12-2013

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**Document Type**
Thesis

**Degree Name**
MS in Special Education

**Department**
Education

# Students with Learning Disabilities: The Effectiveness of Using Assistive Technology

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December 2013

## Abstract

The study focuses on the effectiveness of assistive technology devices and software in helping students with learning disabilities. Students with reading and writing disabilities experience difficulties with literacy tasks throughout the school day. This study consisted of interviewing an assistive technology specialist and analyzing student work samples. The outcome of this study is that the use of assistive technology supports help to level the playing field for these students. The findings of the study impact general education teachers, special educators, and parents/ guardians.

## Introduction

The purpose of this study was to determine if assistive technology devices and software can help students with learning disabilities, particularly in the areas of reading and writing. My research questions were: What assistive technology supports is available for students with learning disabilities at the elementary and secondary levels? How effective are these devices and software programs in helping these students express themselves?

In order to answer these research questions, I read and analyzed scholarly articles that have been written on this topic. I also interviewed an assistive technology specialist in a school district in upstate New York, as well as analyzed work samples of students before and after they used assistive technology. The two students whose work I analyzed have learning disabilities in the area of literacy. Based upon my interview and work sample analysis, I determined that assistive technology supports are integral aspects of a student's success.

The role of the assistive technology specialist is a significant one because as evident from my interview, she is responsible from initiating the assistive technology process, to training the student as well as his team, and continually monitoring the student's progress. The assistive technology specialist assesses students to determine what their needs are and consequently, finds the appropriate device and/or software that meet the students' learning needs. Once the evaluation process has occurred, the assistive technology specialist attends meetings and then trains the student as well as his caregivers and teachers. This training provides the student's team with the skills needed to integrate assistive technology effectively throughout the student's day.

Based upon the work samples that I analyzed from the two students, it is apparent that assistive technology greatly helps students express themselves, increases their confidence, and enables them to participate in literacy activities with their peers. Therefore, I found that the

benefits of assistive technology are profound for students with learning disabilities, and it is essential that districts have assistive technology specialists who can support the students, their teachers, and parents/guardians.

The study is grounded in the four assistive technology models (Edyburn, 2001) that advocate the need of determining if, and which, assistive technology tools students require (Chambers, 1997; Zabala, 1995), the assistive technology protocol process (Bowser & Reed, 1995), and how teachers can plan effectively (Haines, Robertson, & Sanche, 1997). These models provide the groundwork for the necessity of assistive technology, and this current study further documents the value of assistive technology for students with learning disabilities.

## Theoretical Framework

Edyburn (2001) has compiled four theoretical models that surround the use and integration of assistive technology. Edyburn (2001) writes that "each of these models has had significant impact on the design and delivery of assistive technology devices and services in schools" (p. 16). The first model, which Edyburn (2001) describes, was founded by Zabala (1995). This model is known as the SETT framework; SETT stands for student, environment, the tasks, and the tools (Edyburn, 2001). The purpose of this framework is to develop an understanding of how the student functions and what supports he needs (Edyburn, 2001). Edyburn (2001) writes that "information is gathered concerning the Student's abilities and needs, the Environment(s) in which the student navigates, the Tasks required for the student's active participation in the activities within the environment, and finally, the Tools needed for completing the tasks" (p. 17).

The second model that Edyburn (2001) writes about is from Bowser and Reed (1995). This model is known as the Education Tech Points, and its purpose is to develop a plan to

support the assistive technology needs of the students (Edyburn, 2001). This model consists of six aspects which are: "(1) referral, (2) evaluation, (3) extended assessment, (4) plan development, (5) implementation, and (6) periodic review" (Edyburn, 2001, p. 18). Hence, the significance of this model is that the student is consistently getting the support he needs based upon his performance (Edyburn, 2001).

The third model that Edyburn (2001) writes about is called: Has technology been considered? This model was created by Chambers (1997). Edyburn (2001) describes this model by writing:

> Whereas the 1997 reauthorization of the Individuals with Disabilities Education Act (I.D.E.A.) required that assistive technology be considered when planning for the educational program of each student with a disability, no guidelines were initially provided on how to meet this mandate. Chamber's model of the consideration process was developed…the results of her work is a flowchart of the consideration process…that illustrates key questions and decisions that must be made when considering assistive technology. (p. 19)

Hence, this model provides educators with the framework needed to determine if a child requires assistive technology (Edyburn, 2001).

The final model that Edyburn (2001) describes was developed by Haines, Robertson, and Sanche (1997). This model is titled the AT CoPlanner, and it consists of electronic handouts to help educators work with each other (Edyburn 2001). This tool enables professionals to collaborate as they support students in their classrooms (Edyburn, 2001).

## Literature Review

### The Definition of Assistive Technology and its Legality in the Classroom Setting

Assistive technology [AT] is a set of tools that individuals with disabilities can access during school and work (Bryant & Bryant, 1998; Dyal, Carpenter, & Wright, 2009; Flanagan, Bouck, & Richardson, 2013; Judge, 2006; Kelker & Holt, 1997; Martinez-Marrero & Estrada-Hernandez, 2008; Mitchen, Knight, Fitzgerald, Koury, & Boonseng, 2007; Netherton & Deal, 2006; Raskind & Higgins, 1998). Netherton and Deal (2006) define assistive technology by writing that it "is any piece of equipment or device that may be used by a person with a disability to perform specific tasks, improve functional capabilities, and become more independent" (p. 11). Individuals with disabilities are permitted to use assistive technology as it is mandated in regulations (Bryant & Bryant, 1998; Dyal et al., 2009; Flanagan et al., 2013; Judge, 2006; Kavale et al., 2009; Kelker & Holt, 1997; Martinez-Marrero & Estrada-Hernandez, 2008; Mitchen et al., 2007; Netherton & Deal, 2006; Raskind & Higgins, 1998; Skylar, 2007). Martinez-Marrero and Estrada-Hernandez (2008) explain that four regulations make the use of assistive technology mandated for individuals with disabilities. The authors write that "these legal mandates are the Assistive Technology Act, the Individuals with Disabilities Education Act, the Americans with Disabilities Act, the Rehabilitation Act, and the Telecommunications Act" (Martinez-Marrero & Estrada-Hernandez, 2008, p. 56).

One of the fundamental laws in special education is IDEA, which stands for the Individuals with Disabilities Education Act (Bryant & Bryant, 1998; Dyal et al., 2009; Flanagan et al., 2013; Judge, 2006; Martinez-Marrero & Estrada-Hernandez, 2008; Mitchen et al., 2007; Raskind & Higgins, 1998). Martinez-Marrero & Estrada-Hernandez (2008) articulate that "IDEA identifies the provision of AT services to students with disabilities as a resource to minimize

their functional limitations, maximize their functional abilities, and as a factor that facilitates transition for school-aged children with disabilities" (p. 57). Hence, it is essential for educators to be aware of these assistive technology tools, incorporate them in their classrooms, and provide support and instruction for students who use them (Bryant & Bryant, 1998; Dyal et al., 2009; Flanagan et al., 2013; Forgave, 2002; Judge, 2006; Lewis, 1998; Martinez-Marrero & Estrada-Hernandez, 2008; Mitchen et al., 2007; Netherton & Deal, 2006; Raskind & Higgins, 1998; Skylar, 2007).

**Assistive Technology Candidates**

Students with disabilities who require access to assistive technology are entitled to have those services, as enacted by regulations (Bryant & Bryant, 1998; Dyal et al., 2009; Flanagan et al., 2013; Judge, 2006; Kelker & Holt, 1997; Martinez-Marrero & Estrada-Hernandez, 2008; Mitchen et al., 2007; Netherton & Deal, 2006; Raskind & Higgins, 1998; Skylar, 2007). Kelker and Holt (1997) discuss which students may require assistive technology and how the technology can support them. The authors write:

> Technology helps the student to overcome or compensate for the impairment and be more independent in participating at school. Students who benefit from assistive technology may have mild learning problems like learning disabilities or they may have physical or cognitive disabilities that range from mild to severe. Assistive technology is not necessary or helpful for every student in special education, but it is an important part of the support system for many students with identified disabilities. (Kelker & Holt, 1997, p. 5)

In order for a student with a disability to be considered for assistive technology, an evaluation needs to occur (Kelker & Holt, 1997). The evaluation process is a team effort in which the

student, parents, teachers, and other related service providers consider the needs of the student, evaluate what supports the student may need, and determine if, and which assistive technology devices, are necessary (Kelker & Holt, 1997). Bryant and Bryant (1998), as well as Kelker and Holt (1997), emphasize that the student's team needs to consider which assistive technology devices and services correspond to the needs of the student. Bryant and Bryant (1998) write that the "selection of an assistive technology device should be guided by setting specific demands, the capabilities a person must possess to use the device, and the individual's functional limitations that will be bypassed by using the device" (p. 47).

Since students who have assistive technology devices are classified, it is important for the team, such as the Committee on Special Education (CSE), "to determine an appropriate match among the device [assistive technology device], the setting-specific demands (i.e. tasks and requisite abilities), and the student specific characteristics" (Bryant & Bryant, 1998, p. 47). Hence, it is essential for the team to thoroughly understand the academic needs of the student and to provide the technology that will support the student in accessing the same materials as his classmates (Bryant & Bryant, 1998). Bryant & Bryant (1998) write:

> During the selection process for matching the adaptation to the student's needs, certain evaluation criteria should be considered, including (a) ease of use (setup operation, maintenance); (b) amount of training required for the user (student) and provider (teacher, family); (c) cost to purchase, to maintain, to repair; (d) technological features (e.g., computer modifications, specialized software programs, compatibility with other devices); (e) functional assistance (e.g., pencil grip enables some students with motor problems to grasp and hold a pencil more readily; speech synthesizer [with appropriate software] reads text shown on the monitor, thus enabling students with reading problems

> to access the text material); (f) performance (reliable, durable, safe); (g) use across environments and tasks; (h) promotion of student independence; and (i) user's knowledge of how to use the device. (p. 47)

Thus, it is important for the student's team to thoroughly consider his needs, what supports the student requires, and which assistive technology tools are appropriate for the student (Bryant & Bryant, 1998).

**Training and Assistive Technology**

The researchers also stress that the student and his team need to receive instruction on how to integrate the assistive technology device or software into the student's day, which will ensure that the assistive technology devices are properly used (Bryant & Bryant, 1998; Flanagan, et al., 2013; Kelker & Holt, 1997). Bryant and Bryant (1998), Flanagan et al., (2013), as well as Kelker and Holt (1997) emphasize the importance for the student to receive support in using his assistive technology device or software. Kelker and Holt (1997) discuss that one way to do so is to incorporate "training for the student …into the IEP as a separate goal or may be included as a related service that supports the student's special education program" (p. 22). By doing so, training will be mandated since the IEP is a legal document (Kelker & Holt, 1997).

Assistive technology training for educators is an integral part of the assistive technology process (Bryant & Bryant, 1998; Flanagan et al., 2013; Kelker & Holt, 1997). Flanagan et al. (2013) found that "AT [devices]…are promoted as effective tools to support literacy, [but] these same tools had the highest report of never being used…[and] results support providing trainings and in-services…for teachers" (p. 29). Based upon the findings of Flanagan et al. (2013), if the student and his team do not receive the needed support in learning how to use and integrate the

assistive technology tools into the student's school day, then the student will not benefit from the assistive technology devices and software, which may impede his progress.

Furthermore, Flanagan et al., (2013) executed a study in which the researchers determined how special education teachers at the middle school level feel about the integration of assistive technology. The teachers articulated that assistive technology helps students with their reading and writing skills (Flanagan et al., 2013). However, the educators voiced concerns (Flanagan, et al., 2013). Flanagan et al. (2013) reports that "yet, over 30% of teachers in this study reported they did not feel prepared, were unsure of how to use technology, and/or they were unaware of how to effectively implement, integrate, and evaluate AT" (p. 28). Based upon the findings of Flanagan et al. (2013), it is essential that school districts consider the incorporation of assistive technology training in their professional development plans. Although Flanagan et al. (2013), like Bryant and Bryant (1998) and Kelker and Holt (1997), found that assistive technology training is imperative, "little is currently known about how to actually begin to support teachers-at-any level-in gaining more access and knowledge" (Flanagan et al., 2013, p. 28). Due to this, Flanagan et al. (2013) proposes that pre-service teachers learn about assistive technology in their university classes, before attaining a teaching position.

**Specific Learning Disabilities and Assistive Technology**

Specific Learning Disabilities [SLD] are one of the thirteen disability categories in IDEA (Kavale et al., 2009). Kavale et al. (2009) cites IDEA (2004) by defining specific learning disabilities as:

> A disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in an imperfect ability to listen, think, speak, write, spell, or do mathematical calculations. (p. 40)

Therefore, students with specific learning disabilities may require supports with reading, writing, and spelling (Kavale et al., 2009).

Due to the literacy challenges that students with learning disabilities [LD] may have, they might require assistive technology devices and software (Bryant & Bryant, 1998; Forgave, 2002; Lewis, 1998; Martinez-Marrero & Estrada-Hernandez, 2008; Raskind & Higgins, 1998). However, since every student with a learning disability is unique, educators need to successfully determine the needs of the student and provide the corresponding assistive technology device (Bryant & Bryant, 1998). Bryant and Bryant (1998) provide an example by writing that "a student who has a reading disability yet has good listening skills…might benefit from tape-recorded text" (p. 46). As illustrated by Bryant and Bryant (1998), educators need to document each student's needs and areas of weaknesses in order to provide appropriate academic supports.

Many students with learning disabilities are in general education settings (Lewis, 1998). Kelker and Holt (1997) write that the utilization of assistive technology can help students in the general education setting. The researchers explain:

> One important feature of assistive technology is the fact that it can make it easier for students with and without disabilities to learn together. Students with disabilities are guaranteed the right to be with nondisabled peers and to receive their education in the setting which is the least restrictive environment. In order to be successful in the least restrictive environment, students are to be afforded whatever supplementary aids and services are necessary. (Kelker & Holt, 1997, p. 36)

As stated by Kelker and Holt (1997), assistive technology needs to be considered for students with disabilities who are in general education settings as a means to further support these students and to help them grow academically and socially.

**Reading and Assistive Technology**

Many students with learning disabilities demonstrate difficulties with reading (Lewis, 1998). One way to support students with learning disabilities in school is to utilize assistive technology (Skylar, 2007). Students with learning disabilities may find reading difficult, particularly decoding, comprehending texts, and summarizing information from the text (Lewis, 1998). Assistive technology software can be beneficial for students who struggle with reading (Lewis, 1998). Flanagan et al. (2013) as well as Raskind and Higgins (1998) write about software that reads texts for students. These text-to-speech programs enable students to listen to the text, which aides them in the comprehension of the material (Flanagan et al., 2013; Raskind & Higgins, 1998). This software can be useful, particularly for students who are in a general education setting, who may struggle with decoding the books but can use text-to-speech software in order to read and participate in the same activities as their classmates (Flanagan et al., 2013; Kelker & Holt, 1997; Raskind & Higgins, 1998).

Another assistive technology support that can help students with learning disabilities who struggle with decoding is listening to books on tape (Raskind & Higgins, 1998). This can be helpful for students because they listen to the texts, comprehend the concepts, and participate in classroom activities and discussions (Raskind & Higgins, 1998). Along with listening to books on tapes, students can also use tape recorders (Raskind & Higgins, 1998). The authors write that "tape recorders can be utilized to record classroom lectures, as either an alternative or a supplement to taking notes. This may be beneficial for students with LD who have listening difficulties … difficulty processing oral language or attentional disorders" (Raskind & Higgins, 1998, p. 34). Thus, assistive technology supports can help students participate with their general education peers and have access to grade level material (Raskind & Higgins, 1998).

**Writing and Assistive Technology**

Students with learning disabilities may struggle with writing (Bryant & Bryant, 1998; Forgave, 2002; Lewis, 1998; Martinez-Marrero & Estrada-Hernandez, 2008; Raskind & Higgins, 1998). One tool that is beneficial for students is using a word processor (Lewis, 1998; Raskind & Higgins, 1998). The use of a word processor can help students who are having difficulties with writing letters, spelling, and using proper grammar (Lewis, 1998; Raskind & Higgins, 1998). In particular, the use of a spell checker is helpful for students who struggle with spelling and is another tool that they can utilize (Raskind & Higgins, 1998). However, Lewis (1998) articulates that some students struggle with word processing because they do not have the appropriate typing skills; therefore, these students may find word processing tedious. Hence, it is recommended that students with learning disabilities have the opportunities to learn how to keyboard so that they do not feel frustrated when typing (Lewis, 1998).

Researchers explain that students who struggle with writing may find proofreading software to be useful (Raskind & Higgins, 1998). Raskind and Higgins (1998) discuss proofreading programs by writing:

> Adults with LD who experience written language problems may also benefit from the use of proofreading programs. These software programs (now included in many word processors) scan word processing documents and alert users to probable errors in punctuation, grammar, word usage, structure, spelling, style, or capitalization. Most of these programs can be used to either mark probable errors or mark the error and attach a commentary…Many programs include online tutorials that allow the user to study the language rules checked by the program. (p. 30)

As demonstrated by Raskind and Higgins (1998), proofreading programs can assist students with learning disabilities to check their syntax.

Another program that can be considered for students who struggle with writing is word prediction software (Flanagan et al., 2013; Raskind & Higgins, 1998). Raskind and Higgins (1998) describe how the program works by writing that "as the first letter of a word is typed, the program offers a list of words beginning with that letter. If the desired word appears in the list… [it] will automatically be inserted into the sentence" (p. 32). Therefore, word prediction software can help students who struggle with spelling because they can use the computer generated list to pick and hear the word that they want to insert into their writing assignments (Flanagan et al., 2013; Raskind & Higgins, 1998). These supports help students with learning disabilities feel less conscious about spelling and grammar; they can instead focus on the content of their writing pieces (Flanagan et al., 2013; Raskind & Higgins, 1998).

Another tool that is beneficial for students who struggle with spelling, syntax, and proofreading their written work is the use of speech recognition software (Flanagan et al., 2013; Forgave, 2002; Lewis, 1998, Martinez-Marrero & Estrada-Hernandez, 2008; Raskind & Higgins, 1998). Speech recognition software is commonly known as speech-to-text software because students orally dictate what they would like to write and the software types it (Forgave, 2002). Forgave (2002) describes the speech recognition program by writing:

> When students use voice recognition software they wear a headset and operate the computer by voice commands…Speech-to-text software allows students to get their ideas down before they are forgotten because of slow typing speed. A meta-analysis of five studies found that stories that students wrote using speech-to-text dictation were longer,

> more complex, and contained fewer grammatical errors than ones composed using other methods. (p. 124)

As articulated by Forgave (2002), speech-to-text software can help students capture their ideas rather than being concerned about properly forming letters and spelling words. The speech-to-text software also enables students to hear what they have dictated and due to this, students can proofread their writing (Forgave, 2002).

Although speech-to-text can help students immensely, there are some difficulties (Forgave, 2002). Students need to learn how to use the program, speak clearly when dictating, and sometimes the speech-to-text recognition programs do not accurately show the words that the student is dictating. When this occurs, Forgave (2002) suggests that the student uses the word options that are provided by the speech-to-text software. These options are very similar to the ones that word processors provide (Raskind & Higgins, 1998). When a student is not accurately pronouncing a word, the speech-to-text software can provide a list of words that are similar to the word that the student may be attempting to spell. The student can listen to the words in the list and pick the one that he wants to incorporate in his writing piece (Forgave, 2002). Despite these difficulties, Forgave (2002) describes the positives of using speech-to-text software. The researcher writes "when students used continuous speech recognition programs, they also showed improved scores on tests of working memory" (Forgave, 2002, p. 124). Hence, the CSE may consider speech-to-text software for students with disabilities who struggle with writing.

**Assistive Technology in Elementary Schools**

Students at all grade levels can use assistive technology software if it is deemed appropriate by the CSE (Netherton & Deal, 2006). Although assistive technology can be used at any grade level by students, there are different assistive technology devices that work better in

elementary schools than in secondary settings. One of these devices is the Talking Storybooks (Lewis, 1998). Lewis (1998) writes the following about the Talking Storybooks:

> Typical talking storybook programs present an entire work of children's literature on CD-ROM disc. These are multimedia programs with impressive illustrations and high-quality digitized sound for speech, music, and sound effects. They are hypermedia in that they allow readers to interact with the text and in most cases, the visuals that accompany the text. The interactive nature of these storybooks serves two purposes: First, interactivity acts as a motivator to encourage readers to persist in the reading task, and second, some interactive features provide assistance in reading (e.g. a reader may be able to select an unknown word in the text to hear it read aloud). (p. 21)

As discussed by Lewis (1998), the Talking Storybooks is ideal for students in the younger grades because the literature in the software is geared towards the elementary school years.

Skylar (2007) writes about a kindergarten teacher who used assistive technology in her classroom to help students learn their sight words. The teacher used Classwide Peer Tutoring (Skylar, 2007). The author writes that "Classwide Peer Tutoring (CWPT) is evidenced based, cooperative learning strategy that increases student engagement with academic content. Across the classroom setting, students are paired with one another, reciprocally teaching each other by taking turns as tutor and tutee" (Skylar, 2007 p. 53). To further make Classwide Peer Tutoring effective, the kindergarten teacher used a technological device called Mini-Me (Skylar, 2007). The Mini-Me is a voice recorder where students record themselves when they read sight words and are then able to hear themselves (Skylar, 2007). Although the Mini-Me is a small device (it is only 3.81 centimeters in diameter) and inexpensive (it costs about $8.00), it is effective because students practice their sight words, record and listen to their reading of the sight words,

and it makes learning sight words engaging (Skylar, 2007). The example provided by Skylar (2007) is one that is ideal for the primary grades as students are learning their sight words; however, using the Mini-Me device may be plausible for students in the middle school and high school setting when working on projects and presentations.

**Assistive Technology in Secondary Education**

Students with learning disabilities may face significant difficulties at the middle school and high school level (Kennedy & Deshler, 2010). The authors write that:

> The gap between the level at which students with learning disabilities (LD) perform and the demands of the curriculum that they are expected to meet is often wide. This is especially the case as students move into the secondary grades where curricular expectations accelerate and content demands (e.g., history, science, mathematics) are markedly different. (Kennedy & Deshler, 2010, p. 289)

However, the use of assistive technology can help students and there are many devices and software programs for this age group, especially computer based programs (Forgave, 2002; Lewis, 1998; Martinez-Marrero & Estrada-Hernandez, 2008; Raskind & Higgins, 1998). One of the technology devices that can benefit students with learning disabilities at the secondary level is the use of speech synthesis and speech recognition in which students dictate information and the software converts it to text (Forgave, 2002; Lewis, 1998, Martinez-Marrero & Estrada-Hernandez, 2008; Raskind & Higgins, 1998). The authors illustrate that such assistive technology devices help students to complete writing assignments, such as essays for their classes, and participate in the same writing lessons (i.e. learning about the writing process) (Forgave, 2002; Lewis, 1998, Martinez-Marrero & Estrada-Hernandez, 2008; Raskind & Higgins, 1998).

There are also assistive technology tools that help students create graphic organizers when preparing for writing assignments, such as the Inspiration software (Forgave, 2002; Lewis, 1998; Martinez-Marrero & Estrada-Hernandez, 2008). Forgave (2002) writes the following about the software:

> Inspiration helps students to organize information and ideas through a variety of "webs" or concept-maps on the computer screen…Information included in the organizational web can be in the form of text, graphics, or Internet hyperlinks. The outline's headings and subheadings can be easily manipulated to reflect different organizational styles. This type of software can be used to gather information before writing a project or research paper. (p. 134)

As described by Forgave (2002), Inspiration enables students, including students with disabilities, to plan their writing and to feel confident during the writing process.

**Conclusion**

Assistive technology devices, software, and services (i.e. training) can support students with disabilities, including students who have learning disabilities in the areas of reading and writing (Bryant & Bryant, 1998; Dyal et al., 2009; Flanagan et al., 2013; Kelker & Holt, 1997; Martinez-Marrero & Estrada-Hernandez, 2008; Mitchen et al., 2007; Netherton & Deal, 2006; Raskind & Higgins, 1998; Sharon, 2006;). Therefore, the CSE needs to carefully analyze each student's strengths and weaknesses in order to determine if the student is qualified for assistive technology, and if so, which devices and services would best support each individual (Bryant & Bryant, 1998; Kelker & Holt, 1997). Once students with disabilities receive assistive technology supports, students feel more confident (Martinez-Marrero & Estrada-Hernandez , 2008). The authors write that assistive technology enables students to use tools that they feel comfortable

utilizing in order to complete assignments, which in turn helps them feel proud of their work (Martinez-Marrero & Estrada-Hernandez, 2008).

## Methodology

### Context

The purpose of this study was to determine how assistive technology devices, software, and services can support students with learning disabilities, particularly in the area of literacy. Therefore, this study took place in a school district that employs an assistive technology specialist. The interview of the assistive technology specialist took place in a suburban elementary school in upstate New York. The district, which the elementary school belongs to, has an assistive technology specialist. She works in all the schools in the district; however, her office is located in the elementary school.

The role of the assistive technology specialist is a multi-faceted one. The assistive technology specialist assesses students to determine if they qualify for assistive technology devices and/or services, and if so, works with each student's team to provide the services that best support the student. The specialist directly works with the student and consults with the student's teachers to help them infuse the technology in the classroom. The assistive technology specialist also provides training to parents/guardians so that if applicable, the child can use the device/software in the home setting.

### Participants

The participant in this study was the assistive technology specialist, Arianna. Arianna received her Bachelor of Science in communicative disorders and a Master of Science in education. She is permanently certified as a speech pathologist and has her assistive technology practitioner (ATTP) certification. Arianna has been working in the field of education for fifteen

years. Arianna's responsibilities, as the assistive technology specialist, is to attend CSE meetings, serve as a member on school and district wide committees, work with parents/ guardians, students, and teachers, monitor student progress, and provide professional development workshops.

**Researcher Stance**

My role in the study was to be an interviewer. I interviewed Arianna, the assistive technology specialist. Through interviewing her, I further learned what assistive technology is, the role of the assistive technology specialist, the different types of devices/services that students can receive, and how assistive technology supports students, particularly how it builds their independence in the classroom setting. During the interview, the assistive technology specialist provided me with samples of students' work before and after the utilization of assistive technology (the students' names did not appear on the work samples). I carefully observed and analyzed the differences between the work samples.

I am working on earning my Master of Science in special education (grades 1-6) at St. John Fisher College. I am also currently employed as a substitute teacher.

**Method**

The current study focuses on determining how assistive technology devices, software, and services benefit students with learning disabilities. The study concentrates on the use of assistive technology to support students who have difficulties in the areas of reading and writing. In order to gather data, I first located a school district that employs an assistive technology specialist and contacted the specialist in order to ask for consent to interview her.

Upon receiving consent to interview the assistive technology specialist, I wrote interview questions (refer to appendix A) to ask the assistive technology specialist. The questions inquired

about the different devices and software that can help support students who are struggling with reading and writing, as well as the role of the assistive technology specialist in the district. Another method that I used to collect data was studying the work samples that the assistive technology specialist provided me. The work samples were assignments that students completed prior to and after employing the assistive technology devices and/or software.

**Informed Consent**

I explained my study to the assistive technology specialist, and she signed a consent letter in order to participate. Arianna, the assistive technology specialist, had a clear understanding of her rights, as I explained them to her and as stated in the consent letter. She voluntarily participated in the study. To protect the assistive technology specialist's confidentiality, a pseudonym is being used.

**Data Collection**

In order to collect data for this study, I interviewed the assistive technology specialist and I analyzed students' work samples. During the interview, I took notes on Arianna's responses. I also analyzed the work samples that Arianna showed me. The samples consisted of assignments completed prior to and after the use of assistive technology devices and/or software. Through this analysis, I observed the differences between the work samples.

**Data Analysis**

I analyzed the data that I attained from the interview and the work samples. I read over the responses that Arianna provided during her interview and highlighted the important information that demonstrates how the use of assistive technology can help students who are having difficulties with reading and writing. Another data collection method that was used in this study was analyzing the work samples that the assistive technology specialist showed me. These

samples were assignments that students had completed with and without their assistive technology devices and/or software. While studying these work samples, I took notes on the differences and similarities between the ones that were completed with the use of technology and the ones without the utilization of the device and/or software. I took note of the presentation of the work samples (formation of letters), as well as the content of the work samples (i.e. level of description that each one had, use of proper spelling and grammar). Based upon my data analysis, I was able to gather evidence that would answer my research questions.

## Findings and Discussions

### Introduction

I interviewed Arianna, an assistive technology specialist, who is also a certified speech language pathologist. I asked Arianna several questions throughout my interview. Arianna also provided me with students' work samples. The students that Arianna works with are in inclusion classrooms and self-contained classes, such as in 12:1:1. Arianna shared the many different devices available for students with learning disabilities, particularly in the areas of reading and writing, and she also showed me how these devices function. Some devices can be very simple while others require that the students and teachers receive training in order to be able to integrate them in the classroom setting.

### Interview Responses

#### *Responsibilities of an Assistive Technology Specialist.*

Arianna explained the responsibilities that she has as an assistive technology specialist. Arianna is accountable for finding the appropriate assistive technology device and/or software that addresses the student's social and academic needs. As Bryant and Bryant (1998) explain, it is integral that the student who is need of assistive technology services, receives the appropriate

software or device. Students that are in need of assistive technology support typically are students with IEPs. Therefore, Arianna is expected to attend all CSE meetings for each student that she works with. Along with assessing the student's need for assistive technology, Arianna is also responsible for training the student, his teachers, and caregivers. This training is imperative because it enables the student and his team to learn how to use and incorporate the technology into the student's day (Bryant & Bryant, 1998; Flanagan et al., 2013; Kelker & Holt, 1997). Since Arianna works with students who use the assistive technology device at home, she provides training for the parents/guardians. Hence, students can complete homework assignments and can study for exams at home, by using their assistive technology device.

***The Assistive Technology Evaluation Process.***

Arianna discussed the assistive technology evaluation process. Once a student is referred for an assistive technology evaluation by their teachers, parents, or themselves, and the parents/guardians give permission for their child to be assessed, Arianna needs to schedule a time to assess the student. One of the assessments entails a student reading a passage on his own. After the student has read the text, the assistive technology specialist will ask the student a series of questions in order to determine how well the student has comprehended the text. Then, the assistive technology specialist orally reads another passage to the student and asks questions to assess the student's comprehension. Upon the conclusion of this task, the assistive technology specialist has the student read a passage via the computer. Thus, the computer reads the text to the student, and then he answers comprehension questions. If the student performs better with texts being read to him, then it is determined that the student may require assistive technology, as his comprehension increases when he hears texts. A similar process occurs with writing because the student is asked to write and then use assistive technology. If the student performs

significantly better with the use of assistive technology (i.e. his writing contains more detail, he uses grammar accurately), then he may require assistive technology support. Perhaps, he may need to use an app, like Dragon, which is a speech-to-text support.

***Assistive Technology and Literacy.***

Almost all of the assistive technology devices and software that Arianna works with are literacy based (Kelker & Holt, 1997; Lewis, 1998; Skylar, 2007; Raskind & Higgins, 1998). Arianna uses several computer programs to help students with both reading and writing (refer to appendix B). Although these programs are beneficial, they are costly and require significant training for both the students and teachers.

One of the software programs that Arianna uses is text-to-speech. Kelker and Holt (1997) as well as Raskind and Higgins (1998) write about the usefulness of text-to-speech software. One of the programs that Arianna uses is Read&WriteGold. This software enables students to listen to a text and also interact with it (i.e. highlighting the important information, finding visuals, determining synonyms and antonyms of words). For example, if the class is reading about the Industrial Revolution, the students who use this software can pull up the text on a computer. Therefore, this enables the students to read the same material as their peers. In turn, students can participate in classroom discussions and work on assignments because they are able to hear the text. Arianna explained that if a text is not available electronically, teachers can scan documents into the program. By doing so, students can access all handouts. Arianna also articulated that Read&WriteGold can read all texts on the Internet. For example, if a student wants to read an article that he finds on the Internet, the software will read it to the student.

Another device that students can use is an iPad or iPod, where students can download apps (i.e. reading apps and math apps). For example, a student can download an app to practice

grammar. One app that helps students is Dragon Naturally Speaking. This is a speech-to-text app. Forgave (2002), Lewis (1998), Martinez-Marrero & Estrada-Hernandez (2008), as well as Raskind and Higgins (1998) write about the usefulness of speech-to-text. Arianna explained that the speech-to-text app is very helpful in aiding those students with reading and writing disabilities. This app enables the student to talk into his iPod or iPad. While the student verbally dictates, Dragon converts the speech into text. Once the student has completed the assignment by using Dragon, he can listen to what he has dictated and revise his writing. After the proofreading process, the student may email his writing assignment to his teacher or save it in DropBox. Arianna explained that Dropbox is a free download that can be shared with both the student and teacher. It can be accessible from a computer or tablet. Arianna stated that there are different versions of Dragon and some spell check and place punctuation in the appropriate places.

### *Challenges of Using Assistive Technology.*

There are obstacles that need to be addressed when working with assistive technology. Arianna explained that some assistive technology devices and software is expensive, whereas others, like apps, are not. Nevertheless, districts need to plan to include these in their budgets. Another challenge, as descried by Arianna, is lack of time. According to Arianna, in order for students to be assessed, as well as for the students, educators, and parents to be trained, this requires a substantial amount of time. Arianna has found that the implementation of professional development workshops has proven to be helpful in training educators. The same finding, regarding the significance of training and workshops, has been demonstrated in research studies (Bryant & Bryant, 1998; Flanagan et al., 2013; Kelker & Holt, 1997). Arianna further articulated that the use of workshops have helped her train and support multiple teachers at once, while providing a venue for teachers to collaborate and support each other.

**Work Samples**

Arianna provided me with two students' work samples. The students' names did not appear on the samples, and I was not told who the students are. The purpose of this is to protect student confidentiality. The samples demonstrate the success that students can experience when they use assistive technology devices and software. In the following paragraphs, I will describe the writing samples of both students (student A and student B).

Student A, who is in middle school, was given the task to write a response about the book that her class recently read. Before utilizing the assistive technology device, the student only wrote one sentence and the student's handwriting was difficult to read. The spelling was incorrect and all the words blended together without any spaces between them. The student did not capitalize the first letter in a sentence. When the student used Dragon Naturally Speaking, she wrote an entire paragraph. Student's A paragraph had correct grammar and spelling. The only errors the student made were that there was no space after one period and the first letter of one sentence was not capitalized. By using assistive technology, student A was able to produce a writing sample that was on grade level. Her writing was well organized and contained proper grammar. The student expanded her writing by including details. This example demonstrates that without speech-to-text, the student had difficulties expressing herself in writing. However, with the use of assistive technology, the student exemplified what she knew about the book and wrote a paragraph that illustrated her thoughts. The following chart shows the number of words the student was able to write prior to using Dragon and the number of words she was able to dictate after the use of this app:

| Number of words in writing piece prior to using Dragon | Number of words in writing piece with the use of Dragon |
|---|---|
| 10 words | 86 words |

As demonstrated in student's A writing, it is evident that the student was able to more effectively express her ideas and add details, when using the app. She greatly expanded her writing because prior to the use of Dragon, she handwrote one sentence, and after using the app, the student successfully wrote one paragraph. This immense difference illustrates that assistive technology can have a positive impact.

Student B is in primary school. He does not recognize the letters in the alphabet. Reading and writing is very difficult for the student. However, by using assistive technology, student B was able to complete his assignment. The student's task was to write what he did over the weekend. He used an app on his iPad which enabled him to pick pictures that would express his ideas. For example, he wanted to write about a house. Using the app, he found a picture of a house. Underneath the picture of a house, the word house was written. Therefore, after student B generated the pictures that he needed, he was able to copy the words that appeared underneath the pictures into pages, on his iPad. The sentence that he wrote was "my dad house." He was attempting to write "I went to my dad's house." Although what he wrote is not a complete sentence, the student was able to use assistive technology in order to express his idea.

**Conclusion**

Arianna's position as an assistive technology specialist requires her to multi-task. She not only ensures that the students' technology is properly working, but she instructs the students and provides support to educators and caregivers. Arianna needs to monitor student progress as well as adjust the types of supports that the students need in order to be successful. She attends CSE

meetings, assesses students, and completes progress reports. The services that Arianna provides are important as they offer students and educators the skills needed to integrate the technology into the classroom and help students experience success. Arianna also stays current on the latest research in the field and participates in workshops and conferences so that she is knowledgeable of the new assistive technology devices and software, particularly since technology is consistently evolving.

Although the assistive technology process can be intricate (i.e. evaluations, meetings, monitoring, instructing, and training), based upon the work samples, it is evident that students who use the devices or software make significant gains. Both students A and B were able to express themselves through the use of assistive technology. This not only helps the students make academic progress, but students feel more confident in school. The use of assistive technology, as evident through the interview with Arianna and the analysis of students' work samples, is beneficial for students with learning disabilities.

## Implications and Conclusion

The study focused on the use of assistive technology for students with learning disabilities. As evidenced by Kennedy and Deshler (2010), students with learning disabilities experience difficulties with reading and writing, and it can become more difficult for these students as they progress in school, particularly in the upper grades. Therefore, as found in the research (Bryant & Bryant, 1998; Dyal et al., 2009; Flanagan et al., 2013; Kelker & Holt, 1997; Martinez-Marrero & Estrada-Hernandez, 2008; Mitchen et al., 2007; Netherton & Deal, 2006; Sharon, 2006; Raskind & Higgins, 1998), as well as through my interview and analysis of student work samples, assistive technology can greatly help students with their reading and writing development.

In terms of reading, assistive technology devices and software, such as the one that Arianna showed me, Read&WriteGold, helps students read grade level passages, engage with the texts, and participate in classroom discussions. Students can use this software to read any type of text, whether it is a passage from a textbook or an online article. Assistive technology can also help students with writing. For example, the app that Arianna showed me, Dragon, enables students who struggle with writing to verbally dictate their thoughts and produce a written piece. There are also several apps that students can access on their iPods and iPads that will help them with decoding, reading stories, and practice concepts, like grammar.

Assistive technology is effective for students with learning disabilities, and it is imperative that an assistive technology specialist is a member of a district's faculty in order to assess students effectively and work with the students' teams. Training, as articulated by Arianna, as well as researchers (Bryant & Bryant, 1998; Flanagan et al., 2013; Kelker and Holt 1997), is significant so that students, as well as their teachers and caregivers, can successfully integrate the technology. Therefore, in order for students to receive the assistive technology support that they need, it is significant for an assistive technology specialist to work with the students from the initial steps of the process (evaluation) to the monitoring of the students' progress.

The findings of this study impact general education teachers and special education professionals, as well as caregivers. It is evident from this study that teachers should consider referring students for assistive technology evaluations when they observe that students are having difficulties with reading and writing. Teachers need to be open to receiving training from the assistive technology specialist so that they can learn how to infuse the technology into the classrooms. By doing so, not only will teachers grow as professionals, but they will support the

students' academic progress as well as their self-esteems. Educators should also consider attending workshops on assistive technology to further learn about the field. By being aware of assistive technology devices and software, caregivers can advocate for their children. If a parent/ guardian observes that his child is struggling with completing homework due to difficulties with reading and writing, he should talk to his child's teacher regarding the consideration of assistive technology.

This study has limitations. The first limitation was time. I had a semester to complete this research. If I had more time, I would have spent more time with Arianna. Another limitation was the participants. In the future, I would interview more assistive technology specialists and directly work with students who use assistive technology. This would give me the opportunity to further learn about the roles and responsibilities of assistive technology specialists in other districts, as well as the programs that are available in different schools.

Based on the findings of my study, I also have more questions. One question is what assistive technology supports are available for students who have learning disabilities in the area of math. Another question is how can adults, who may have difficulties in the area of reading and writing, support themselves. For example, where could they get assistive technology evaluations and services? With assistive technology support, perhaps more adults can experience success in the workplace.

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# Appendix A

Interview questions:

1. What is your role as an assistive technology specialist?
2. Which students have access to assistive technology software?
3. Which software is available for students and how do you determine which assistive technology devices meet the needs of each student?
4. How do you teach students how to successfully use their assistive technology software?
5. What types of supports are offered to parents/guardians so that they can learn how to help their child successfully use the software/device at home?
6. How do you help classroom teachers integrate the assistive technology software into the classroom?
7. What are benefits of using the assistive technology software?
8. What are obstacles in implementing the use of assistive technology devices?
9. Do general education students have access to assistive technology devices and how so?
10. Can you please show me samples of students' work before and after the use of their assistive technology devices?
11. Can you please show me how text-to-speech and speech-to-text software works?

# Appendix B

Below are assistive technology software/apps as provided by Arianna. The following descriptions come directly from a handout that Arianna gave me.

RWG – Read Write Gold – This program can read back to the user. It can also help during writing by providing spell check and word prediction. There are many other uses of RWG, however these are the main resources.

ROL – Read Out Load – This program provides students with "BookShare" which allows us to access books/novels/textbooks used in the classroom. Teachers will download the books and put them on a shared folder for the students to gain access to them. The student can then listen to the books and/or have access to them at home in electronic format.

Dragon – Dragon Naturally Speaking – This program allows a student to verbally dictate his/her written work. The student is still in charge of playing back what he/she has dictated and making necessary corrections.

Ginger – Very similar to RWG – This program provides the student with the ability to listen to electronic format text, a grammar check, and will rephrase sentences as needed.

Word Processor – The student has access to the keyboard and computer screen to type written work.

Read2Go – This app pairs with ROL and allows ROL to be viewed on the iPad.

Pages – This app provides the student with word processor on the iPad or iPod.

iReadWrite – This app provides the student with text-to-speech for typed in messages along with grammar checker, spell checker, and word prediction on the iPad or iPod.

StoryPages – This app provides a user to draw pictures and organize the pictures to help with memory of learned information.

ProLoQuo2Go – This app pairs vocabulary words with pictures to help with vocabulary retrieval.

DropBox – This is a free download on a computer or electronic device. One can take classroom files, put them in Dropbox, and share this folder with students. Students can easily access materials.