the SETT framework are shown in Table 2.3. The SETT Framework requires consideration of four elements: the student, the environment, the tasks, and the tools, but it does not specify when AT consideration should occur within the IEP process because AT should be considered at any time when IEP team members think that appropriate AT is necessary in the service delivery system to students with disabilities.

Table 2.2

Sample Questions Asked in AT Adaptation Framework

Features	Questions
Setting-Specific Demands: Tasks and Requisite Abilities	▪ What instructional tasks do students perform daily? ▪ What skills are necessary to accomplish the tasks? ▪ How is instruction delivered? ▪ How are students expected to learn skills and concepts? ▪ What types of assignments must the student complete? ▪ What types of instructional materials do students interact with?
Student-Specific Characteristics: Functional Strengths and Limitations	▪ What is the learning disability and how does it impact the student's ability to complete setting demand tasks? ▪ What are the student's strengths and weaknesses? ▪ How well does the student complete setting demand tasks independently? ▪ How do the student's specific learning disabilities match the requisite abilities? ▪ What instructional adaptations have been implemented and how has the student responded to the adaptations?
Technology Features	▪ What set-up and maintenance features must be addressed? ▪ Are there compatibility issues with other technology already in the classroom that must be addressed? ▪ How can the technology be used across environments and tasks? ▪ How easy is it to use the technological or non-technological adaptation? ▪ What training is required for the student, teacher, and family? ▪ What environmental features (space, electrical outlets) must be addressed to accommodate the adaptation? ▪ How reliable is the technology?
Student-Technology Match	▪ To what extent does the assistive technology adaptation assist the student in compensating for the learning disability? ▪ To what degree does the technology promote student independence? ▪ What is the student's opinion about the technology adaptation? ▪ What is the family's opinion about the technology adaptation? ▪ Is the technology adaptation efficient and easy for student use? ▪ Does the device promote FAPE?

Note. From “Using Assistive Technology to Enhance the Skills of Students with Learning Disabilities,” by B. Bryant & D. P. Bryant, 1998, *Intervention in School & Clinic*, p. 1053-4512.

Table 2.3

SETT Framework

Element 1	The student
Questions	1. What does the student need to do? 2. What are student's special needs? 3. What are the student's current abilities?
Element 2	The environment
Questions	1. What materials and equipment are currently available in the environment? 2. What is the instructional arrangement? Are there likely to be changes? 3. What is the physical arrangement? Are there special concerns? 4. What supports are available to the people supporting the student? 5. How are the attitudes and expectations of the people in the environment likely to affect the student's performance?
Element 3	The tasks
Questions	1. What activities take place in the environment? 2. What activities support the student's curriculum? 3. What are the critical elements of the activities? 4. How might the activities be modified to accommodate the student's special needs? 5. How might technology support the student's active participation in activities?
Element 4	The tools
Questions	1. What strategies might be used to invite increased student performance? 2. What no-tech, low-tech, and high-tech options should be considered when developing a system for a student with these needs and abilities doing these tasks in these environments? 3. How might these tools be tried out with the student in the customary environments in which they will be used?

Education Tech Point. Bowser and Reed (1995) developed the Education Tech Points as a tool for effective AT delivery system for all students with disabilities. They suggested utilizing the Tech Points as a guide to assist IEP team discussion about specific points within the IEP process where consideration of assistive technology should occur. These six points where consideration should occur were: (a) initial referral, (b) evaluation, (c) extended assessment of AT needs, (d) plan development, (e) implementation, and (f) periodic review (Bowser & Reed, 1995). Bowser and Reed (1995) further explained

details in each point as follows. At each point, questions are raised to guide the IEP team in discussing appropriate assistive technology. For example, the assistive technology questions at the Education Tech Point #1, initial referral stage specify problems that the student is experiencing and examine whether simple or immediately available assistive technology utilized in the classroom might provide enough support that referral to special education would not be necessary. Example questions for the Education Tech Point #2, evaluation, include whether the student can be evaluated accurately without assistive technology and what types of assistive technology might enhance the student's performance. Questions for Education Tech Point #3, extended assessment of assistive technology needs are related to what, if any, specific tasks the student needs to be able to do and what assistive technology could possibly help. After the evaluation and assessment data have been considered and student is found to be eligible for special education, an appropriate educational program must be developed. The school district must determine if assistive technology is needed for the student to receive FAPE. The IEP team needs to be knowledgeable about reviewing data and identifying problems and the needs for students. In Education Tech Point #5, "implementation" questions focus on responsibility for day to day operation. Example questions are who will make sure the equipment is up and running, what will happen when repairs are needed, what training will be provided and when the school districts seek outside funding to purchase a device. Periodic review questions are addressed in Education Tech Point #6. Because IDEA requires periodic review of each student's IEP, the review should include evaluation of the effectiveness of the assistive technology solutions in the student's education plan.

Questions at this point are whether the assistive technology devices and services, which were planned and provided have actually had the intended effect (Bowser & Reed, 1995).

Education Tech Points provide clear guidelines for when and where to consider assistive technology in the procedures of developing the IEP. Professionals in another group, the Wisconsin Assistive Technology Initiative, also suggested strategies for helping educators to provide AT services.

WATI Assistive Technology Consideration Guide. Recognized as a leader in the provision of statewide support for assistive technology services, the Wisconsin Assistive Technology Initiative (WATI, 2003) is designed to provide strategies for assisting school districts in providing AT services. WATI's Assistive Technology Consideration Guide was created to help IEP teams determine whether the student with a disability needs assistive technology devices or services. The following questions guide the IEP team through the process of consideration (Table 2.4).

Table 2.4

WATI Questions to Guide IEP Teams in Considering AT

1. What task is it that IEP team wants this student to do, that he or she is unable to do at a level that reflects his/her skills/abilities (writing, reading, communicating, seeing, and hearing)?
2. Is the student currently able to complete tasks with special strategies or accommodations?
3. Is there available assistive technology (either devices, tools, hardware, or software) that could be used to address this task? If any assistive technology tools are currently being used.
4. Would the use of assistive technology help the student perform skills more easily or efficiently, in the least restrictive environment or perform successfully with less personal assistance?

These questions lead the IEP team to review assistive technology devices and services, which have been used or are currently being used by students with disabilities; furthermore, these questions ask them to consider which potential assistive technology solutions can be used more efficiently and successfully. In addition, the assistive technology checklist is also developed to assist IEP teams in identifying students' current abilities and special accommodations. WATI has provided an AT consideration guide to support IEP teams in considering AT for students in all disability categories.

Assistive Technology Consideration Checklist of GPAT. Developed by assistive technology specialists from Georgia Project for Assistive Technology (GPAT), the Assistive Technology Consideration Checklist also provides a framework to assist IEP teams in considering the potential assistive technology solutions for students with disabilities of all ages and ability levels. The checklist can also be used as documentation of the procedures of assistive technology consideration. Based on the critical elements, the GPAT's Assistive Technology Consideration Checklist addresses a continuum of assistive technology solutions as well as standard classroom tools, modifications, and accommodations that are currently in place to address the student's needs (GPAT, 2004a, ¶3). The Assistive Technology Consideration Resource Guide (GPAT, 2004b, ¶4), designed as a companion to the Assistive Technology Consideration Checklist, assists IEP teams in identifying potential modifications, accommodations, standard classroom tools, and assistive technology solutions that may be needed by students with disabilities (Hartsell, 1998).

When using the Assistive Technology Consideration Checklist, IEP team members are asked to identify instructional or access areas that are relevant for the student. After all of the instructional and access areas have been identified, IEP team members complete the checklist and are then asked to identify the required tasks within the instructional or access areas. After identifying the required tasks within the relevant instructional areas, IEP team members are asked to determine whether the student can complete the identified tasks independently using standard classroom tools. Standard classroom tools are defined as technology solutions that are typically available in the general education curriculum. If the student can independently complete the required tasks within an identified instructional area using standard classroom tools, then the consideration process for that area is complete. However, if the student cannot complete the identified tasks independently, then the educators must determine whether the student's needs are currently being met with modifications and accommodations—either those already in place or with currently available assistive technology tools. If the student's needs are being met in one or more of these ways, then the consideration process for this particular area is complete. If the student's needs are not being met, then the IEP team must identify additional solutions that may be needed (GPAT, 2004a). There are many solutions. They include additional accommodations and modifications that may need to be implemented, trial use of an assistive technology device if the IEP team is aware of technology solutions that may be appropriate to meet the student's needs, or referral for an assistive technology consultation or evaluation if potential assistive technology devices are not known to the IEP team (GPAT, 2004b; Hartsell, 1998).

The GPAT suggests that assistive technology required by the student may also be addressed in other components of the IEP. The components include the present performance levels, the listing of special education and related services, the listing of supplemental aids and services, the listing of required accommodations and modifications, the listing of modifications and accommodations required for participation in district-wide and state-wide assessments, and the annual goals and benchmarks (Hartsell, 1998).

Texas 4-Step Model. Collaboratively developed by the Texas Assistive Technology Network, Texas Technology Access Project, and the Department of Special Education in the College of Education at The University of Texas at Austin, the Texas 4-Step Model is used to assist IEP teams to consider assistive technology in the IEP process for all students with disabilities in accordance with the IDEA of 1997. The four steps included in the model are: 1) review present levels of performance and evaluation data, 2) develop goals and objectives, 3) determine if any tasks are difficult or impossible for the student, and 4) decide whether or not AT devices and services are required and document decisions (Texas Assistive Technology Network, 2004).

Summary. Within the above models or frameworks, the following common elements have been found:

1. The purpose of each model or framework is to assist IEP teams in considering assistive technology for students with disabilities.
2. Generalizing from all models and frameworks, common factors to be considered include the student, the goals and objects of task, AT devices and services, and environment.

3. The procedures for AT consideration include gathering information, evaluating student's ability and tasks, and proposing potential assistive technology solutions.
4. Questions are usually suggested to guide IEP teams in AT consideration in the process of IEP development.
5. AT consideration could occur at any time during the process of IEP development.
6. Instructional purposes are frequently emphasized because IEPs are designed for school-aged children.
7. The models or frameworks are designed for students of all ages and ability levels.

Assistive Technology in IEP Documentation

An Individualized Education Program (IEP) is required under the IDEA for all students with disabilities who receive special education services. Developed by a group of people which legally must include the special education teacher, general education teacher, administrators, related service professionals and parents, the IEP is used to plan, implement, and evaluate the special education program for students with disabilities. The IEP must be reviewed and revised when needed at least annually. The IEP includes the educational goals and objectives for the student and documents the special education and related services that are necessary to support student achievement toward those goals and objectives (Strickland & Turnbull, 1990). Related services include audiology, counseling services, occupational therapy, speech-language pathology, physical therapy, social work services, psychological services, parent counseling and training, diagnostic medical

services, recreation therapy, school health services, early identification and assessment, and transportation services (Burns, 2001; Strickland & Turnbull, 1990).

The IEP must contain information regarding: (a) present levels of student performance, including how the disability affects the student's involvement and progress in the general education curriculum; (b) measurable annual goals, including short-term objectives; (c) educational needs resulting from the child's disability; (d) all needed services and supports, including special education, related services, and program modifications and supports for school personnel, (e) the extent to which the student will participate in regular education programs; and (f) modifications for needed evaluation or assessments (Bowser, 2003; Burns, 2001; Mistrett, 1994; Strickland & Turnbull, 1990).

AT in the IEP. Current IDEA regulations do not provide specific guidelines regarding where or how to specify AT in an IEP. Therefore, it would be possible to include AT in any of the required components of an IEP. With the 1997 reauthorization of IDEA, the required components of an IEP that might include AT are (1) present level of performance, (2) annual goals including benchmarks or short term objectives, (3) special education services, (4) related services, (5) supplementary aids and services, (6) program modifications or support for school personnel, (7) modifications to assessments, and (8) transition service needs (Golden, 1998).

AT should be specified in the part of the IEP that best fits with the type of AT to be provided. When a specific device is considered to be needed in order to implement any IEP objectives or to allow the student to participate in the special education, that device would be specified as a service (special education, related service, supplementary aid or

service, and/or program modification). These IEP components require a proposed beginning date, anticipated frequency, location, and duration. As a result, when AT is specified as one of these services, there is a clear understanding that AT will be available to the student, within the time periods indicated, at the location specified. This way, schools and parents will not experience confusion and miscommunication about delivery of AT (Golden, 1998; Reed, 2004).

Regardless of where AT is specified in an IEP, the persons who develop the IEP should carefully consider how the device is identified. The IEP team may describe a type of AT or may specify a name brand device. Usually describing the AT with enough specificity to assure delivery of the needed device without specifying name brand is suggested (Carl, D., Bower, G., Caril, D., & Zabala, J. personal communication, July 26, 2003; Lankutis, 2003; Reed, 2004). Doing so provides the IEP team with the flexibility to update equipment and to look for available devices on the market. On the other hand, there are rational reasons to specify a particular brand service rather using a broader description because sometimes a device may have a particular feature that is so unique that there is no comparable device on the market, which would make specifying the name brand appropriate (Carl, D., Bower, G., Caril, D., & Zabala, J. personal communication, July 26, 2003; Golden, 1998; Reed, 2004). For being able to discuss AT in the IEP development, the knowledge regarding AT devices and services are critical for people who participate in IEP meeting.

Promising Practices of AT in the IEP. Over the past few years, the Quality Indicators for Assistive Technology (QIAT) Consortium has focused its efforts on

defining a set of descriptors that can serve as guidelines for determining quality assistive technology services. The quality indicators (practices) for assistive technology consideration in the IEP are described in two categories: consideration of assistive technology needs and documentation in the IEP. Both of them can be considered as guidelines for school educator to follow in order to better considering AT in the IEP development process for students with disabilities.

In summary, AT consideration frameworks or models are available for IEP teams to follow when considering AT in the process of developing IEP for students with disabilities. However, it is very important that IEP team members are knowledgeable about what should be considered in terms of legal requirements, students' characteristics, goals and objectives in curriculum, AT devices and services.

The Use of Assistive Technology for Students with Learning Disabilities

Students with learning disabilities experience difficulties in areas including reading, writing, memory, listening, organization and math. Assistive technology offers a variety of potential solutions for them to compensate for their learning difficulties (Bryant & Bryant, 1998). Although technology has moved rapidly into the field of LD, there has been limited discussion about issues in regard to persons with LD utilizing technology (Raskind & Higgin, 1995; Okolo, Bahr, & Rieth, 1993). The use of technology by individuals with LD has predominantly followed the traditional mechanistic instructional/remedial approaches, which generally take the form of computer software and include both tutorial and drill-and-practice programs (Okolo, et al.,

1993). While acknowledging that there are a number of different kinds of educational software, Lewis (1998) cited the research by the U.S. Congress Office of Technology Assessment and indicated that 66% of available educational software is of the drill-and-practice type, and 33% is tutorial in nature. Hresko and Parmar (1991) also stress that although computers and other technologies have several applications in the education of students with LD, "computer use in the schools has traditionally been limited to drill and practice" (p.46).

Traditionally the use of technology for students with LD has been focused on instruction and remediation; however, the greatest benefits may be more fully realized through its capacity to enable persons with LD to accomplish something that could not have been done before, or reach a specific goal that otherwise would not have been possible. Assistive technology offers a means by which to circumvent weaknesses while capitalizing on strengths. For example, an individual with a reading disability who has strong receptive oral language abilities might be able to "read" through the use of an optical character recognition (OCR) system with speech synthesis. An individual having difficulty writing may be able to bypass the problem through the use of a speech recognition system that converts spoken language to computer text. The use of such technologies has the potential to increase independence, self-concept, and even promote social interaction (Raskind & Higgins, 1998).

Lewis (1993) indicated that "assistive technology has two major purposes for students with learning disabilities. First, AT augments an individual's strengths so that he or she can overcome the disability-related learning problems. Second, AT provides an

alternate way of performing a task so that disabilities are compensated or bypassed (p.17)." For example, a possible solution for supporting students with LD in reading text materials is using auditory materials such as taped books, devices that read print books, and computer programs with speech output to overcome the print barriers through their hearing (Lewis, 1998). The following describes effective technology for reading and writing.

Reading with Technology

Research has demonstrated the effectiveness of using technology, including low- and high-technology to support students with LD in academic learning (Woodward & Rieth, 1997). Reading is usually a big issue for students with learning disabilities. In a review of literature on the use of computer-based instruction (CBI) in special education, Okolo, Bahr, and Rieth (1993) concluded that research has demonstrated that CBI can improve skills in two areas, including word recognition and decoding. Higgins and Boone (1993) agreed, but added that traditional reading software was less effective for improving comprehension. Further developed technology features such as speech-enhanced text and hypermedia-enhanced text seem to support the readers. Speech is useful when it is incorporated in reading software (Wise & Olson, 1994). Hypermedia-enhanced text also seems to improve reading performance. Positive results had been reported for low-achieving students using hypermedia basal readers (Boone & Higgins, 1993; Higgins & Boone, 1991) and for students with learning disabilities using hypermedia study guides in social studies (Higgins & Boone, 1990).

Writing with Technology

Raskind (1994) indicated that studies involving students with learning disabilities using assistive technology have investigated written language difficulties. For students with learning disabilities, the available technologies include word processors with spell checking, proofreading, and outlining software programs. Also available are speech-control tape recorders, optical character recognition systems, listening aids, speech-synthesis/screen-review systems, speech-recognition systems, data managers and talking calculators (Bryant & Bryant, 1998; Bryant, Bryant, & Rieth, 2002; Day & Edwards, 1996). In a meta-analysis of 32 studies comparing word processing with traditional writing methods, Bangert-Drowns (1993) reported that word processing positively affected writing quality, particularly for students with poor writing skills who received remedial writing instruction.

The research literature on word processing technologies for students with LD is limited and more often the research studies focus on word processing combining technology with writing instruction. Some studies, which examine writing as a process and instruction in strategies for writing, revealed that word processing makespositive changes in writing quality, particularly when word processing is combined with instructional approaches (Graham & MacArthur, 1988; MacArthur & Schwartz, 1990; MacArthur, Schwartz, & Graham, 1991). Word processing also increases the quantity of text written (Graham & MacArthur, 1988; MacArthur & Schwartz, 1990). Additionally, word processing seems to increase the accuracy in conventions of written language such as spelling and grammar (MacArthur & Schwartz, 1990). A small number of studies have investigated the effectiveness of keyboarding instruction for students with LD and the use

of word processing features such as speech and editing tools. Okolo, Hinsey, and Yousefian (1990) reported that keyboarding instruction improved the text-entry speed of students with learning disabilities. Dalton, Winburg, and Morocco (1990) found that spelling checkers seem to improve spelling performance. Borgh and Dickson (1992) investigated the effects of speech synthesis on the writing performance of elementary-level general education students and found that students wrote longer stories, made more editorial changes and showed more positive attitudes to writing in the synthesis condition. However, in a preliminary report of research with college students with learning disabilities, Raskind and Higgins (1993) suggested that the effectiveness of speech synthesis, which either facilitated or impeded the writing process, depended on the characteristics of individual students.

In order to provide a better understanding about various possible assistive technologies for students with LD, the following section describes the types of assistive technology that may support them in their learning. Examples of assistive technology are also included.

Reading

Speech synthesis. Speech synthesis is not limited to only word processors. It can be used to review materials written by others such as software tutorials, letters, reports and online database and information systems. A speech synthesizer will read anything on a computer screen. Even some products including recording and speech-out systems that are designed particularly for people with blindness can also be used by persons with learning disabilities (Dutoit, 1999; Forgrave, 2002).

Optical character recognition (OCR). An OCR system may be implemented through a reading machine with features of scanning and speech synthesis. It actually provides a way of directly inputting text/printed material into a computer. Text is input by using a scanner. Once the text has been scanned into the computer, it can be read aloud to the user by a speech synthesis system. This technology may be particularly helpful to students with learning disabilities who have no problem with hearing and listening comprehension (Higgins & Raskind, 1997). Several companies have designed product systems such as Kurzweil 3000 and WYNN, which can highlight words as text that are read back by the system.

Speech control tape recorders. Tape recorders can be used as playback systems for listening to books on audiotape, which may help students with learning difficulties compensate their disability by listening to the recorded text. Although tape recorders may be helpful to some students, they may have problems for those people with learning disabilities who have difficulty in understanding auditory information at the standard audio play-back-rate (McCroskey & Thompson, 1973). However, this problem can be solved by using various speech control tape recorders which can let the user play back audio material slower or faster than the rate that was recorded.

Writing

Word processing. Unlike paper and pencils, word processors enable students with learning disabilities to write without worrying about making errors, since the text can be corrected on-screen before they print. In this way, students with learning disabilities may have less anxiety, since they know that they can always correct errors afterwards. Word

processing may lead students to write “neat” documents. Examples of word processors include Microsoft Word, Write:Outloud, and Kurzweil 3000 (MacArthur, 1999a; MacArthur, 1999b; MacArthur,2000; Quenneville, 2001).

Spelling check. The use of spell checking may help students with learning disabilities compensate for their spelling problems because they usually misspell words in a document. Some software programs with proofreading functions (usually embedded in word processors) can scan word documents and alert the students to errors and other errors that they make in spelling, grammar, punctuation, word usage, or structure. Most of these software programs can be used to mark the errors and provide suggestions on corrections (Ashton, 1999; MacArthur, 1999b). Examples are Microsoft Word with spelling/grammar check, and Write:Outloud with spelling check and dictionary.

Brainstorming ideas/outlining drafting. Some outlining programs may help students with learning disabilities get their ideas down on paper and subsequently organize them. These programs enable them to brainstorm information on a computer in a non-structured manner and then reorganize ideas in appropriate order. Sometimes the programs use the mapping format for users to represent their ideas. With computer software that processes more powerful features, students with learning disabilities may use templates specifically designed for particular writing formats, or they may use pictures to represent their ideas (Forgrave, 2002). A very typical outlining software example is Inspiration, which is appropriate for school-age children.

Word prediction. Word prediction software supports word processing programs by predicting the word that the user types into the computer. Predictions are based on

syntax and spelling as well as frequency and redundancy. Typically, word prediction programs operate in the following way. When the first letter of a word is typed, the program provides a list of possible words beginning with that letter. If the desired word appears on the list, the user can choose the word by pressing the number or pointing and clicking. Then the desired word will be automatically inserted into the sentence. Word prediction is helpful for students with learning disabilities because the program minimizes the keying process when they find the word they need on the prediction list (MacArthur, 1999a; Quenneville, 2001; Williams, 2002). Co:Writer is a word prediction software program that has been widely in schools for supporting students with LD writing.

Speech recognition. Speech recognition systems operate in conjunction with personal computers and consist of speech recognition hardware, software, head phones, and microphones. Speaking recognition systems enable users to operate the computer by speaking into it. Dragon Naturally Speaking is one of the software programs that allows students with LD to speak to the computer to get the program to type the words or the computer for them (MacARthur, 1999a; MacARthur, 1999b; Forgrave, 2002).

Speech synthesis/screen reading. Speech synthesis refers to a computerized voice output system that usually consists of an internal board or an external hardware device. In conjunction with screen reading software, a speech synthesizer can read a text displayed on a computer screen so that users can hear and see the text on the screen at the same time. The text can be read in a word, line, sentence or paragraph. This is particularly helpful for students with LD when they are struggling with reading (Forgrave, 2002).

Another type of speech synthesis combines with word processing program to benefit students with learning disabilities on written language. Generally, this type of speech synthesis gives users auditory feedback when they write with the word processor. By using this function, students have the ability to hear what they write and may find errors in grammar, spelling, and punctuation, which they may not find without using speech synthesis (MacArthur, 1999b). A popular example is Write:Outloud, which contains the above functions.

Summary. Students with LD face many challenges in learning and AT can be a potential tool for compensating for their difficulties. Many researchers have demonstrated positive results of using AT to support students with LD in their learning as far as various aspects in word recognition and decoding, reading comprehension, drafting writing ideas, word processing, spelling check, word prediction, speech recognition, and speech synthesis.

This chapter reviewed the literature regarding considering assistive technology when developing IEPs for students with learning disabilities in reading and writing. Several pieces of legislation related to assistive technology, several models or frameworks of supporting IEP team in considering assistive technology, and the assistive technology used by students with learning disabilities were addressed. The literature indicated that the law requires IEP team to consider AT to determine whether AT devices and services is necessary for their students with disabilities to access general education curriculum. Therefore, IEP team members play an important role for considering AT and

how AT should be specified in the IEP. Models and frameworks discussed in this chapter provided guidelines for IEP team members to follow when they considered AT for their students with LD. In the models and frameworks, students with disabilities, AT devices, and AT services are important elements to be considered. For example, word processors with speech synthesis can help students with LD to compensate for their struggles with reading and writing.

Since IEP team members are key persons to consider AT in the IEP development for students with LD, it is important to know whether IEP team members obtain sufficient knowledge regarding the characteristics of students, AT legislation, AT devices, and AT services. The following chapter describes the research methodology for this study.

CHAPTER 3

METHOD

This study examined IEP team members' level of knowledge about characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services when developing IEPs for students with learning disabilities in reading and writing. This chapter describes the research methodology used in this study, including participants, instrumentation, data collection procedures, and data analysis. These components are important to the study because they relate to the quality of data and how successfully the study is conducted (Fowler, 2002).

Research Methodology

This study employed survey methodology (Babbie, 1990; Dillman, 2000; Fowler, 2002) to help determine whether there are differences among IEP team members' levels of knowledge about characteristics of students with LD, AT legislation, AT devices, and AT services when developing IEPs for students with LD in reading and writing. The research method used in the study involved the administration of an online survey questionnaire designed to assess IEP team members' levels of knowledge regarding the content areas. This research method is suitable because it allows the researcher to get numerical information for exploring and generalizing the results from some particular populations (Babbie, 1990).

Surveys are effective means of gathering information on specific topics from particular populations, and continuing growth in the use of Internet to support teaching and learning has led to large-scale replacement of paper surveys with electronic versions.

Online surveys are considered effective due to their ease of use (Cooper, 2000); furthermore, they are self-administered questionnaires, and hence, participants are free to self-control time and answer each survey question. Eliminating the need for costly printing of hard-copy surveys is often presented as one of the benefits of Internet surveys (Dillman, 2000). However, it would be difficult to use Web-based surveys when participants in the sample have limited access to computers and the Internet. This study surveyed IEP team members including school administrators, general education teachers, special education teachers, and school professionals. Fortunately, these professionals usually have e-mail addresses, computers, and Internet access in their work environments.

Research Questions

The research questions that guided this study were as follows:

5. What is the level of knowledge of IEP team members (school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists) about the characteristics of students with LD when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning the characteristics of students with LD?
6. What is the level of knowledge of IEP team members about AT legislation when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT legislation?

7. What is the level of knowledge of IEP team members about AT devices when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT devices?
8. What is the level of knowledge of IEP team members about AT services when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT services?

Hypotheses

There were four hypotheses in this study, and each hypothesis corresponds to a research question:

5. There are differences among IEP team members (school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists) in their levels of knowledge about the characteristics of students in Grades 3 to 5 who have learning disabilities in reading and/or writing as they pertain to the use of AT in the IEP development.
6. There are differences among IEP team members in their levels of knowledge about AT legislation when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing.
7. There are differences among IEP team members in their levels of knowledge about AT devices when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing.

8. There are differences among IEP team members in their levels of knowledge about AT services when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing.

Participants

For this study participants were randomly selected from elementary schools in three large urban school districts (school districts A, B, and C) within one southwestern state. Participants were IEP team members randomly selected including school administrators, general education teachers, special education teachers, speech/language pathologists, diagnosticians, and occupational therapists. All had experience working with students in Grades 3 to 5 who had been identified as having learning disabilities in reading and writing.

To select the participants, systematic sampling was used (Babbie, 1990; Fowler, 2002; Kalton, 1983) because it was impractical to compile a list of personnel in each school district comprising the target population in this study. Systematic sampling involves two basic steps: listing and sampling. Participants' e-mail addresses were obtained from the central administration office of each school district and were randomly selected.

Instrumentation

Survey development. The survey development for this study involved two steps: combining items from other surveys and revising question items by AT professionals. For generalizing questions from other surveys, the survey questionnaire was adapted from Raskind and Bryant's (2002) *Functional Evaluation for Assistive Technology (FEAT)*;

Maushak, Kelley, and Blodgett (2000); Puckett (2002); and QIAT (2002). The sample survey is shown in Appendix A. The purpose of the survey was to gather IEP team members' demographic information.

After the survey questions were generated, the next step was to invite AT specialists in the Austin Independent School District (AISD) to review the survey and judge whether question items were clearly described and easily understandable. If there was any question item that needed to be elaborated on or changed, the AT specialists were asked to make suggestions. They were also asked to indicate the degree of importance of each knowledge area by using a Likert scale which 1 refers to "the least importance", and 5 refers to "the most importance". For example, they may answer "5" when they strongly agree that the question item is important in being knowledgeable about AT devices. The AT specialists were also asked to indicate which question addressed which knowledge area, such as whether the question addressed legislation, students with LD, AT devices, or AT services, and whether a question tapped more than one knowledge area. This process was used to help establish the content validity of the survey.

Survey content. The survey questionnaire contains Part A: Participant Demographic Information, and Part B: Assessing Knowledge Areas. The nine items in Part A ask for the participant's job title, gender, age, highest education degree, ethnic background, years of teaching experiences overall, years of working with students with LD, number of ARD meetings participated in, and accessibility to AT resources. The first eight questions are multiple choice, and the last question requires the interviewee to

check all that apply. Part B contains four sections, querying characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services. Section One asks interviewees about their knowledge regarding the problems that students with LD may exhibit in reading and writing. Nine questions focus on reading and the other eight questions focus on writing. Section Two lists 11 questions about AT legislation, and the purpose of this section is to determine whether interviewees are knowledgeable about the laws related to AT when developing an IEP for students with disabilities. Section Three includes eight questions concerning AT devices to support students with LD in their reading, and the other 10 questions deal with writing. These questions are designed to identify interviewees' level of knowledge about various AT solutions for the problems that students with LD have in reading and writing. The last section, Section Four, contains 13 questions about AT regarding the interviewees' level of knowledge about the AT services that need to be considered when developing IEPs. At the end of Part B, an open-ended question is listed for interviewees to leave comments, concerns, or more information if they agree to be further contacted by the researcher or are willing to participate in future studies. Overall, 60 questions are listed in Part B. Combining Part A and Part B, there are 69 questions in the survey.

The final survey was tested by a group of five volunteer graduate students in the Department of Special Education at the University of Texas at Austin. All five volunteers had teaching experiences with students with learning disabilities, and they volunteered to test and measure how long the survey takes interviewees to complete. The results showed that they spent about 15 minutes completing the survey. According to Crawford et al.

(2001), survey respondents are more likely to answer a survey if they are told the survey takes 8 to 12 minutes to complete than if they are told it takes 20 minutes. Therefore, the length of this survey is acceptable.

Internet data collection. Because an online survey was chosen as the data collection tool for this study, a Web-based commercial survey development program, surveymonkey.com, was selected for posting survey questions on the Internet so that participants could submit the survey answers after they responded. Professional subscription was purchased. The raw data collected on SurveyMonkey.com were stored in the safe storage and could be easily downloaded to Microsoft Excel or SPSS programs for further analysis.

Reliability of the instrument. The reliability of an instrument is important in that it ensures the consistency of the outcome of what the instrument is measuring. Cronbach's alpha was employed to determine the internal consistency reliability of the survey. The results yielded a coefficient alpha of 0.97 (n = 41; 63 items). The reliability of the survey is therefore acceptable according to Nunnally's (1994), Bobko's (2001), and Litwin's (1995) criterion of 0.70 as a minimally acceptable alpha value.

Validity of the instrument. The validity of an instrument is crucial in that it ensures that an instrument actually measures what it is supposed to measure. *Content validity* is the degree to which the sample of survey items represents the content that the survey intends to measure; *construct validity* is the extent to which a particular survey measures a hypothetical construct; and *interpretive validity* is the degree to which a

survey appears to measure what it purports to measure (Borg & Gall, 1989; Fowler, 1993). Several steps were taken to ensure the validity of the survey in this study.

First, survey items were adapted from several resources that were appropriate for this study. For example, items in Section 1 (about students with learning disabilities in reading and writing) were adapted from the FEAT (1998) and the GPAT (1998). Question items in Section 2 (AT legislation) and Section 4 (AT services) were adapted from the QIAT matrix (2002). Question items in section 3 (AT devices) were adapted from the FEAT (1998), the GPAT (1998) and Bryant (2000).

Second, because there were more than 100 adapted items in the survey, the list of items was split in half and randomly sent to 12 QIAT professionals in the leadership group and 20 AT specialists in the Texas Assistive Technology Network (TATN) for identifying the importance of each item for this study. Therefore, 6 QIAT professionals and 10 TATN AT specialists received half of the survey, and the other 6 QIAT AT professionals and 10 TATN AT specialists received the other half. The QIAT professional group comprised AT specialists, practitioners, and diagnosticians across many states; 7 of them reviewed and rated the survey. TATN consists of 20 AT specialists from 20 regional education centers in the state of Texas; 12 of them rated and returned the survey. The frequencies of the importance ratings were calculated for each item, and the items considered the least important were eliminated from the survey list.

Third, valuable feedback and professional advice were provided by my committee members. Each committee member reviewed the survey and provided his or her feedback. During the proposal meeting for this dissertation study, committee members also made

constructive suggestions as to how to further improve the survey. It was suggested, for example, that items on legislation be rewritten in simpler language for the respondents, rather than directly copying the statements from the law. The final version of the questionnaire was completed after the pilot study.

Data Collection

Data collection involved a pilot study and a formal study. The pilot study was conducted in March 2007, and the formal study was conducted from April to May 2007. Before this, approval for conducting the research had been obtained from the office of Institutional Review Board (IRB) at University of Texas and the office of research in each school district. The university and each school district had been informed of what my studies were about and how they were to be conducted.

Pilot Study

The purposes of the pilot study were to (1) evaluate the clarity of the items to be used in the formal study; (2) ensure that the measurement instruments were reliable and valid before undertaking the formal study; and (3) rehearse and test the use of a prepaid online survey Website (Surveymonkey.com), including designing my online survey, organizing participants' e-mail addresses, sending the online survey to my participants, and exporting data for further analysis. The results of the pilot study served as the basis for fine-tuning the instrument and improving the online survey design, including the number of items displayed on each page, color, font, and so on.

The survey was pilot-tested with 41 participants including general education teachers, special education teachers, and school administrators in three school districts

who were randomly selected and voluntarily participated in this study. Alpha coefficients computed for each section were 0.97, 0.96, 0.97, and 0.95. In Section 3, some items had coefficient lower than 0.7. Therefore, these items were deleted to reach 0.9 alpha or higher.

On the whole, the results of the pilot study indicated that the survey was acceptable in terms of reliability and validity. The questionnaire items as well as the online survey design also were deemed to be clear.

Formal Study

A different sample from the one used for the pilot study was used in the formal study. A total of 209 participants in school district A, 914 participants in school district B, and 217 participants in school district C participated in the formal study. The formal study was conducted through the online survey. Before the formal study, the researcher obtained approval from the office of research to conduct human-subject study in each school district and permission to do the study from the school principals. Each school district released their employees' e-mail addresses. In school district A, the selected participants' e-mail addresses were collected and released in Excel format. The e-mail addresses were transferred to the database in surveymonkey.com. The survey was successfully sent to the participants through the database. In school district B, each participant's e-mail address was not accessible until the proposal had been approved and the Webmaster of the school district was given permission to release e-mail information in an Excel format. The e-mail addresses were stored in the database in surveymonkey.com; however, the survey sent through surveymonkey.com was not a

success because those messages were marked as spam. Therefore, extra assistance was sought through the Office of the Superintendent, which sent out a reminder e-mail to the participants, asking them to respond to the survey. As a result, in school district B, the return rate of 50.53% was satisfied. In school district C, participants' e-mail addresses were easily obtained from the school district Website and transferred to the database in surveymonkey.com. The researcher was given permission to send out the survey to each participant once the research proposal has been approved. Each survey was successfully sent through surveymonkey.com.

The first e-mail with the survey link was sent to the participants on April 12th; this message informed them about the study and invited them to participate (see the Appendix for the sample of the first contact e-mail). Once they responded to my survey, their record in my surveymonkey.com database said, "Responded." People who had not responded to my survey were recorded as "No response" in my database. If they decided not to participate in my study, they clicked on "do not wish to receive further contact," and my database showed "decline" under their names. They would not receive any more e-mails from the system. Two weeks later, on April 26th, the second e-mail was sent as a reminder to participants who had not responded to my survey (See the Appendix for the sample of the second contact email). One week later, on May 3rd, the third and final contact was sent to participants who still had not responded to my survey. As a result, the 1,340 participants who responded to my survey were sufficient for statistical analysis. Thus, the data collection was completed, and the final sample was 207 participants in

school district A, 754 participants in school district B, and 217 participants in school district C in the formal study.

Data Analysis

Quantitative analyses were conducted using SPSS (Statistical Packages for the Social Sciences), Version 14. The first statistical procedure yielded the analysis of the participants' demographic information; descriptive statistics, including frequencies, means, and standard deviations of the questionnaire items in the section of the characteristics of students with LD; AT legislation; AT devices; and AT services. The percentages of the points earned by respondents at each role group from the possible of total maximum points were also calculated for each section.

The survey included an optional, open-ended question asking for respondents' personal comments regarding AT consideration for students with LD. Responses to the open-ended question in this study were not intended to generate theories about the IEP team's knowledge; instead, the open-ended question data served as supplemental information to the questionnaire data. The responses that were close in meaning were compiled, and frequencies were calculated. "No comments" and responses such as "Good luck with your study" that were irrelevant were disregarded.

The next statistical procedure was a MANOVA. The MANOVA was employed to examine whether job position had significant effects on level of knowledge about the characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services. The variable job position served as predictor or independent variable, while the level of knowledge about the characteristics of students with LD in reading and

writing, AT legislation, AT devices, and AT services served as predicted or dependent variable. The results of this analysis helped to address the research questions.

CHAPTER 4

RESULTS

IDEA (2004) requires IEP teams to consider AT for students with disabilities during the IEP development process to provide a free, appropriate public education (FAPE) and to assist students with disabilities in accessing the general education curriculum. IEP team members may have different levels of knowledge for AT consideration in the IEP, yet they are expected to decide whether AT is necessary and how it should be implemented to help students with LD. The purpose of this study is to investigate the IEP team's level of knowledge of AT for students with learning disabilities in reading and writing in the IEP development. The research questions that guided this study were as follows:

1. What is the level of knowledge of IEP team members (school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists) about the characteristics of students with LD when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning the characteristics of students with LD?
2. What is the level of knowledge of IEP team members about AT legislation when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT legislation?
3. What is the level of knowledge of IEP team members about AT devices when

developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT devices?

4. What is the level of knowledge of IEP team members about AT services when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing? Do IEP team members exhibit different levels of knowledge concerning AT services?

This chapter discusses the rate of response and missing data, demographic analysis of the participants, and the survey item analysis, and describes the survey.

Rate of Response and Missing Data

A total of 3,201 participants, including school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists, were sampled from elementary schools within three school districts in a southwestern state. After three e-mail contacts, 1,340 individuals responded. As a result, the return rate was 41.86%, which is considered acceptable.

The original set of participants for this study consisted of a total of 785 IEP team members from school district A, 1,809 IEP team members from school district B, and 607 IEP team members from school district C (see Table 4.1). The total responses from participants in school districts A, B, and C were 209 (26.62%), 914 (50.52%), and 217 (35.75%), respectively. However, after examining the responses, 22 cases in school district A, 214 cases in school district B, and 54 cases in school district C were unusable

due to incomplete responses (e.g., participants' withdrawal in the process of responding to the survey) to the questionnaire. The final sample was 1,050 cases: 187 cases from school district A, 700 cases from school district B, and 163 from school district C.

Table 4.1

Number of Returned and Missing Surveys

School district	Original	Returned	Missing	Incomplete	Final sample
A	785	209	576	22	187
B	1,809	914	895	214	700
C	607	217	390	54	163
Total	3,201	1,340	1,861	279	1,050

Demographic Analysis of the Participants

All 1,050 participants from the three school districts are presented in Table 4.2. The number of respondents from each job position was 134 (12.8%) for school administrators, 700 (66.7%) for general education teachers, 145 (13.8%) for special education teachers, 14 (1.3%) for diagnosticians, and 57 (5.4%) for speech/language pathologists. Numbers of participants at each job position from each school district are listed in Table 4.3. Of 134 school administrators, 26 (19.4%) were from school district A, 90 (67.17%) were from school district B, and 18 (13.43%) were from school district C. Of the 700 general education teachers, 98 (14%) were from school district A, 496 (70.86%) were from school district B, and 106 (15.14%) were from school district C. Of the 145 special

Table 4.2
Participant Demographics

Background variable	Frequency (*n*)	Percentage (%)
Job position		
School administrators	134	12.8
General education teachers	700	66.7
Special education teachers	145	13.8
Diagnosticians	14	1.3
Speech/language pathologists	57	5.4
Gender		
Male	164	15.6
Female	886	84.4
Age		
Less than 30 years old	128	12.2
30-40 years old	327	31.1
41-50 years old	279	26.6
51-60 years old	267	25.4
More than 60 years old	49	4.7
Highest degree		
Bachelor's	503	48
Master's	510	48.7
Doctorate	35	3.3
Ethnic background		
African American	211	20.1
European American	546	52
Hispanic American	252	24
Native American	10	1
Pacific Islander/ Asian American	23	2.2
Other	8	0.7
Years of experience with students overall		
Less than 1 year	13	1.2
1-3 years	99	9.4
4-6 years	178	17
7-9 years	131	12.5
More than 9 years	629	59.9
Years of experience with students with LD		
Less than 1 year	79	7.5
1-3 years	166	15.8
4-6 years	192	18.3
7-9 years	140	13.3
More than 9 years	473	45.1
Number of ARDs		
1-10	340	34.2
11-20	165	16.6
21-30	107	10.8
More than 30	382	38.4
Accessing AT resources		
University/college course	218	20.8
Online training curriculum	91	8.7
Workshop/on-site training	556	53
Professional conferences	211	20.1
Never, but interested	342	32.6
Never, and not interested at all	55	5.2

education teachers, 51 (35.17%) were from school district A, 73 (50.35%) were from school district B, and 21 (14.48%) were from school district C. For the diagnosticians, 1 (7.14%) was from school district A, 9 (64.29%) were from school district B, and 4 (28.57%) were from school district C. Regarding the 57 speech/language pathologists, 11 (19.3%) were from school district A, 32 (56.14%) were from school district B, and 14 (24.56%) were from school district C.

Table 4.3

Numbers of Participants in Each Job Position in Each School District

School district	School administrators *N* (%)	General ed. teachers *N* (%)	Special ed. teachers *N* (%)	Diagnosticians *N* (%)	Speech/language pathologists *N* (%)
A	26 (19.4)	98 (14)	51 (35.17)	1 (7.14)	11 (19.3)
B	90 (67.17)	496 (70.86)	73 (50.35)	9 (64.29)	32 (56.14)
C	18 (13.43)	106 (15.14)	21 (14.48)	4 (28.57)	14 (24.56)
Total	134 (100)	700 (100)	145 (100)	14 (100)	57 (100)

Gender. Within the total of 1,050 participants, gender was distributed approximately 5 to 1, female to male, where 886 were females and 164 were males. For all role groups of the participants, the majority were females with 80.6% (n = 108) for school administrators, 83.4% (n = 584) for general education teachers, 91% (n = 132) for special education teachers, 85.7% (n = 12) for diagnosticians, and 87.7% (n = 50) for speech/language pathologists (see Table 4.4).

Table 4.4

Participants' Gender in Job Position

	School administrators *N* (%)	General ed. teachers *N* (%)	Special ed. teachers *N* (%)	Diagnosticians *N* (%)	Speech/language pathologists *N* (%)
Male	26 (19.4)	116 (16.6)	13 (9.0)	2 (14.3)	7 (12.3)
Female	108 (80.6)	584 (83.4)	132 (91.0)	12 (85.7)	50 (87.7)
Total	134 (100)	700 (100)	145 (100)	14 (100)	57 (100)

Age. One third of the participants were 30 to 40 years old, about one fourth were 41 to 50 years old, and one fourth were 51 to 60 years old. Participants who were less than 30 years old, or more than 60 years old were less than one tenth of the sample. For the 134 school administrators, more than one third were 51 to 60 years old, about one third were 41 to 50 years old, and less than one third were 30 to 40 years old. Of the general education teachers, more than one third were 30 to 40 years old; about one fourth were 41 to 50 years old; and about one fifth were 51 to 60 years old. Of the special education teachers, about one third were 30 to 40 years old and 51 to 60 years old; and one fourth were 41 to 50 years old. More than one third of the diagnosticians were 41 to 50 years old, and similar percentages were shown for the groups of 51- to 60-year-olds and those more than 60 years old. Of the speech/language pathologists, the groups with the three highest percentages were the 41- to 50-year-olds, 30- to 40-year-olds, and 51- to 60-year-olds (see Table 4.5).

Table 4.5

Participants' Age by Job Position

	School administrators *N* (%)	General ed. teachers *N* (%)	Special ed. teachers *N* (%)	Diagnosticians *N* (%)	Speech/language pathologists *N* (%)
Less than 30	4 (3.0)	104 (14.9)	14 (9.7)	1 (7.1)	5 (8.8)
30-40	36 (26.9)	230 (32.9)	42 (29.0)	2 (14.3)	17 (29.8)
41-50	39 (29.1)	178 (25.4)	38 (26.2)	5 (35.8)	19 (33.3)
51-60	46 (34.3)	157 (22.4)	46 (31.7)	3 (21.4)	15 (26.3)
More than 60	9 (6.7)	31 (4.4)	5 (3.4)	3 (21.4)	1 (1.8)
Total	134 (100)	700 (100)	145 (100)	14 (100)	57 (100)

Education. In terms of education, the numbers of participants holding bachelor's and master's degrees were similar: 503 (48%) had earned a bachelor's degree and 510 (or 48.7%) held master's degrees; in addition, 35 (3.3%) participants had earned a doctoral degree. Within the school administrator group, the majority (75%; $n = 99$) held master's degrees. The majority of the 700 general education teachers (56.6%; $n = 396$) held bachelor's degrees. Of the special education teachers, more than half (56.6%; or $n = 82$) held bachelor's degrees. All of the diagnosticians except 1 held master's degrees. The majority of the speech/language pathologists (80.7%; $n = 46$) held master's degrees (see Table 4.6).

Table 4.6

Participants' Highest Degree Earned by Job Position

	School administrators *N* (%)	General ed. teachers *N* (%)	Special ed. teachers *N* (%)	Diagnosticians *N* (%)	Speech/language pathologists *N* (%)
Bachelor's	19 (14.4)	396 (56.6)	82 (56.6)	0	6 (10.5)
Master's	99 (75.0)	291 (41.6)	61 (42)	13 (92.9)	46 (80.7)
Doctorate	14 (10.6)	13 (1.8)	2 (1.4)	1 (7.1)	5 (8.8)
Total	134 (100)	700 (100)	145 (100)	14 (100)	57 (100)

Ethnicity. Of the 1,050 participants, the majority were European Americans (52%; *n* = 546), the second largest group was Hispanic Americans (24%; *n* = 252), and 20.1% (*n* = 211) were African Americans. Native Americans and Pacific Islander/Asian American accounted for the smallest groups (1%, or *n* = 10, and 2.2%, or *n* = 23). For the role of each participant, the largest group was European American with 46.3%, or *n* = 62,for school administrators, 49%, or *n* = 343, for general education teachers, 66.9% or n=97 for special education teachers, 64.3% or n=9 for diagnosticians, and 61.4% or n=35 for speech/language pathologists (see Table4.7).

Years working with students overall. More than half of the participants (59.9%) had more than 9 years of experience working with students overall, while 9.4% had 1 to 3 years, 17% had 4 to 6 years, 12.5% had 7 to 9 years, and 1.2% had less than 1 year. The majority of individuals in all roles had more than 9 years of experience with students overall (see Table 4.8).

Table 4.7

Participants' Ethnicity by Job Position

	School administrators *N* (%)	General ed. teachers *N* (%)	Special ed. Teachers *N* (%)	Diagnosticians *N* (%)	Speech/language pathologists *N* (%)
African Americans	28 (20.9)	147 (21)	26 (17.9)	2 (14.3)	8 (14.0)
European Americans	62 (46.3)	343 (49)	97 (66.9)	9 (64.3)	35 (61.4)
Hispanic Americans	43 (32.1)	183 (26.2)	15 (10.4)	3 (21.4)	8 (14.0)
Native Americans/ Indians	0	7 (1.0)	1 (0.7)	0	2 (3.5)
Pacific Islander/ Asian Americans	0	15 (2.1)	5 (3.4)	0	3 (5.3)
Others	1 (0.7)	5 (0.7)	1 (0.7)	0	1 (1.8)
Total	134 (100)	700 (100)	145 (100)	14 (100)	57 (100)

Table 4.8

Participants' Years of Working with Students Overall by Job Position

	School administrators *N* (%)	General ed. teachers *N* (%)	Special ed. teachers *N* (%)	Diagnosticians *N* (%)	Speech/language pathologists *N* (%)
Less than 1	2 (1.5)	10 (1.4)	1 (0.7)	0	0
1-3	0	81 (11.6)	17 (11.7)	0	1 (1.8)
4-6	8 (6.0)	139 (19.8)	24 (16.6)	2 (14.3)	5 (8.8)
7-9	8 (6.0)	93 (13.3)	13 (9.0)	3 (21.4)	14 (24.5)
More than 9	116 (86.5)	377 (53.9)	90 (62)	9 (64.3)	37 (64.9)
Total	134 (100)	700 (100)	145 (100)	14 (100)	57 (100)

Years working with students with LD. In terms of the numbers of years working with students with learning disabilities, of the total participants, 45.1% had more than 9 years of experience, 13.3% had 7 to 9 years of experience, 18.3% had 4 to 6 years', 15.8% had 1 to 3 years', and 7.5% had less than 1 year of experience working with students with LD. For the role of each participant, the largest percentages were found in the group working with students with LD for more than 9 years (see Table 4.9).

Table 4.9

Participants' Years of Working with Students with LD by Job Position

	School administrators *N* (%)	General ed. teachers *N* (%)	Special ed. teachers *N* (%)	Diagnosticians *N* (%)	Speech/language pathologists *N* (%)
Less than 1	8 (6)	66 (9.4)	4 (2.8)	1 (7.1)	0
1-3	8 (6)	135 (19.3)	22 (15.1)	0	1 (1.8)
4-6	11 (8.2)	135 (19.3)	33 (22.7)	4 (28.6)	9 (15.8)
7-9	12 (8.9)	96 (13.7)	14 (9.7)	3 (21.4)	15 (26.3)
More than 9	95 (70.9)	268 (38.3)	72 (49.7)	6 (42.9)	32 (56.1)
Total	134 (100)	700 (100)	145 (100)	14 (100)	57 (100)

Numbers of ARD meetings. Of the 1,050 participants, 38.4% reported that they had attended more than 30 Admission, Review and Dismissal (ARD) meetings, and 34.2% said they had attended 1 to 10 ARD meetings. Of the remaining participants, 16.6% had attended 11 to 20 ARD meetings, and 10.8% had attended 21 to 30 ARD meetings. Regarding the role of IEP team members, the majority of school administrators, special education teachers, diagnosticians, and speech/language pathologists attended more than 30 ARD meetings. For general education teachers, the highest group (43.3%) attended 1 to 10 ARD meetings.

Accessibility to AT resources. In this study, participants' access to AT resources related to students with LD varied. When participants responded to the survey, they were asked to check all the answers that applied to their current experience and situation.

Therefore, it was possible that the respondents provided more than two answers regarding their accessibility to AT resources. For example, a participant might answer that he had taken university/college courses and that he also attended workshops or on-site training. The majority of participants (65%) reported that they had the access to resources to learn about AT in one or more than one resource formats, and some participants (35%) said that they had never had experiences of accessing resources. Attending workshops or on-site training seemed to be the most popular way of learning AT (51.7%). The same result also showed for each role of participants (see Table 4.11). For the 397 participants who never had access to AT resources, the majority (86.15%) said that they were interested (see Table 4.12).

Table 4.10

Participants' Numbers of ARD Meetings by Job Position

	School administrators *N* (%)	General ed. teachers *N* (%)	Special ed. teachers *N* (%)	Diagnosticians *N* (%)	Speech/language pathologists *N* (%)
0	10 (7.5)	39 (5.6)	3 (2)	1 (7.1)	3 (5.3)
1-10	12 (8.9)	303 (43.3)	18 (12.4)	0	7 (12.3)
11-20	4 (3)	137 (19.5)	11 (7.6)	1 (7.1)	12 (21.0)
21-30	9 (6.7)	81 (11.6)	13 (9)	0	4 (7.0)
More than 30	99 (73.9)	140 (20.0)	100 (69)	12 (85.8)	31 (54.4)
Total	134 (100)	700 (100)	145 (100)	14 (100)	57 (100)

Table 4.11

Number of the Role of Participants' Accessibility to AT Resources

	Access AT Resources				
	University/ college courses *n* (%)	Online training *n* (%)	Workshops/ onsite training *n* (%)	Professional conferences *n* (%)	Total *N* (%)
School administrators	31 (23.7)	8 (6.1)	56 (42.7)	36 (27.5)	131 (100)
GED teachers	147 (21.7)	53 (7.8)	360 (53.3)	116 (17.2)	676 (100)
SED teachers	29 (15.4)	27 (14.4)	94(50)	38 (20.2)	188 (100)
Diagnosticians	2 (11.8)	0	9 (52.9)	6 (35.3)	17 (100)
Speech/language pathologists	9 (14.1)	3 (4.7)	37 (57.8)	15 (23.4)	64 (100)
Total	218 (20.3)	91 (8.4)	556 (51.7)	211 (19.6)	1,076(100)

Table 4.12

Number of the Role of Participants Not Accessing to AT Resources

	Never access AT resources		
	Never, but interested *n* (%)	Never, and not interested *n* (%)	Total *N* (%)
School administrators	50 (86.2%)	8 (13.8%)	58 (100%)
GED teachers	240 (84.5%)	44 (15.5%)	284 (100%)
SED teachers	37 (94.9%)	2 (5.1%)	39 (100%)

Diagnosticians	2 (100%)	0	2 (100%)
Speech/language pathologists	13 (92.9%)	1 (7.1%)	14 (100%)
Total	342 (86.15%)	55 (13.85%)	397 (100%)

Survey Item Analysis

As described in chapter 3, several steps were taken to ensure the validity of the survey in this study. First, questionnaire items were adapted from several resources, including the FEAT (1998), the GPAT (1998), and QIAT (2000); as a result, more than 100 items were listed. Second, survey items were sent to 12 QIAT leadership groups and 20 TATN AT professionals for identifying the importance of the survey items for this study.

The reliability of an instrument is important in that it ensures the consistency of the outcome of what the instrument is measuring. The survey contained four sections pertaining to the characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services. Cronbach's alpha was employed to determine the internal consistency reliability of the survey. The overall results yielded alpha coefficients of 0.97 (n = 41, 63 items). For each section, the alpha coefficient was 0.975 (n = 41, 18 items) for items in the characteristics of students with LD in reading and writing, 0.974 (n = 41, 11 items) for AT legislation, 0.963 (n = 41, 18 items) for AT devices, and 0.979 (n = 41, 16 items) for AT services. The reliability of the survey is therefore acceptable based on Nunnally's (1994), Bobko's (2001), and Litwin's (1995) criterion of 0.70 as a minimally acceptable alpha value.

Descriptive Statistics of the Survey

Participants were asked to self-rate and respond to the survey items on a 4-point scale from 1 (*Not Knowledgeable*) to 4 (*Very Knowledgeable*), expressing their level of knowledge for each survey statement. Therefore, the lower the point value assigned to an item by a respondent, the less knowledgeable he or she was about the item. Or, inversely, the higher the point value assigned to an item, the higher the level of his or her knowledge. Thus, 1 point was assigned to "Not Knowledgeable", 2 point was assigned to "Somewhat Knowledgeable", 3 point was assigned to "Knowledgeable", and 4 point was assigned to "Very Knowledgeable." The survey included four sections related to the four research questions. The means, standard deviations, and frequencies of the responses to the individual items were computed; in addition, the possible maximum points and the points that respondents at each role group actually earned were also calculated for each section. By computing the percentage of points earned by respondents in each role group out of the total of possible points, the researcher determined IEP team members' level of knowledge in the survey. The overall results were summarized for each research question and were presented in order from the survey: knowledge about (a) the characteristics of students with LD in reading and writing, (b) AT legislation, (c) AT devices, and (d) AT services. In addition, participants' responses to the open-ended questions are described.

The characteristics of students with LD in reading and writing. IEP team members were asked 17 questions related to the first research question: "What is the level of knowledge of IEP team members (school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists) about the

characteristics of students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing as they pertain to the use of AT in the IEP development?" Nine survey items about reading (items coded as SR1-9) and eight survey items about writing (SW1-8) were included. Of these 17 items, 13 had a mean higher than 3.0 (range: 3.0-3.14) and the remaining four items (item SR4, SR7, SW1, and SW3) had a mean between 2.81 to 2.94 (see Table 4.13). The frequency table also shows that 65.3% to 80% of the respondents considered themselves *knowledgeable* to *very knowledgeable*, with 42.0% to 47% of them being knowledgeable about the characteristics students with LD exhibit on each survey item and another 23.3% to 37.0% being very knowledgeable (see Table 4.14). In addition, less than 7.2% of respondents said that they were not knowledgeable about the characteristics of students with LD on each survey item. The results showed that respondents tended to be knowledgeable or very knowledgeable about most characteristics of students with LD in reading and writing. However, 65.4% of participants showed that they were *somewhat knowledgeable* or knowledgeable about the following characteristics of students: (a) reread lines in oral reading or skip lines, words, letters, and numbers; (b) transpose words or syllables; (c) have poor handwriting; and (d) have difficulty copying.

The percentage of the points earned by respondents in each role group was calculated. Diagnosticians and special education teachers showed 84.66% and 83.14%, respectively, regarding their level of knowledge about the characteristics of students with LD in reading and writing. School administrators, speech/language pathologists, and

general education teachers reported 74.76%, 74.33%, and 74.26%, respectively (see Figure 4.1).

Table 4.13

Means and Standard Deviations of the Items Related to the Characteristics of Students with LD in Reading and Writing

Question item	N	*M*	*SD*
SR1. They struggle with reading words accurately.	1050	3.09	.780
SR2. They struggle with reading speed/fluency.	1050	3.12	.769
SR3. They reread lines in oral reading or skip lines, words, letters, and numbers.	1050	3.00	.835
SR4. They have difficulty in reading signs, notes, forms, want ads, etc.	1050	2.81	.874
SR5. They may substitute, omit, and/or transpose letters, words, syllables, and phrases.	1050	3.06	.793
SR6. They have difficulty in using phonics to sound out words.	1050	3.07	.807
SR7. They transpose words or syllables.	1050	2.94	.831
SR8. They have difficulty in understanding the meaning of individual words.	1050	3.06	.820
SR9. They have poor comprehension of written passages.	1050	3.14	.803
SW1. They have poor handwriting.	1050	2.90	.840
SW2. They write short and simple sentences.	1050	3.05	.794
SW3. They have difficulty copying.	1050	2.93	.841
SW4. They have poor spelling skills.	1050	3.09	.807
SW5. They have problems with grammar, syntax and organization.	1050	3.08	.807
SW6. They have problems with sentence structure.	1050	3.07	.806
SW7. They struggle with editing/proofing well.	1050	3.04	.843
SW8. They struggle with writing well conceptually.	1050	3.02	.840

Table 4.14

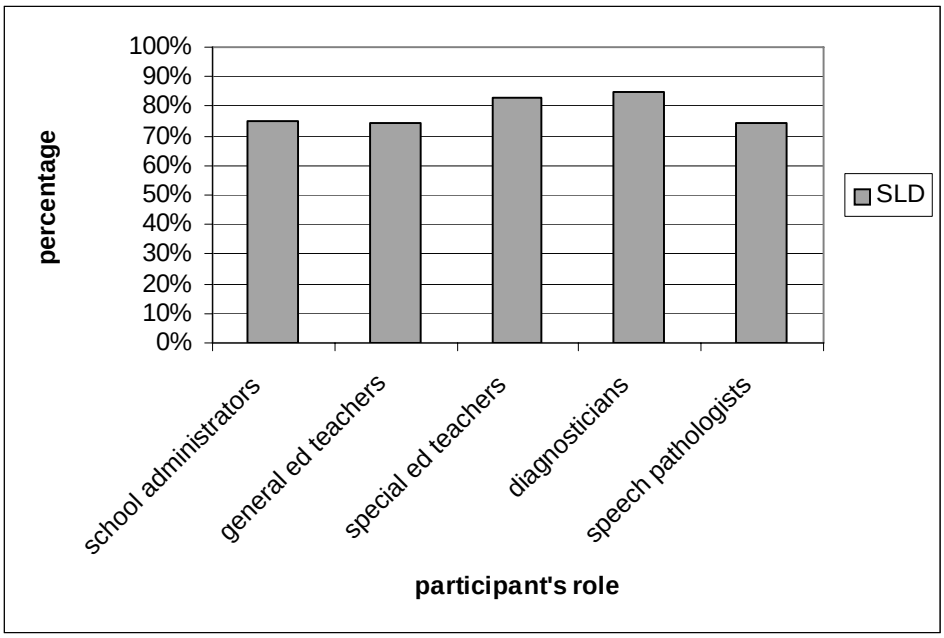
Frequencies and Percentages of the Items Related to the Characteristics of Students with LD in Reading and Writing

Survey item	Not knowledgeable *N* (%)	Somewhat knowledgeable *N* (%)	Knowledgeable *N* (%)	Very knowledgeable *N* (%)
SR1. They struggle with reading words accurately.	24 (2.3)	204 (19.4)	476 (45.3)	346 (33.0)
SR2. They struggle with reading with speed/fluency.	25 (2.4)	179 (17.0)	490 (46.7)	356 (33.9)
SR3. They reread lines in oral reading or skip lines, words, letters, and numbers.	50 (4.8)	217 (20.7)	469 (44.7)	314 (29.9)
SR4. They have difficulty in reading signs, notes, forms, want ads, etc.	76 (7.2)	288 (27.4)	441 (42.0)	245 (23.3)
SR5. They may substitute, omit, and/or transpose letters, words, syllables, and phrases.	33 (3.1)	202 (19.2)	486 (46.3)	329 (31.3)
SR6. They have difficulty in using phonics to sound out words.	35 (3.3)	201 (19.1)	467 (44.5)	347 (33.0)
SR7. They transpose words or syllables.	48 (4.6)	253 (24.1)	465 (44.3)	284 (27.0)
SR8. They have difficulty in understanding the meaning of individual words.	40 (3.8)	201 (19.1)	461 (43.9)	348 (33.1)
SR9. They have poor comprehension of written passages.	32 (3.0)	180 (17.1)	449 (42.8)	389 (37.0)
SW1. They have poor handwriting.	57 (5.4)	257 (24.5)	470 (44.8)	266 (25.3)

SW2. They write short and simple sentences.	36 (3.4)	199 (19.0)	494 (47.0)	321 (30.6)
SW3. They have difficulty copying.	59 (5.6)	233 (22.2)	480 (45.7)	278 (26.5)
SW4. They have poor spelling skills.	37 (3.5)	189 (18.0)	470 (44.8)	354 (33.7)
SW5. They have problems with grammar, syntax and organization.	40 (3.8)	181 (17.2)	479 (45.6)	350 (33.3)
SW6. They have problems with sentence structure.	40 (3.8)	185 (17.6)	483 (46.0)	342 (32.6)
SW7. They struggle with editing/proofing well.	49 (4.7)	205 (19.5)	450 (42.9)	346 (33.0)
SW8. They struggle with writing well conceptually.	50 (4.8)	212 (20.2)	460 (43.8)	328 (31.2)

Figure 4.1

The role of participants' level of knowledge about characteristics of students with LD in reading and writing



AT legislation. There were 11 survey items (items coded as ATL1-11) in this section related to the second research question: "What is the level of knowledge of IEP team members about AT legislation when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing?" The 11 survey items asked whether respondents were knowledgeable about the statement and regulations specifically related to AT in the law. All 11 items had mean scores between 2.11 and 2.71 (see Table 4.15), indicating that respondents ranged from somewhat knowledgeable to knowledgeable about AT legislation when considering AT in IEP development for students with LD. As far as the frequency for items, more than half of the respondents (range= 59.2% – 68.5%) reported that they were somewhat knowledgeable (26.2% – 35% of respondents) or knowledgeable (25% – 40%) about AT legislation, while 8.9% to 21.7% of the respondents said that they were very knowledgeable and 12.2% to 31.9% said that they were not knowledgeable (see Table 4.16). More than 26.2% of respondents who answered "somewhat knowledgeable" and more than 25% of respondents who said "knowledgeable" on every survey item. In items ATL3, 4, 5 and 6, 26% of the respondents reported that they were not knowledgeable about each statement. In addition, 25% of participants were not knowledgeable about the law addressing AT services, including (a) purchasing, leasing, or providing for the acquisition of AT devices; (b) selecting, applying, and repairing or replacing the devices; (c) coordinating and using other therapies, interventions, or services with AT devices; and (d) training or technical assistance for a child with a disability and his or her family members.

The percentage of the points earned by respondents in each role group regarding the level of knowledge on AT legislation was calculated. Diagnosticians and special education teachers ranked as the highest (79.55%) and second highest (73.97%), respectively, on their levels of knowledge. School administrators, speech/language pathologists, and general education teachers showed 69.03%, 68.42%, and 56.19%, respectively, on their levels of knowledge about AT legislation (see Figure 4.2).

Table 4.15

Means and Standard Deviations of the Items Related to AT Legislation

Question items	*N*	*M*	*SD*
ATL1. The Individuals with Disabilities Education Act (IDEA) defines that AT devices and services be considered during the IEP process for all students with disabilities, regardless of type or severity of disability.	1050	2.55	.976
ATL2. AT services include the evaluation of the needs of a child with a disability.	1050	2.53	.937
ATL3. AT services include purchasing, leasing, or providing for the acquisition of assistive technology devices.	1050	2.24	.967
ATL4. AT services include selecting, applying, and repairing or replacing the devices.	1050	2.11	.955
ATL5. AT services include coordinating and using other therapies, interventions, or services with AT devices.	1050	2.22	.956
ATL6. AT services include training or technical assistance for a child with a disability and his or her family members.	1050	2.22	.954
ATL7. AT services include training or technical assistance for professionals who work with a child with disabilities.	1050	2.29	.964

ATL8. The IEP team uses a collaborative decision-making process to consider each child's need for AT devices and services.	1050	2.69	.955
ATL9. The IEP team identifies the student's AT needs based on his or her IEP goals and objectives, access to the curriculum, and progress in the general education curriculum.	1050	2.71	.940
ATL10. The IEP team collects and analyzes data about the student, environments, educational goals, and tasks when considering the need for AT.	1050	2.66	.935
ATL11. AT needs and supporting data are documented in the IEP and are described as measurable and observable outcomes.	1050	2.62	.953

Table 4.16

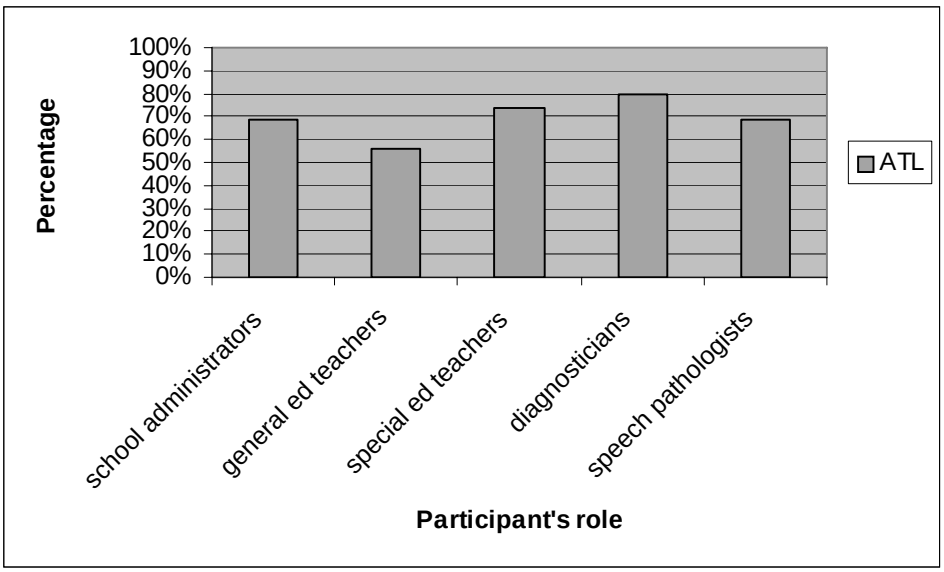
Frequencies and Percentages of the Items Related to AT Legislation

Survey item	Not knowledgeable *N* (%)	Somewhat knowledgeable *N* (%)	Knowledgeable *N* (%)	Very knowledgeable *N* (%)
ATL1.The Individuals with Disabilities Education Act (IDEA) defines that AT devices and services be considered during the IEP process for all students with disabilities, regardless of type or severity of disability.	177 (16.9)	314 (29.9)	366 (34.9)	193 (18.4)
ATL2. AT services include the evaluation of the needs of a child with a disability.	165 (15.7)	326 (31.0)	394 (37.5)	165 (15.7)
ATL3. AT services include purchasing, leasing, or providing for the acquisition of assistive technology devices.	275 (26.2)	368 (35.0)	287 (27.3)	120 (11.4)
ATL4. AT services include selecting, applying,	335 (31.9)	359 (34.2)	263 (25.0)	93 (8.9)

and repairing or replacing the devices.				
ATL5. AT services include coordinating and using other therapies, interventions, or services with AT devices.	279 (26.6)	367 (35.0)	295 (28.1)	109 (10.4)
ATL6. AT services include training or technical assistance for a child with a disability and his or her family members.	283 (27.0)	360 (34.3)	302 (28.8)	105 (10.0)
ATL7. AT services include training or technical assistance for professionals who work with a child with disabilities.	259 (24.7)	351 (33.4)	319 (30.4)	121 (11.5)
ATL8. The IEP team uses a collaborative decision-making process to consider each child's needs for AT devices and services.	138 (13.1)	278 (26.5)	406 (38.7)	228 (21.7)
ATL9. The IEP team identifies the student's AT needs based on his or her IEP goals and objectives, access to the curriculum, and progress in the general education curriculum.	128 (12.2)	275 (26.2)	420 (40.0)	227 (21.6)
ATL10. The IEP team collects and analyzes data about the student, environments, educational goals, and tasks when considering the need for AT.	134 (12.8)	292 (27.8)	416 (39.6)	208 (19.8)
ATL11. AT needs and supporting data are documented in the IEP and are described as measurable and observable outcomes.	152 (14.5)	297 (28.3)	400 (38.1)	201 (19.1)

Figure 4.2

The Role of Participants' Level of Knowledge About AT Legislation



AT devices. In this section, 18 survey items including eight items related to the application of AT devices for reading (coded as ATDR 1-8) and 10 items related to writing (coded as ATDW 1-10) sought the answer to the third research question: "What is the level of knowledge of IEP team members about AT devices when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing?" The 18 items examined whether respondents were knowledgeable about obtaining AT solutions in reading and writing for students with LD to compensate for their learning disabilities. All items had a mean lower than 3.0, and among them, 11 items (items ATDR 1, 2, 3, 6, and 8, and ATDW 1, 2, 3, 4, 6 and 8) had a mean score between 2.09 and 2.78, indicating that respondents ranged from somewhat knowledgeable to knowledgeable about AT device applications (see Table 4.17). The

other items (items ATDR 4, 5, and 7 and ATDW 5, 7, 9, and 10) had a mean lower than 2.0, indicating that respondents ranged from not knowledgeable to somewhat knowledgeable about AT devices. In the frequency of responding to the survey, more than 29% of respondents reported “not knowledgeable” on 13 out of 18 total survey items (items ATDR3, 4, 5, 6, 7, and 8 and ATDW 3, 4, 5, 7, 8, 9, and 10), more than 27% of respondents reported “somewhat knowledgeable” on each survey item, and more than one fourth of respondents said “knowledgeable” on 7 survey items (items ATDR 1, 2, and 6 and ATDW 1, 2, 4, and 6). The range of 3.5% to 24.2% of participants said “very knowledgeable” on the survey questions regarding AT devices (see Table 4.18). The results for IEP team members’ knowledge about AT devices varied. They reported “somewhat knowledgeable” to “knowledgeable” about (a) audio-taped books/books on tape/talking books/tape recorder/player; (b) electronic books/books on disk/books on CD; (c) speaking reading aids; (d) phonic /vocabulary computer software; (e) reading comprehension computer software; (f) pencil grip or other adapted grip, adapted paper; (g) alternative keyboard; (h) portable word processors; (i) spelling and grammar checkers; and (j) outlining/brainstorming/organizing software. Participants reported “not knowledgeable” to “somewhat knowledgeable” about (a) optical character recognition (OCR)/speech synthesis (e.g., Kurzweil 3000, WYNN), (b) speech synthesis/text-to-speech word processors (e.g., Intellitalk, Write Outloud), (c) voice-activated word processors (e.g., Dragon Naturally Speaking), (d) talking word processing software (e.g., Write:Outloud, IntelliTalk II), (e) word prediction software (e.g., Co:writer), (f) speech recognition software (e.g., Dragon Naturally Speaking), and (g) syntax programs (e.g.,

The Sentence Master program). In summary, participants felt that they did not have much knowledge regarding devices or software with synthesis or voice features.

The percentage of the points earned by respondents in each role group was calculated. The five groups seemed to have similar levels of knowledge about AT devices, although diagnosticians and special education teachers had a slightly higher level of knowledge, 65.28% and 62.23%, respectively, as opposed to 58.97% for school administrators, 56.82% for speech/language pathologists, and 50.13% for general education teachers (see Figure 4.3).

Figure 4.3

The Role of Participants' Level of Knowledge About AT Devices

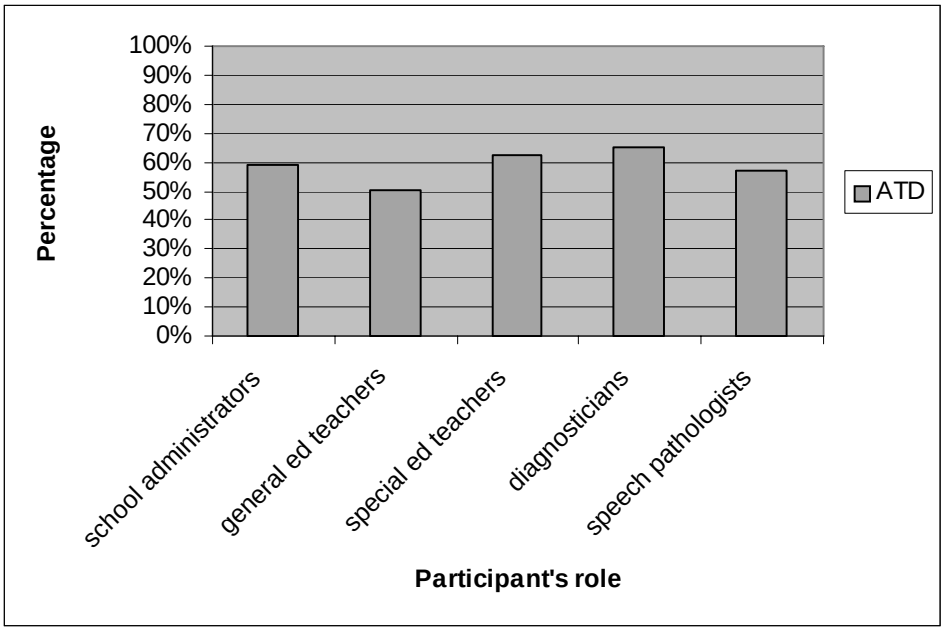


Table 4.17

Means and Standard Deviations of the Items Related to AT devices

Question items	*N*	*M*	*SD*
ATDR1. Audio-taped books/books on tape/talking books/tape recorder/player	1050	2.78	.897
ATDR2. Electronic books/books on disk/books on CD	1050	2.64	.935
ATDR3. Speaking reading aids (e.g., Quicktionary reading pen, Franklin Language Master, Speaking Merriam-Webster Dictionary)	1050	2.16	.962
ATDR4. Optical character recognition (OCR)/speech synthesis (e.g., Kurzweil 3000, WYNN)	1050	1.67	.843
ATDR5. Speech synthesis/text-to-speech word processors (e.g., Intellitalk, Write Outloud)	1050	1.80	.884
ATDR6. Phonic/vocabulary computer software (e.g., Simon Sounds It Out, Lexia Reading SOS)	1050	2.09	.953
ATDR7. Voice-activated word processors (e.g., Dragon Naturally Speaking)	1050	1.77	.870
ATDR8. Reading comprehension computer software (e.g., Start-to-Finish Books, Stories & More Series, Inspiration)	1050	2.08	.959
ATDW1. Pencil grip or other adapted grip	1050	2.70	.982
ATDW2. Adapted paper (bold line, raised line, different spacing, secured to desk, paper stabilizers)	1050	2.54	1.027
ATDW3. Alternative keyboard	1050	2.15	1.023
ATDW4. Portable word processors (e.g. ,Alpha Smart)	1050	2.32	1.082
ATDW5. Talking word processing software (e.g., Write:Outloud, IntelliTalk II)	1050	1.97	.971
ATDW6. Spelling and grammar checkers	1050	2.57	1.025
ATDW7. Word prediction software (e.g., Co:writer)	1050	1.83	.949
ATDW8. Outlining/brainstorming/organizing software (e.g., Inspiration)	1050	2.09	1.011
ATDW9. Speech recognition software (e.g., Dragon Naturally Speaking)	1050	1.73	.864
ATDW10. Syntax programs (e.g., The Sentence Master program)	1050	1.65	.823

Table 4.18

Frequencies and Percentages of the Items Related to AT Devices

Survey item	Not knowledgeable *N* (%)	Somewhat knowledgeable *N* (%)	Knowledgeable *N* (%)	Very knowledgeable *N* (%)
ATDR1. Audio-taped books/books on tape/talking books/tape recorder/player	94 (9)	284 (27)	435 (41.4)	237 (22.6)
ATDR2. Electronic books/books on disk/books on CD	136 (13)	312 (29.7)	401 (38.2)	201 (19.1)
ATDR3. Speaking reading aids (e.g., Quicktionary reading pen, Franklin Language Master, Speaking Merriam-Webster Dictionary)	305 (29)	379 (36.1)	257 (24.5)	109 (10.4)
ATDR4. Optical character recognition (OCR)/speech synthesis (e.g., Kurzweil 3000, WYNN)	566 (53.9)	310 (29.5)	133 (12.7)	41 (3.9)
ATDR5. Speech synthesis/text-to-speech word processors (ex: Intellitalk, Write Outloud)	479 (45.6)	359 (34.2)	155 (14.8)	57 (5.4)
ATDR6. Phonic/vocabulary computer software (e.g., Simon Sounds It Out, Lexia Reading SOS)	346 (33)	352 (33.5)	264 (25.1)	88 (8.4)
ATDR7. Voice-activated word processors (e.g., Dragon Naturally Speaking)	501 (47.7)	340 (32.4)	162 (15.4)	47 (4.5)
ATDR8. Reading comprehension computer software (e.g., Start-to-Finish Books, Stories & More Series, Inspiration)	356 (33.9)	347 (33.0)	258 (24.6)	89 (8.5)

ATDW1. Pencil grip or other adapted grip	141 (13.4)	292 (27.8)	363 (34.6)	254 (24.2)
ATDW2. Adapted paper (bold line, raised line, different spacing, secured to desk, paper stabilizers)	206 (19.6)	289 (27.5)	338 (32.2)	217 (20.7)
ATDW3. Alternative keyboard	352 (33.5)	323 (30.8)	244 (23.2)	131 (12.5)
ATDW4. Portable word processors (e.g. Alpha Smart)	308 (29.3)	287 (27.3)	264 (25.1)	191 (18.2)
ATDW5. Talking word processing software (e.g., Write:Outloud, IntelliTalk II)	425 (40.5)	324 (30.9)	213 (20.3)	88 (8.4)
ATDW6. Spelling and grammar checkers	193 (18.4)	293 (27.9)	334 (31.8)	230 (21.9)
ATDW7. Word prediction software (e.g., Co:writer)	501 (47.7)	303 (28.9)	170 (16.2)	76 (7.2)
ATDW8. Outlining/brainstorming/organizing software (e.g., Inspiration)	379 (36.1)	311 (29.6)	246 (23.4)	114 (10.9)
ATDW9. Speech recognition (e.g., Dragon Naturally Speaking)	522 (49.7)	336 (32.0)	144 (13.7)	48 (4.6)
ATDW10. Syntax programs (e.g., The Sentence Master program)	564 (53.7)	324 (30.9)	125 (11.9)	37 (3.5)

AT services. There were 13 survey items (ATS1-13) related to the fourth research question: "What is the level of knowledge of IEP team members about AT services for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing?" The items asked whether participants were knowledgeable about the AT services provided to students with LD. The services included AT assessment, selection, purchasing, training, and documentation in the IEP. All 13 items had a mean score between 2.11 and 2.49 (see Table 4.19), indicating that respondents ranged from

somewhat knowledgeable to knowledgeable about AT services when designing IEPs for students with LD. In terms of the frequencies and percentages, 30.8% (*n* =323) or greater of respondents reported “somewhat knowledgeable,” 25.4% (*n* =267) or greater of respondents reported “knowledgeable” on every survey item (see Table 4.20), and 25.5% or greater of respondents said “not knowledgeable” on six survey items (item ATS 5, 6, 7, 10, 12, and 13), including (a) “AT assessment procedures are clearly defined and consistently used”; (b) “AT assessment is conducted by a multidisciplinary team involving the student and family”; (c) “AT assessment is conducted in the student’s usual environments within reasonable timelines”; (d) “The IEP includes selecting, adapting, purchasing, leasing, repairing, or replacing AT devices as part of AT services for students with LD”; (e) “The IEP includes training or technical assistance for the student with LD and the family members as part of AT services”; and (f) “The IEP includes training or technical assistance for school educators or professionals who are involved in the IEP development for students with LD as part of AT services.” In addition, 9.2% to 14.7% of participants considered themselves “very knowledgeable” on every survey item. The results showed that the majority of respondents ranged from not knowledgeable to knowledgeable.

Special education teachers revealed the highest percentage, 89.23%, on level of knowledge about AT services, compared with other role groups. Diagnosticians showed 76.79% on their level of knowledge, followed by 62.48% for speech/language pathologists, 62.48% for school administrators, and 54.33% for general education teachers (see Figure 4.4).

In summary, participants tended to rate themselves as very knowledgeable to knowledgeable about the characteristics of students with LD, but they tended to see themselves as knowledgeable to somewhat knowledgeable on AT legislation and AT services. They reported “somewhat knowledgeable” to “not knowledgeable” on the AT device applications.

Table 4.19

Means and Standard Deviations of the Items Related to AT services

Question items	*N*	*M*	*SD*
ATS1. The IEP describes AT as a tool to access the general curriculum by addressing the student’s goals and objectives, his or her needs, AT devices, and services.	1050	2.49	.929
ATS2. The IEP includes procedural guidelines for all services needed to support the selection, acquisition, and use of AT devices.	1050	2.41	.949
ATS3. The needs and uses of AT are written in the IEP to show how it contributes to measurable and observable outcomes.	1050	2.42	.959
ATS4. AT services include evaluation of assistive technology needs of the student with LD.	1050	2.37	.967
ATS5. AT assessment procedures are clearly defined and consistently used.	1050	2.22	.956
ATS6. AT assessment is conducted by a multidisciplinary team involving the student and family.	1050	2.30	.989
ATS7. AT assessment is conducted in the student’s usual environments within reasonable timelines.	1050	2.30	.991
ATS8. AT assessment recommendations are based on data about the student, environments, and tasks.	1050	2.40	.986
ATS9. AT assessment provides the IEP team with recommendation(s) about AT devices and services.	1050	2.38	.993
ATS10. The IEP includes selecting, adapting, purchasing, leasing, repairing, or replacing AT devices as part of AT services for students with LD.	1050	2.11	.970

ATS11. The IEP includes coordination and use of necessary therapies and interventions as part of AT services for students with LD.	1050	2.29	.948
ATS12. The IEP includes training or technical assistance for the student with LD and the family members as part of AT services.	1050	2.20	.961
ATS13. The IEP includes training or technical assistance for educators or professionals who are involved in IEP development for students with LD as part of AT services.	1050	2.22	.965

Table 4.20

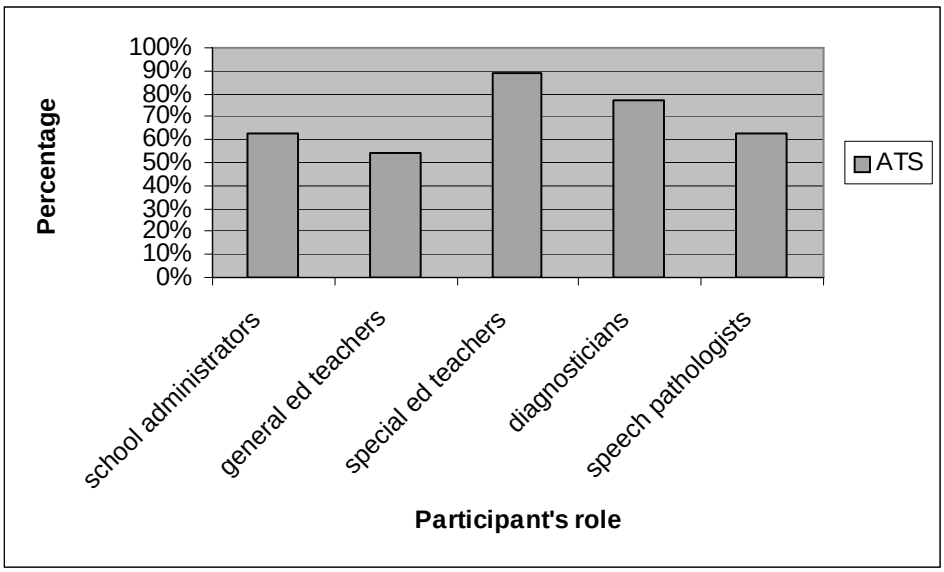
Frequencies and Percentages of the Items Related to AT Services

Survey item	Not knowledgeable *N* (%)	Somewhat knowledgeable *N* (%)	Knowledgeable N (%)	Very knowledgeable *N* (%)
ATS1. The IEP describes AT as a tool to access the general curriculum by addressing the student's goals and objectives, his or her needs, AT devices, and services.	170 (16.2)	342 (32.6)	387 (36.9)	151 (14.4)
ATS2. The IEP includes procedural guidelines for all services needed to support the selection, acquisition, and use of AT devices.	204 (19.4)	353 (33.6)	352 (33.5)	141 (13.4)
ATS3. The needs and uses of AT are written in the IEP to show how it contributes to measurable and observable outcomes.	206 (19.6)	343 (32.7)	353 (33.6)	148 (14.1)
ATS4. AT services include evaluation of assistive technology needs of the student with LD.	231 (22.0)	337 (32.1)	345 (32.9)	137 (13)
ATS5. AT assessment procedures are clearly defined and consistently used.	285 (27.1)	355 (33.8)	305 (29)	105 (10)

ATS6. AT assessment is conducted by a multidisciplinary team involving the student and family.	268 (25.5)	333 (31.7)	314 (29.9)	135 (12.9)
ATS7. AT assessment is conducted in the student's usual environments within reasonable timelines.	270 (25.7)	326 (31.0)	320 (30.5)	134 (12.8)
ATS8. AT assessment recommendations are based on data about the student, environments, and tasks.	231 (22.0)	323 (30.8)	343 (32.7)	153 (14.6)
ATS9. AT assessment provides the IEP team with recommendation(s) about AT devices and services.	239 (22.8)	323 (30.8)	334 (31.8)	154 (14.7)
ATS10. The IEP includes selecting, adapting, purchasing, leasing, repairing, or replacing AT devices as part of AT services for students with LD.	345 (32.9)	341 (32.5)	267 (25.4)	97 (9.2)
ATS11. The IEP includes coordination and use of necessary therapies and interventions as part of AT services for students with LD.	249 (23.7)	359 (34.2)	328 (31.2)	114 (10.9)
ATS12. The IEP includes training or technical assistance for the student with LD and the family members as part of AT services.	295 (28.1)	357 (34.0)	292 (27.8)	106 (10.1)
ATS13. The IEP includes training or technical assistance for educators or professionals who are involved in the IEP development for students with LD as part of AT services.	286 (27.2)	353 (33.6)	300 (28.6)	111 (10.6)

Figure 4.4

The Role of Participants' Level of Knowledge about AT Services



Participants' responses to the open-ended questions. In addition to the survey items, an open-ended question was used to solicit participants' comments as supplemental information to this study. As a result, 44 respondents, including 6 school administrators, 25 general education teachers, and 13 special education teachers, answered the open-ended question. The responses that were close in meaning were compiled by the researcher into significant topics, such as training issues, AT issues, financial concerns, and insufficient use of technology. Other concerns, such as the requirements of the law and collaboration between teachers, staff, and TAs, were also addressed.

Training was the topic most often addressed by respondents who answered the open-ended question. The total of 13 responses commented that educators have

insufficient or inadequate training regarding students with LD and AT in the IEP. They reported that they would like to have more training to better serve their students with LD. Examples of the comments are listed below by each role in the IEP team.

A school administrator said:

> "As administrators, we carry a big responsibility in planning for the many needs of our students. Special Ed. training at the district level should be broken down into different components (speech referrals, autism, dyslexia, etc) to better prepare us for ARDs and to check IEPs of our students. When we have 1, spell out "one" big meeting as Special Ed training for Administrators, everything is thrown in, becomes overwhelming, and everyone just wants to run out of the session. Make the sessions short, comprehensible and allow for questions, mock ARD sessions. If you're gonna do training, do it right."

General education teachers said:

> "A student in my room just started using such a device. It is very difficult for her to use and I am not able to help her at all because I have not had any training. It is very frustrating for the student and myself!!!"
>
> "There are not enough staff developments on LD students and how general education teacher may better assist them."
>
> "This was my first year as a teacher and I had a student with disabilities I really had no idea of what to do with him. We should have some training."
>
> "Teachers should be trained to recognize learning disabilities and intervene! In my school of almost 1,000 students (Pre-K through 6), we have 2 students diagnosed with dyslexia. Get real!!!!! Students fail the TAKS test or do badly on norm-referenced standardized tests and people wonder why! Again, teachers should be trained on LD and REQUIRED to help these children. Never getting around to doing the SST paperwork for the committee to BEGIN considering problems is NOT acceptable!!! This is my 5th year in education (I came from the business world after building a successful corporation) and I am astounded at the lack of competency I find among people who supposedly have the interest of the child at heart! We need more!!! Good luck with your project."
>
> "I have just enough knowledge of AT devices to get myself in trouble! I have had several children in special ed in my regular ed classroom but no AT devices have been offered even though I have thought there must be something out there that

> could help! My district doesn't train regular ed teachers enough in this area to be successful as a teacher in helping students."
>
> "AT procedures and regulations are written up very well in the IEPs for students with LDs. I believe that the AT team should spend a lot of time assessing and determining the level of assistance needed by individuals. In saying that, there are more times than not, that the staff initiating these procedures and teaching the student, do not always get the proper training (on the particular AT needs of that student) or information needed to ensure that the student's needs are met in the appropriate fashion."

Special education teachers said:

> "Several of the questions required an expertise in areas that I'm not acquainted with. I would like more training in the use of equipment that is/might be available to assist students to be successful."
>
> "IEP is usually done by Special Ed teachers; however, it's never explained and carried out for the student benefit with the General teacher. Basically Gen teachers are left with the load of the IEP to be applied without having the adequate training and at least 50% of support and work load shared from the Spec Ed teacher. Besides this, we haven't been trained in special ed education for techniques, ways of learning styles, resources, aides etc that may help [these] students."
>
> "I wish Texas would move forward in the dissemination of general low-tech AT information for classroom teachers to practice. I believe we seem to moving away from practical applications that could be implemented before moving to hi-tech AT devices. Possibly from lack of either teacher training program classes or professional caps classes training availability."

The fact that AT devices and services were not provided to their students with LD was the participants' second biggest concern, with 9 responses reported in this survey. Responses revealed that AT device and service needs often went undocumented in students' IEPs, thus resulting that AT devices and services were not successfully

provided to students with LD who may benefit from using AT. The followings are some comments from school administrators and teachers.

A school administrator said:

> "In my experience as a [school district A] administrator working with AT services I honestly have not seen these services provided for many, if any, LD students. In most cases it was not offered because the teacher did not seem to think it was needed. It also seems to have gotten harder over the years for students to qualify for these types of services. I feel the district has made it more difficult to qualify for some services, like AT, due to budget constraints. We also see more 'consults' these days and the burden is being put on the classroom teacher to do some of the tasks previously done by a specialist."

General education teachers said:

> "From this survey, it seem like AT is a readily available component of an IEP. We always check 'no' in all the ARDS I've ever attended!"
>
> "I wish there were more AT devices for bilingual children in Texas (Spanish and English). Most of our IEP teams are unable to complete their needs due to a language barrier. The children stay with an unfilled IEP because there are NO resources available. Good Study!"
>
> "It's interesting how much focus your survey places on AT devices and yet I fail to see the implementation of these devices. I have only used AT devices for the visually impaired and not the LD students. This has been an eye-opener for myself."
>
> "I have seen the AT section on the IEP forms, but teachers are steered away from requesting them - that AT is just for severely handicapped students. The only exception would be hearing aids for deaf ed. students."
>
> "I have had several children in special ed in my regular ed classroom but no AT devices have been offered even though I have thought there must be something out there that could help! My district doesn't train regular ed teachers enough in this area to be successful as a teacher in helping students."
>
> "I do, however, feel AT is not emphasized on my campus. I do feel many students with LD on my campus could benefit from increased use of AT."

Special education teachers said:

> "I have been fortunate enough to be exposed to AT in both grant-based inservices (AT-STAR) and an excellent course in my Master's program that I believe make me uncommonly aware of perhaps its very existance. I find in our district that

> almost all IEPs have ‘none needed’ checked routinely in the multiple areas where AT is addressed in the paperwork --- based on the initial eval. where our diags have indicated that AT would not be a necessary service of benefit to the child. That covers us all legally. What more could anyone ask for? Please do not use my name if you use my comments. I make enough of my own waves sometimes as it is.”
>
> “As a teacher and parent of a child with LD, no services like those described were offered to me or my child.”
>
> “I have observed that in different institutions (rehab, school), people value AT differently. I also have observed that AT is not used when it is needed. This appears to be a result of limited knowledge of AT devices or the caseload is too large and the person does not have the time to find the appropriate device.”

A total of five responses reported that they were not informed about AT by their school district, thus they did not know about AT availability for their students with LD. Respondents said that they wished to know more about students with LD and AT so that they could help their students to learn better. Several comments follow.

General education teachers said:

> “I don't actually write up the IEP's, am not in charge of the technical upkeep of the devices, and don't know much about all the various AT devices available.”
>
> “I felt very uninformed about the last 4 or so pages of the survey. I feel that I don't know enough about LD to really get my students what they need. I'm not sure if our Sp. Ed. folks know these things either. Teachers who want to know more really have to seek it out.”
>
> “I have been informed that AT is only for HI/VI or Physically Disabled students. This is an eye opening survey. I wish I could get more information regarding these AT services we can provide for our students with LD. I would be glad to know more information about this.”

Special education teachers said:

> “School District A has provided me with zero information about assistive technology for children with learning disabilities. I have never seen it addressed even as a formality. I have never met or heard of an assistive technology coordinator/assessor....I feel that School District A has dropped the ball completely on assistive technology. I know I could use the writing program that helps students spell as they go by giving them a word bank... I come from Boise,

Idaho, where we were much more informed and had the paperwork and teamwork to address AT needs. If I had a question, I at least knew who to call for assistance in meeting my students' needs. I would not have been able to answer any of your questions with any knowledge without my experience there and my education. Shame on School District A."

"It's been a number of years since I've been directly involved with decision making with LD students. Looking at this survey, things have really changed and info hasn't been shared with everyone in this period of time."

Financial concerns in the school district were commented on five times. The results indicate that AT devices and services were not considered or provided to students with disabilities due to funding issues in the school districts. Some comments:

School administrators said:

"In my experience as an [School District A] administrator working with AT services…… I feel the district has made it more difficult to qualify for some services, like AT, due to budget constraints. We also see more consults these days and the burden is being put on the classroom teacher to do some of the tasks previously done by a specialist."

"Good luck in your studies. I was part of the assistive technology team a few years ago on my campus. Unfortunately we were told not to recommend devices not currently on campus due to the financial responsibilities associated."

A general education teacher said:

"It would be great if all public schools had more access and training with the range of AT tools listed without regard to economic considerations for purchase and training. I'm sure the survey will reveal interesting data"

A special education teacher said:

"Most special education teachers do not have enough knowledge of what AT options there are for students. I think that most districts do not want teachers in school to know what is available for students, because then the district would have to purchase the items."

A total of five responses revealed that many school educators had limited knowledge and experience regarding the use of technology to support students with disabilities in the classroom. Participants were familiar with basic word processing

programs, but did not know not very much about other types of AT. Several comments follow:

General education teacher said:

> "Thank you for working on a topic that needs great attention. We as teachers have such limited knowledge sometimes due to the inefficient use of technology."

> "One AT device I have seen used is laptop computers to make writing and note taking legible."

> "I believe that it would be a burden to regular classroom teachers to require them to be able to use all of the available assistive technologies with children who need them. I believe this should be done with the special needs teacher."

A special education teacher said:

> "Most of the students we have worked with have required no more than computer/word processing in terms of AT--as far as we know. Perhaps we have needed more, but did not receive assistance."

Other comments were also presented here. One respondent was concerned that his participation in an ARD meeting was just to meet the requirements of the law. The general education teaches said:

> "As a Gen. Ed. teacher, I am usually just sitting in the ARD to meet the requirements of the law. Most of the decisions have already been made before the ARD even starts."

Another response showed concern about collaboration between staff. A general education teacher suggested:

> "It would be nice to let the TA and other staff know about the needs of children with learning disabilities so when we work with them we can help them reach their goal."

One response suggested that the school district should provide better services to serve students with LD:

> "When you have the results of your survey, discuss with [School District B] how to address Special Education Services better and with the appropriate resources for those children with LD."

Summarizing participants' responses to the open-ended question, it is clear that participants were concerned about (a) the insufficient professional training provided to IEP team members, (b) AT devices and services not being provided to their students with LD, (c) lack of AT information from their school districts, (d) budget situations in the school districts, and (e) unfamiliarity with technology by IEP team members.

Differences in Levels of Knowledge Among Role Groups in AT Consideration

This section discusses the differences in levels of knowledge among the role groups in the IEP team regarding AT consideration for students with LD. Hypotheses related to the differences are listed, followed by MANOVA results that test the hypotheses.

Hypotheses. There are four hypotheses in this study.

1. There are differences among IEP team members (school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists) in their levels of knowledge about the characteristics of students in Grades 3 to 5 who have learning disabilities in reading and/or writing as they pertain to the use of AT in IEP development.

2. There are differences among IEP team members in their levels of knowledge about AT legislation when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing.

3. There are differences among IEP team members in their levels of knowledge about AT devices when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing.

4. There are differences among IEP team members in their levels of knowledge about AT services when developing IEPs for students in Grades 3 to 5 who have been identified as having learning disabilities in reading and/or writing.

MANOVA Results. The characteristics of students with LD, AT legislation, AT devices, and AT services served as dependent variables in this study. The survey items asking participants' level of knowledge on each specific topic were categorized into four sections and the scores were summed. These composite scores (i.e., scores of the items) were used for the multivariate analysis. To be specific, the raw score of the four composite variables (named SLD, ATL, ATD, and ATS) served as dependent variables, whereas IEP team members' roles served as independent variables.

The effect of "job position" on the participants' level of knowledge regarding AT in the IEP development was examined. Participants were asked to identify their role (school administrator, general education teacher, special education teacher, AT specialist, diagnostician, occupational therapist, or speech/language pathologist). Due to the small number of AT specialists (4) and occupational therapists (3), which were not sufficient for statistical analysis, these two categories were dropped for further analysis. As shown

in Table 4.21, the results of the MANOVA indicated a significant effect for participants' job position. The four multivariate tests all indicated a significant effect of job position at $p < .001$. As indicated in Table 4.22, job position had a significant effect on each composite variable, that is, SLD, ATL, ATD, and ATS.

Since there were five role groups, it was necessary to conduct post hoc comparisons to compare inter-group differences with respect to the group effect on IEP team members' level of knowledge. Therefore, Tukey's HSD was employed to perform post hoc testing and multiple comparisons of the five role groups as the independent variable. Table 4.23 displays the results of the multiple comparisons.

Regarding each role group's knowledge about the characteristics of students with LD, there were significant differences between special education teachers and any other groups which did not differ from one another. Special education teachers were higher in all cases. The results seem to be reasonable that special education teachers showed the differences on the level of knowledge regarding the characteristics of students with LD.

In terms of AT legislation, there were significant differences between school administrators and general education teachers, and also between school administrators and special education teachers. School administrators had higher levels of knowledge than general education teachers, but lower levels than special education teachers. This may due to school administrators' having different backgrounds and perspectives on legislation from teachers. Furthermore, general education teachers were significantly lower on the level of knowledge than any groups. The results seemed reasonable because participants in the group of special education teachers, diagnosticians and

speech/language pathologists obtain different professional backgrounds in education than those in general education teachers.

Considering AT devices and AT services, significant differences of the levels of knowledge existed between general education teachers and school administrators, special education teachers, diagnosticians, and speech/language pathologists. General education teachers were lower in those levels than any other groups. These results might be expected because special education teachers may have more opportunities than general education teachers to be exposed to students who need assistive technology to support their learning. The same situation applies to diagnosticians and speech/language pathologists because they typically work with students with disabilities.

In summary, special education teachers were significantly higher in their levels of knowledge regarding the characteristics of students with LD than school administrators, general education teachers, and speech/language pathologists. Significant differences in the level of knowledge regarding AT legislation, AT devices, and AT services also existed between general education teachers and school administrators, special education teachers, diagnosticians, and speech/language pathologists.

Table 4.21
Multivariate Tests of Job Position

Effect		Value	*F*	Hypothesis *df*	Error *df*	Sig.
Intercept	Pillai's Trace	.841	1379.947	4.000	1042.000	.000
	Wilks' Lambda	.159	1379.947	4.000	1042.000	.000
	Hotelling's Trace	5.297	1379.947	4.000	1042.000	.000
	Roy's Largest Root	5.297	1379.947	4.000	1042.000	.000
jobposition	Pillai's Trace	.143	9.720	16.000	4180.000	.000
	Wilks' Lambda	.859	10.150	16.000	3184.000	.000
	Hotelling's Trace	.161	10.486	16.000	4162.000	.000
	Roy's Largest Root	.142	36.976	4.000	1045.000	.000

Table 4.22
Tests of Between-Subjects Effects of Job Position

Source	Dependent variable	Type III sum of squares	*df*	Mean square	*F*	Sig.
Corrected model	S-sum	5,010.650(b)	4	1,252.663	8.615	.000
	ATL-sum	10,320.342(c)	4	2,580.086	33.990	.000
	ATD-sum	13,258.062(d)	4	3,314.515	20.454	.000
	ATS-sum	8,407.372(e)	4	2,101.843	17.576	.000
Intercept	S-sum	675,338.745	1	675,338.745	4,644.451	.000
	ATL-sum	220,116.526	1	220,116.526	2,899.772	.000
	ATD-sum	426,062.958	1	426,062.958	2,629.270	.000
	ATS-sum	270,323.299	1	270,323.299	2,260.540	.000
Job position	S-sum	5,010.650	4	1,252.663	8.615	.000
	ATL-sum	10,320.342	4	2,580.086	33.990	.000
	ATD-sum	13,258.062	4	3,314.515	20.454	.000
	ATS-sum	8,407.372	4	2,101.843	17.576	.000
Error	S-sum	151,950.993	1,045	145.408		
	ATL-sum	79,324.097	1,045	75.908		
	ATD-sum	169,338.163	1,045	162.046		
	ATS-sum	124,964.782	1,045	119.584		
Total	S-sum	2938,735.000	1,050			
	ATL-sum	846,103.000	1,050			
	ATD-sum	1740,268.000	1,050			
	ATS-sum	1086,369.000	1,050			
Corrected total	S-sum	156,961.643	1,049			
	ATL-sum	89,644.439	1,049			
	ATD-sum	182,596.225	1,049			
	ATS-sum	133,372.153	1,049			

Note. $p = .05$. $R^2 = .032$ (Adjusted $R^2 = .028$)

Table 4.23
Tukey's Post hoc Testing of Job Position

Dependent variable	(I) job position	(J) job position	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
	1	2	.34	1.137	.998	-2.77	3.45
		3	-5.70(*)	1.445	.001	-9.65	-1.75
		5	-6.74	3.387	.272	-15.99	2.52
		7	.29	1.907	1.000	-4.92	5.50
	2	3	-6.04(*)	1.100	.000	-9.05	-3.03
		5	-7.07	3.255	.191	-15.97	1.82
		7	-.05	1.661	1.000	-4.59	4.49
	3	5	-1.03	3.375	.998	-10.26	8.19
		7	5.99(*)	1.885	.013	.84	11.15
	5	7	7.03	3.597	.290	-2.80	16.86
	1	2	4.75(*)	.822	.000	2.51	7.00
		3	-3.07(*)	1.044	.028	-5.92	-.21
		5	-5.52	2.447	.160	-12.21	1.16
		7	-.63	1.378	.991	-4.39	3.14
	2	3	-7.82(*)	.795	.000	-9.99	-5.65
		5	-10.27(*)	2.352	.000	-16.70	-3.85
		7	-5.38(*)	1.200	.000	-8.66	-2.10
	3	5	-2.46	2.438	.852	-9.12	4.21
		7	2.44	1.362	.379	-1.28	6.16
	5	7	4.89	2.599	.327	-2.21	12.00
	1	2	6.36(*)	1.200	.000	3.08	9.64
		3	-2.35	1.525	.535	-6.52	1.82
		5	-4.54	3.575	.709	-14.31	5.23
		7	1.54	2.013	.940	-3.96	7.04
	2	3	-8.71(*)	1.161	.000	-11.89	-5.54
		5	-10.91(*)	3.436	.013	-20.29	-1.52
		7	-4.82(*)	1.753	.048	-9.61	-.03
	3	5	-2.19	3.563	.973	-11.93	7.54
		7	3.89	1.990	.288	-1.54	9.33
	5	7	6.09	3.797	.496	-4.29	16.46
	1	2	4.34(*)	1.031	.000	1.52	7.15
		3	-2.43	1.310	.342	-6.01	1.15
		5	-7.34	3.071	.119	-15.73	1.05
		7	.10	1.729	1.000	-4.63	4.82
	2	3	-6.77(*)	.998	.000	-9.49	-4.04
		5	-11.68(*)	2.952	.001	-19.74	-3.61
		7	-4.24(*)	1.506	.040	-8.35	-.12
	3	5	-4.91	3.060	.495	-13.27	3.45
		7	2.53	1.710	.576	-2.14	7.20
	5	7	7.44	3.262	.152	-1.48	16.35

*$p < .05$.

CHAPTER 5

DISCUSSION

The 2004 amendments to IDEA require IEP teams to consider AT for students with disabilities during the IEP development process to provide a free and appropriate public education (FAPE) and to assist students with disabilities in accessing the general education curriculum. IEP team members may have different perspectives on AT consideration, yet they are expected to be knowledgeable about whether AT is necessary for students with disabilities. Limited research has been conducted that focuses on understanding this critical aspect of knowledge about AT and student characteristics. Little research, in particular, has been undertaken regarding IEP teams' consideration of AT for students with LD in reading and writing. The purpose of this study was to examine IEP team members' perceived levels of knowledge, and the differences in their knowledge about the characteristics of students with LD, AT legislation, AT devices, and AT services in considering assistive technology in the IEP development for third-grade to fifth-grade students who have been identified as having learning disabilities in reading and/or writing. As found in this study, IEP team members' knowledge ranged from knowledgeable to very knowledgeable about the characteristics of students with LD, somewhat knowledgeable to knowledgeable about AT legislation and AT services, and not knowledgeable to somewhat knowledgeable about AT devices.

According to TAM's assistive technology competency requirements, educators are expected to have essential knowledge and skills in (a) learning about the legal foundations, including legislation and regulations, related to technology and implications

for special education; (b) the characteristics of exceptional learners, because those influence decision making regarding technology use; (c) computer software and other technology materials; and (d) conveying professionalism (Lahm & Nickels, 1999). The findings of this study suggest that IEP team members generally felt that they were knowledgeable to very knowledgeable about the characteristics of students with LD, and somewhat knowledgeable to knowledge about AT legislation, AT devices, and AT services. Similar research has indicated that members of IEP teams are often unprepared to implement AT effectively, and school districts are often unprepared to provide AT support to IEP teams (Bowser & Reed, 1995; Chamber, 1997; Hartsell, 1998; Huntinger, Johnson, & Stineburner, 1996; Todis & Walker, 1993; Zabala, 1995). When educators lack knowledge and skills, they have more difficulty meeting the AT needs specified in IDEA (Lahm, 2003).

Differences in levels of knowledge regarding the characteristics of students with LD, AT legislation, AT devices, and AT services existed within job positions in terms of school administrators, general education teachers, special education teachers, diagnosticians, and speech/language pathologists. School administrators are frequently found lacking in sufficient knowledge for participating in IEP meetings (Judge, 2002; Parrett & Hourcade, 1997; Parette & McMahan, 2002). Compared with other role groups, special education teachers and diagnosticians perceived themselves to have more knowledge about the characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services.

It is not surprising that the results of the study indicated that the perceived knowledge of the IEP team members ranged from not knowledgeable to somewhat knowledgeable regarding optical character recognition (OCR) technology and AT devices with speech synthesis. However, many studies have demonstrated that students with learning disabilities who have no problem with hearing and listening comprehension may benefit from technologies with OCR (Higgins & Raskind, 1997; Higgins & Raskind, 1997; Raskind, 1993), and technologies with speech synthesis (Higgins & Raskind, 2005; Lange, McPhillips, Mulhem, & Wylie, 2006; MacArthur, 1998; MacArthur, 1999; Raskind & Higgins, 1995). IEP team members might not have been familiar with these technologies and thus might not have suggested their use to their students.

Implications

The results of the survey indicate that, although a variety of formats for accessing AT resources and training are available (university/college courses, online training curriculum, workshop/on-site training, and professional conferences), 37.8% (n = 397) of the respondents reported that they never had used them. Responses to the open-ended question also showed that respondents were most concerned about insufficient or inadequate training. Overall, the results of the study suggested that more adequate training is needed for IEP members in terms of understanding their students with LD and the legislation, devices, and services that address their needs. Training needs to be adequate in terms of time and content related to the job responsibilities for the IEP team member. Other factors also need to be considered, such as training format, content of training session, ease of accessibility, length of time, convenience, and personal variables

of the target population (Narita, 1995; Smith, 1990). Training can be provided in pre-service teacher training programs as well as in-service teacher training. For example, legal information about assistive technology, the availability of assistive technology devices and services, the assessment of assistive technology, understanding how assistive technology can be implemented to compensate for the difficulties that students might have in the classroom, and good teaching techniques are expected to be provided in preservice teacher training curricula. For in-service teachers, besides the above information, more practical information, such as how the school district system works in providing assistive technology supports to educators, how and where to find assistive technology devices and services to help students with disabilities in the classroom, and where to find updated information about assistive technology, must be available. Training with different content emphases needs to be provided. School administrators are expected to be knowledgeable about legal aspects, whereas teachers need to know their students' learning characteristics and about using assistive technology to help their special learners.

Several implications of the study concern the school system. School funding, both for training in its use and for the technology itself, directly affects the use of technology in the schools. Indeed, responses to the open-ended question indicated that lack of teacher training and lack of the use of assistive technology for students were due to limited budgets, in many cases. For example, one general educator said,

> "It would be great if all public schools had more access and training with the range of AT tools listed without regard to economic considerations for purchase and training. I'm sure the survey will reveal interesting data"

A school administrator said,

> "[…] I was part of the assistive technology team a few years ago on my campus. Unfortunately we were told not to recommend devices not currently on campus due to the financial responsibilities associated."

A special education teacher said,

> "Most special education teachers do not have enough knowledge of what AT options there are for students. I think that most districts do not want teachers in school to know what is available for students, because then the district would have to purchase the items."

However, simply expanding budgets for teacher training or purchasing assistive technology cannot guarantee consideration of the use of assistive technology (Derer, Polsgrove, & Rieth, 1996). The school district could utilize existing resources, such as having professionals in the school district or experts in regional education centers share their knowledge with teachers. Another way of using the existing resources is to have each IEP team member work with other educators or professionals with expertise from other IEP teams in small groups, and bring the knowledge back to the team. In this way, feelings of nonsupport would be reduced.

Limitations of the Study

While there is no perfect study, several limitations are found in this study. First of all, because the self-rate survey employed in this study required the participants to reflect retrospectively on their knowledge regarding characteristics of students with LD, AT legislation, AT devices, and AT services, IEP team members' responses to the questionnaire items were subjective and might not entirely reflect their actual knowledge. Second, as noted by Nesi (2000), the researcher and the respondent do not necessarily share the same terms of reference. This was possible in the present study. For example,

although detailed response guides and explanations were provided in the survey at the beginning of the questionnaire, there is no guarantee that each respondent read these explanations or understood them exactly as intended by the researcher. Third, because an online survey was employed, participants' actual access to the use of computer and Internet for participants is unclear. It is possible that people who were sampled were not representative of the whole team, due to the inability by some to access computers and, thus, the Internet. In addition, there was no guarantee that the survey respondent was the person who was sampled, thus influencing the data.

Recommendations for Future Research

This study was exploratory in nature and was sampled in three school districts in a southwestern state. It is necessary to replicate the present investigation with a different IEP team body to compare results regarding their levels of knowledge on the characteristics of students with LD, AT legislation, AT devices, and AT services, as well as the differences among the roles of IEP team members in the above four areas. Also, this study focused on the IEP team's level of knowledge regarding AT considerations for students with LD; investigations into AT for students with different disability groups would be a worthwhile effort.

In addition, more investigation is necessary to understand how IEP team members consider AT for the student with disabilities, the factors that may influence their decision making, and whether IEP team members follow legislation and regulations when considering appropriate AT devices and AT services for the students with LD in the process of making decisions in the IEP. Further research also needs to investigate

professional development for IEP team members. For example, it would be interesting to investigate what training they have, where they can receive more training, what content in the training is desired, and follow-up after training.

Conclusions

This study examined the levels of perceived knowledge of IEP team members about characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services when developing IEPs for third- through fifth-grade students with LD in reading and writing, and whether there were differences among IEP team members, in terms of their roles, in the levels of their knowledge in the above four areas. Although, overall, the IEP team members demonstrated knowledge about the characteristics of students with LD in reading and writing, AT legislation, AT devices, and AT services, they were not 100% knowledgeable about each topic. The study results also demonstrated the statistically significant differences in the level of perceived knowledge about the above four topics among school administrators, general education teachers, special education teachers, diagnostician, and speech/language pathologists. Training for IEP team members is critical in terms of quality and quantity. As IEP team members become more knowledgeable about the characteristics of their students with LD, AT legislation, AT devices, and AT services, they will be more capable of considering appropriate assistive technology and making decisions on the use of assistive technology when developing IEPs to support students with LD in their academic learning.

Appendix A

Survey of AT Consideration in the Development of IEPs for Students with LD

Dear Colleagues,

You are being invited to participate in a research study about assistive technology (AT). The purpose of my dissertation study is to assess the level of IEP team members' knowledge concerning students' reading and writing characteristics, legislation regarding assistive technology, assistive technology devices, and assistive technology services for 3rd to 5th grade students with learning disabilities (LD) in reading and writing. The results of this study will be provided to school districts for considering whether IEP team members have essential knowledge about AT and whether more training is needed when considering the need for AT. The findings will also inform higher education, regional education centers, and AT training units about potential AT training needs. To ensure confidentiality, no participant names will be used in subsequent reports.

There are two parts in this survey. The first part contains demographic information, and the second part consists of four sections regarding students with LD in reading and writing, AT legislation, AT devices, and AT services. Please rate each survey item using the relevant rating scale. The survey will take you approximately 15 minutes to complete. Your participation is very important, and I thank you for your kind consideration. I appreciate your time, kindness, and support for helping me to complete this study.

If you have any questions, please do not hesitate to contact me. My email address: hko@teachnet.edb.utexas.edu

Hui-Ching Ko
Ph.D. Candidate
Department of Special Education
The University of Texas at Austin

Part A: Personal Information. Please complete the information about yourself.

1. What is your job position?

   ❑ School administrator ❑ General education teacher

   ❑ Special education teacher ❑ AT specialist ❑ Diagnostician

   ❑ Occupational therapist ❑ Speech/language pathologist

   ❑ paraprofessional ❑ other, please specify: _____

2. What is your gender?

   ❑ Male ❑Female

3. What is your age?

   ❑ Less than 30 years old ❑30-40 ❑41-50 ❑51-60

   ❑ More than 60 years old

4. What is the highest degree that you earned?

   ❑ Bachelors ❑ Masters ❑Doctorate ❑ other (please specify: _____)

5. What is your ethnic background?

   ❑ African American ❑ European American ❑ Hispanic American

   ❑ Native American/Indian ❑ Pacific Islander/Asian American

6. How many years have you been working with students overall?

   ❑ less than 1 year ❑ 1-3 years ❑ 4-6 years ❑ 7-9 years ❑ more than 9 years

7. Of those years, how many involve working with students who have learning disabilities?

   ❑ less than 1 year ❑ 1-3 years ❑ 4-6 years ❑ 7-9 years ❑ more than 9 years

8. How many students' ARD meetings related to LD have you participated in or attended?

   ❑ 0 ❑ 1-10 ❑ 11-20 ❑ 21-30 ❑ more than 30

9. Have you accessed any AT resources related to LD? (Check all that apply)

   ❑ Yes, I have taken university/college courses

   ❑ Yes, I have participated in on-line training curriculum.

   ❑ Yes, I have been to workshops or on-site training.

   ❑ Yes, I have participated in professional conferences

   ❑ No, I never have, but I am interested.

   ❑ No, I am not interested at all.

   ❑ Other (please specify: _____)

Part B: Students with LD, AT legislation, AT Devices and AT Services

Directions: This part contains four sections asking about your knowledge concerning different topics: students with learning disabilities in reading and writing, AT legislation, AT devices, and AT services. Please rate your level of knowledge as it pertains to each topic in the following sections.

Use the 1 to 4 scale.

1: Not knowledgeable—I know nothing about this, and I would rely on others in an IEP meeting.

2: Somewhat knowledgeable—I know something about this, but I would rely on others in an IEP meeting.

3: Knowledgeable— I know about this and could contribute to a discussion, but I would rely on others for expertise.

4: Very knowledgeable—I have considerable knowledge about this and can contribute significantly to any discussion.

Section 1: About Students with LD in Reading and Writing

Please rate your level of knowledge regarding students with problems in reading.

	1	2	3	4
▪ They struggle with reading words accurately……	○	○	○	○
▪ They struggle with reading speed/fluency…….....	○	○	○	○
▪ They reread lines in oral reading or skip lines, words, letters, and numbers..	○	○	○	○
▪ They have difficulty in reading signs, notes, forms, want ads, etc…….	○	○	○	○
▪ They may substitute, omit, and/or transpose letters, words, syllables, and phrases.....	○	○	○	○
▪ They have difficulty in using phonics to sound out words……..	○	○	○	○
▪ They have decoding problems…….	○	○	○	○
▪ They transpose words or syllables……...	○	○	○	○
▪ They have difficulty in understanding the meaning of individual words……	○	○	○	○
▪ They have poor comprehension of written passages……...	○	○	○	○

Please rate your level of knowledge regarding students with problems in writing.

	1	2	3	4
▪ They have poor handwriting……	○	○	○	○
▪ They write short and simple sentences……..……..	○	○	○	○
▪ They have difficulty copying……...	○	○	○	○
▪ They have poor spelling skills…….	○	○	○	○
▪ They have problems with grammar, syntax and organization…….	○	○	○	○
▪ They have problems with sentence structure……...	○	○	○	○
▪ They struggle with editing/proofing well……	○	○	○	○
▪ They struggle with writing well conceptually……..……..	○	○	○	○

Section 2: About AT Legislation

Please rate your level of knowledge about AT legislation.

	1	2	3	4
▪ The Individuals with Disabilities Education Act (IDEA) defines that AT devices and services be considered during IEP process for all students with disabilities regardless of type or severity of disability……..	○	○	○	○
▪ AT services include the evaluation of the needs of a child with a disability…	○	○	○	○
▪ AT services include purchasing, leasing, or providing for the acquisition of assistive technology devices…….. …….....	○	○	○	○
▪ AT services include selecting, applying, and repairing or replacing the devices……....	○	○	○	○
▪ AT services include coordinating and using other therapies, interventions, or services with AT devices……..…….	○	○	○	○
▪ AT services include training or technical assistance for a child with a disability and his/her family members…….	○	○	○	○
▪ AT services include training or technical assistance for professionals who work with a child with disabilities…….....	○	○	○	○
▪ The IEP team uses a collaborative decision-making process to consider each child's needs for AT devices and services……...…….	○	○	○	○
▪ The IEP team decides the student's AT needs based on his/her IEP goals and objectives, access to the curriculum and the progress in the general education curriculum…….	○	○	○	○
▪ The IEP team collects and analyzes data about the student, environments, educational goals, and tasks when considering the need of AT……	○	○	○	○
▪ AT needs and supporting data are documented in the IEP and described as measurable and observable outcomes……...	○	○	○	○

Section 3: The Application of AT Devices

Please rate your level of knowledge pertaining to AT solutions in reading.

	1	2	3	4
▪ Audio-taped books/ Books on Tape/Talking books/ Tape recorder/player….	○	○	○	○
▪ Electronic Books/Books on Disk/Books on CD……..	○	○	○	○
▪ Speaking reading aids (e.g., Quicktionary reading pen, Franklin Language Master, Speaking Merriam-Webster Dictionary)……	○	○	○	○
▪ Optical character recognition (OCR) / speech synthesis (e.g., Kurzweil 3000, WYNN)….....	○	○	○	○
▪ Speech synthesis / Text to speech word processors (ex: Intellitalk, Write Outloud)……..	○	○	○	○
▪ Phonic / Vocabulary computer software (e.g., Simon Sounds It Out, Lexia Reading SOS)……..	○	○	○	○
▪ Voice activated word processors (e.g., Dragon Naturally Speaking)…..…….	○	○	○	○
▪ Reading comprehension computer software (e.g., Start-to-Finish Books, Stories & More Series, Inspiration)…….	○	○	○	○

Please rate your level of knowledge pertaining to AT solutions in writing.

	1	2	3	4
▪ Pencil grip or other adapted grip…….....	○	○	○	○
▪ Adapted paper (bold line, raised line, different spacing, secured to desk, paper stabilizers)……....	○	○	○	○
▪ Alternative keyboard……	○	○	○	○
▪ Portable word processors (e.g. Alpha Smart)…..…….….....	○	○	○	○
▪ Talking word processing software (e.g., Write:Outloud, IntelliTalk II)……...	○	○	○	○
▪ Spelling and grammar checker……..…….....	○	○	○	○
▪ Word prediction software (e.g., Co:writer)……...	○	○	○	○
▪ Outlining/Brainstorming/Organizing software (e.g., Inspiration)……	○	○	○	○
▪ Speech recognition (e.g., Dragon Naturally Speaking)……..……...	○	○	○	○
▪ Syntax programs (e.g., The Sentence Master program)… ……..…….	○	○	○	○

Section 4: About AT Services

Please rate your level of knowledge about AT services for students with learning disabilities.

	1	2	3	4
▪ The IEP describes AT as a tool to access the general curriculum by addressing the student's goals and objectives, his/her needs, AT devices and services……..	○	○	○	○
▪ The IEP includes procedural guidelines for all services needed to support the selection, acquisition, and use of AT devices……...	○	○	○	○
▪ The needs and use of AT are written in the IEP to show how it contributes to measurable and observable outcomes.....……..……...	○	○	○	○
▪ AT services include evaluation of assistive technology needs to the student with LD……..……...	○	○	○	○
▪ AT assessment procedures are clearly defined and consistently used…….	○	○	○	○
▪ AT assessment is conducted by a multidisciplinary team involving the student and family…….	○	○	○	○
▪ AT assessment is conducted in the student's usual environments within reasonable timelines.....	○	○	○	○
▪ AT assessment recommendations are based on data about the student, environments, and tasks……	○	○	○	○
▪ AT assessment provides the IEP team with recommendation(s) about AT devices and services……..	○	○	○	○
▪ The IEP includes selecting, adapting, purchasing, leasing, repairing, or replacing AT devices as part of AT services for students with LD…….	○	○	○	○
▪ The IEP includes coordination and use of necessary therapies and interventions as part of AT services for students with LD……...	○	○	○	○
▪ The IEP includes training or technical assistance for the student with LD and the family members as part of AT services……..	○	○	○	○
▪ The IEP includes training or technical assistance for school educators or professionals who are involved in the IEP development for students with LD as part of AT services…...……	○	○	○	○

Appendix B

Email Contact

Dear *(Dr./Ms./Mr. Last name)*:

I am currently a Ph.D. student in the Department of Special Education at The University of Texas at Austin, and have participated in the QIAT Listserv for years. Because you have been identified as an expert in the field of assistive technology and special education, I am writing to see if you can provide feedback on survey items for my dissertation entitled "IEP Team's Knowledge about AT Legislation, Reading and Writing Difficulties Exhibited in Students, AT Devices, and AT Services for Considering Assistive Technology in the IEP Development for 3rd and 5th Grade Students with Learning Disabilities in Reading and Writing."

I have attached my survey draft in this email and hope that you will review and rate each survey item. The instructions for completing this task are included in this email. Please return your feedback about my survey items in an email (address below). You help is greatly appreciated and will be acknowledged in my dissertation. I appreciate your returning your survey feedback to me by no later than December 1st. I sincerely thank you for your time and kindness for helping me out to complete my study. If you have any questions regarding the survey, please do not hesitate to contact me by email hui-ching@mail.utexas.edu or phone (512) 471-4004.

Sincerely,

Hui-Ching Ko
Ph.D. Candidate
Department of Special Education
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Vita

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