Perceptions and Use of Digital Technology by Educators Who Support Students with Disabilities in Public Schools: A Mixed Methods Study

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Perceptions and Use of Digital Technology by Educators Who Support Students with Disabilities in Public Schools: A Mixed Methods Study

A Dissertation
Presented to the Faculty of
College of Education & Social Work
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the Degree of
Doctor of Education

By
Tammy Thompson-Cooke

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Abstract

The purpose of this explanatory, sequential, mixed-method study was to examine the perceptions and use of digital technology by educators supporting the needs of students with disabilities attending K-12 classrooms and any correlation between the assistive technology (AT) knowledge, skills, and needs of K-12 educators within Pennsylvania. Technology has become ubiquitous and has emerged in schools as a means for students to interact with academic content. The provision of 1:1 devices was accelerated by the COVID-19 pandemic, which created opportunities for educators to discover innovative features that made learning more accessible to all students. Results indicated educators recognized AT as helpful for all core academic classes, helped students complete their assignments, and assisted them in making academic progress. Much of the commonly used AT identified offered features that have become streamlined over time or are alternatives to non-digital items. Themes identified in the study were associated with (1) access and engagement, (2) technology integration factors, and (3) elements of AT use. Although AT was viewed positively by all participants, its integration was reliant on the comfort level of the educator, challenges experienced, and the training and support needed to effectively implement AT with confidence. Training on how to use devices, ideas for use in special education settings, and having the ability to try devices as part of the decision-making process were identified as currently working to promote AT use, whereas additional training on how to use AT in general education settings was identified as a need for improving AT implementation.

Keywords: education technology, assistive technology, inclusive technology
Dedication

This dissertation is dedicated to my family and friends who have prayed for me, cheered me one, offered words of encouragement, and even a few reality checks along this journey. To my mom who always believed in me, prayed for me, and encouraged me to do my best. To my husband who has been my personal editor and willing participant on every adventure. And, particularly to my children, Lexi and AJ… Aim high, believe in yourself, creatively find solutions, and persevere ‘til you achieve your goals, but the most important thing is to have fun (always!). Thank you all for being the cheerleaders and inspiration I needed to succeed!
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# Table of Contents

List of Tables ......................................................................................................................... viii
List of Figures ......................................................................................................................... ix

Chapter 1: Introduction ............................................................................................................. 1
  Introduction ............................................................................................................................. 1
  Background ............................................................................................................................. 4
  Purpose of the Study ............................................................................................................... 7
  Problem Statement ............................................................................................................... 8
  Research Questions ............................................................................................................... 9
  Significance of Methods ....................................................................................................... 9
  Definition of Terms .............................................................................................................. 10
  Assistive Technology (Assistive tech or AT) ..................................................................... 10
  Educational Technology (Ed Tech) ..................................................................................... 10
  Information Technology (InfoTech) .................................................................................... 11
  Inclusive Technology .......................................................................................................... 11
  Child with a Disability, as defined by IDEIA 2004 ............................................................ 12
  Limitations ............................................................................................................................ 12
  Summary ............................................................................................................................... 13

Chapter 2: Literature Review .................................................................................................. 15
  Review of Literature ............................................................................................................ 16
  Background ........................................................................................................................... 16
  Related Studies .................................................................................................................... 19
  Educational Support .......................................................................................................... 20
List of Tables

1. Table 4.1 Demographics of Quantitative Participants .......................................................... 51
2. Table 4.2 Current Primary Teaching Position of Survey Respondents ................................. 52
3. Table 4.3 Perceptions of Usage of Assistive Technology Usage ........................................ 53
4. Table 4.4 Responses to Survey Item for AT Used for Reading (N = 73) ............................ 55
5. Table 4.5 Responses to Survey Item for AT Used for Writing (N = 73) ............................ 57
6. Table 4.6 Responses to Survey Item for AT Used for Mathematics (N = 73) .................... 59
7. Table 4.7 Responses to Survey Item for AT Used for Organization/Memory (N = 73) ....... 60
8. Table 4.8 Satisfaction of Assistive Technology Skills ....................................................... 62
9. Table 4.9 Educator Attitudes and Beliefs about AT – Responses to Positively-worded Items ........................................................................................................................................... 66
10. Table 4.10 Educator Attitudes and Beliefs about AT – Negatively-worded Items ............... 67
11. Table 4.11 Percentage of Distribution, Means, and Standard Deviations for Supports and Barriers to AT Integration ........................................................................................................ 70
12. Table 4.12 Responses to Survey Item for Options Currently Working to Improve AT Use .......................... 72
13. Table 4.13 Responses to Survey Item Important Options for Improving AT Use ............. 73
14. Table 4.14 Number and Percentages of Codes Identified ................................................ 75
15. Table 4.15 Joint Display Representing the Integration of the Quantitative and Qualitative Results – Access and Engagement .................................................................................................. 83
16. Table 4.16 Joint Display Representing the Integration of the Quantitative and Qualitative Results – Technology Integration Factors .................................................................................. 85
17. Table 4.17 Joint Display Representing the Integration of the Quantitative and Qualitative Results – Elements of Technology Use .................................................................................. 87
List of Figures

1. Figure 3.1 Flow Chart of Explanatory, Sequential, Mixed-Method Design ........................................37
2. Figure 3.2 Flow Chart of Implementation Procedures ...........................................................................43
3. Figure 4.1 Mean of Responses for the Three Items Related to Assistive Technology Usage 54
4. Figure 4.2 AT Used for Reading ........................................................................................................56
5. Figure 4.3 AT Used for Writing ...........................................................................................................58
6. Figure 4.4 AT Used for Mathematics .................................................................................................59
7. Figure 4.5 AT Used for Organization or Memory ..............................................................................60
8. Figure 4.6 Educator Satisfaction of AT Skills .....................................................................................63
9. Figure 4.7 Attitudes and Beliefs about AT – Responses to Positively-worded Items ..........67
10. Figure 4.8 Attitudes and Beliefs about AT – Responses to Negatively-worded Items ........68
11. Figure 4.9 Supports and Barriers to Assistive Technology Integration ...........................................71
12. Figure 4.10 Training and Equipment Availability for Improving AT Use: Comparison of
    What was Needed vs. What was Currently Working ...........................................................................73
13. Figure 4.11 Codes and Visual Representation of the Associated Percentages .................................75
Chapter 1: Introduction

“For most of us, technology makes things easier. For a person with a disability, it makes things possible” Judy Heumann, Assistant Secretary, Office of Special Education Programs, U.S. Department of Education.

Introduction

Because technology has become more portable, affordable, and available within the mainstream digital market, it has made its way into classrooms and schools as 1:1 technology to increase access to curriculum content. According to Anderson and Jiang (2018), approximately 95% of teens reported they owned or had access to a smartphone, and 88% indicated they had access to a laptop or desktop computer at home. The accessibility features that were once used exclusively for individuals with disabilities have become personalized to a user’s experience regardless of ability, and it has become far less stigmatizing than “traditional” AT (Cumming and Rodriguez, 2017). Depending on its use, a piece of equipment may be used as assistive technology for one student with disabilities, and instructional technology for other students (King-Sears & Evmenova, 2007). For example, students have become able to use the text-to-speech feature built into their iPads because they prefer to listen to content from electronic versions of their textbooks, but for individuals who are blind, visually impaired, or have a print disability, this accessibility option is needed to be able to access the information in a medium besides print. However, when considering the needs of students who require AT to be able to learn or complete tasks, educators need to be able to understand the nuances of when ed tech becomes assistive tech. By definition, the answer seems simple but in practice the answer is a little more complex.
According to the Individuals with Disabilities Education Act (IDEA, 2004), an AT device 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 children with disabilities.” Educational technology (“ed tech”) fits within this definition, particularly when the built-in accessibility features are used to modify, customize, or personalize it as a digital learning tool according to that purpose. However, the accessibility options that lead to the universal design of ed tech have often confused many educators in the field as to whether to “check the box” on Individual Education Plans (IEPs), particularly from the standpoint where all students in the district have been supplied with technology or features that may, in fact, be needed by a student to meet educational demands and would therefore be considered assistive.

In a report by Gallup and NewSchools Venture Fund (Gallup, 2019), 89% of students indicated they used some form of digital tool to learn at school at least a few days a week. And, when teachers were asked to reflect on the digital learning tools they used most often, 76% indicated they felt digital learning tools were effective for personalizing content to meet individual needs, and 69% of special education teachers indicated digital learning tools were effective in making rigorous content accessible for students with special needs. However, there was a lack of specificity in how and under what conditions lessons were being “personalized” using digital learning tools beyond increasing the flexibility of having students working on different content at different paces.

Current practices in teaching, learning, assessment, productivity infrastructure, and trends provided evidence as to the need and potential for including more sophisticated uses of technology (Warschauer & Matuchniak, 2010). However, teaching and learning throughout the nation has continues to be provided through traditional large-group instruction and individual
learning of the core content areas (Gray, et. al., 2011). This has been further supported by the
data from the Gallop and NewSchools Venture Fund report (2019), which showed at least one-half of teachers surveyed believed digital tools were more effective than non-digital tools for personalizing instruction (57%) and engaging students (52%). However, fewer than one-half reported they were more effective than non-digital tools for giving students ownership of their learning (45%) and helping students to learn (30%). Despite believing technology was at least as effective as non-digital tools for personalizing lessons and engaging students, it was not being adequately leveraged as a learning tool for maximizing student potential (Okolo & Diedrich, 2014). With that in mind, those with a vested interest – including parents and educators – should be considering how to incorporate the digital tools used by students into the teaching and learning experience (e.g., gaming, social media, text messaging, etc.). Although applying intensive teaching before considering more support has been consistent with the legal mandates that schools must follow to ensure students are educated in the least restrictive environment (20 U.S.C. §300.314), within our ever-changing world, where children have become more deeply immersed in digital technologies, education needs to embrace the tools that allow students to access curriculum content in a way that best meets their needs while concurrently and intensively teaching strategies that can be applied with and without technology. Allowing students to bring their personally owned technology and the eventual rollout of 1:1 technology in many school districts during the COVID-19 pandemic had a major impact on their ability to access and engage in schoolwork using digital tools and the built-in accessibility features or supplemental apps that allowed students with disabilities to blend in with their peers. However, this has not been the case for most students.
**Background**

Within IDEA 2004, assistive technology (AT) can refer to devices or services, but this study will primarily refer to AT as equipment. At the core, the definition found within IDEA 2004 indicated assistive technology could be *any item* used to “increase, maintain, or improve the functional capabilities of a child with a disability” (34 CFR 300.5). This ambiguity offered professionals the ability to creatively consider an open-ended range of technology that could be needed for academic achievement, but also came with pitfalls. Hook et al., (2014) warned, “AT developed to meet the needs of a homogenized population can fail to address the specific and complex needs of individuals” (p. 598) and often resulted in individuals being given assistive technology that only provided partial solutions that may have needed to be further customized or modified before it could be used effectively.

Many of the digital technologies perceived as assistive technology for students with disabilities have benefited all students (e.g., computer-based concept mapping, virtual manipulatives, and software programs), so the distinction between assistive technology for students with disabilities and educational technology became increasingly blurred (Bouck, 2010). The same piece of equipment could have simultaneously been identified as assistive technology and included in an IEP for one student with disabilities, and then considered instructional technology for other students (King-Sears & Evmenova, 2007). For example, digital audio versions of print textbooks were a form of assistive technology when needed by students who had visual impairments or a print disability, but it was a form of instructional technology for students who preferred digital textbooks to reading the original text (King-Sears & Evmenova, 2007).
Because of the greater availability of technology in schools and the increased use of instructional technology (Michels, 2019), the technological needs of students in public schools have expanded and changed (Jobrack, 2011; Michels, 2019). Further, supporting students with learning challenges has become essential to their academic success, and AT generally has not been implemented effectively (Lamond & Cunningham, 2019). In schools, technology has often been used for a variety of simple purposes, such as the delivery of instruction, the composition of written assignments, or the curation of information from the internet (Cumming & Draper Rodriguez, 2017; Harper, 2018; Hew & Brush 2007; Michels, 2019). For more than 20 years, technology has provided increased access to academic content and greater independence for students with disabilities (Cumming & Draper Rodriguez, 2017; Edyburn & Edyburn, 2012; Wehmeyer et al., 2008). Increasingly, schools provided 1:1 technology as a tool for engaging in instruction with general education students, and students with moderate to severe disabilities who were eligible for special education received assistive technology needed for making educational progress (Hew & Brush, 2007; Liu et al., 2017; Yadav et al., 2018). However, there has been a middle ground between instructional and assistive technology where technology was not being used consistently or effectively within K-12 classrooms to mitigate barriers to learning (Cumming & Draper Rodriguez, 2017; Smith & Okolo, 2010).

The theory of the diffusion of innovations (Rogers, 2003) has been applied for gaining a better understanding of how and under what conditions technology was used in schools. Rogers’ (2003) diffusion of innovations theory has also been used to help explain the variability in the acceptance of technology innovations across adopter profiles and the factors that could be considered for sustainably accelerating its adoption.
Within the existing instructional frameworks, technology could be integrated along with other supports students need to become independent learners. As part of the multi-tier system of support (MTSS) service-delivery model, a school would proactively provide a comprehensive range of supplemental instruction and interventions that would increase the time and intensity of instruction at each tier (Gamm et al., 2012). Response to intervention (RtI) has been used as a multi-tiered approach to the early identification and support of students with learning and behavior needs (RTI Action Network, n.d.). Positive behavioral interventions and supports (PBIS) have been provided as an evidence-based, three-tiered framework designed to improve and integrate all the data, systems, and practices that could affect student outcomes and create schools where all students succeed (Center on PBIS, n.d.). With universal design for learning (UDL), all learners have the ability to access and participate in meaningful, challenging learning experiences across all disciplines or domains through a framework of concrete suggestions (CAST: About Universal Design for Learning, n.d.). UDL could be used to create a foundation for removing or reducing learning barriers by tailoring instruction and student supports to specific learning needs, where technology is suggested an important component for increasing flexibility within instruction (Gamm et al., 2012). Special education and related services have been provided to eligible students who have been determined to be a child with a disability (IDEA §§300.304 through 300.311), which may include the provision of assistive technology.

In order to make the process more seamless for students and educators alike, there is a need for a useful ecological framework that aligns the existing components and practices (e.g., MTSS, RtI, UDL, instructional technology, differentiation, assistive technology, PBIS) that could be further supported systemically for addressing diversity of student needs (Basham, 2010). Integrating technology within the instructional design (i.e., lesson planning) from the
beginning would allow educators to maximize their students’ ability to select the tools and accessibility options needed to focus on and engage more deeply in the content. However, ineffective practices when using technology has often led to abandonment (Kintsch & Depaula, n.d.) or technology becoming the focal point rather than as a tool for providing equal access and increasing independence, engagement, and achievement.

**Purpose of the Study**

The purpose of this explanatory, sequential, mixed-method study was to examine the perceptions and use of digital technology by educators to support the needs of students with disabilities attending K-12 classrooms and the correlation between the assistive technology knowledge, skills, and needs of K-12 educators within Pennsylvania. A two-phase explanatory, sequential, mixed-methods design involved collecting quantitative data first and then explaining the quantitative results with in-depth qualitative data (Creswell & Plano Clark, 2017). In the quantitative phase of this study, survey data was collected from educators of K-12 students in the state of Pennsylvania to examine their perception, experiences, type of training, comfort, and knowledge of digital technology with students with disabilities. In the second, qualitative phase, semi-structured interviews were conducted as a follow-up to the quantitative results to help explain how the perception, experiences, training, and overall familiarity with technology impacted the extent to which digital technology was considered, customized, and used by students with disabilities. In the exploratory follow-up, the data from the qualitative and quantitative phases were used to explore training and support needed to help educators problem solve, match available features to needs, and select AT for students.
Problem Statement

Technology has become ubiquitous and profoundly influenced how we complete tasks, collaborate with others, and communicate with one another (Jobrack, 2011, Cumming & Draper Rodriguez, 2017), and yet, it has not been used to its fullest potential within the academic setting to mitigate barriers to learning and achievement. Not to mention, having access to technology for students with disabilities has been the key to its effectiveness (Bouck, 2010). According to the 2016 Digital Education Survey, some gaps have existed between teachers’ perceived benefits of educational technology and the frequency of its use. When asked whether technology made a positive difference for students, 72% of teachers felt it made a difference in customizing the learning experience. However, only 38% of teachers used technology to accomplish this at least 3-4 days per week. Although technology cannot replace pedagogy or good teaching, the results from this survey suggested instructional technology was not used consistently to mitigate barriers to learning (2016 Digital Education Survey).

Many school districts provided technology to their students in a multi-phase, 1:1 rollout to increase engagement in learning content, which was expedited by the pandemic (Hankerson et al., 2021). However, because digital technology has included accessibility features that can be used to personalize the user experience, the distinction between 1:1 technology and assistive technology (AT) has become less clear (Bouck, 2010). Further, many educators could not clearly define when education technology became assistive technology for students who needed the built-in features for “improving, maintaining, or increasing functional performance” (IDEA, 2004).
Research Questions

The following research questions were used to guide this mixed-methods study:

1. How did educators perceive the use of educational and assistive technologies for addressing the needs of students with disabilities?
   a. What were their experiences with educational and assistive technologies?
   b. What did educators perceive as factors that influence AT integration?

2. What knowledge and skills did educators perceive would facilitate the use of assistive technologies?

Significance of Methods

An explanatory, sequential, mixed-methods design was chosen as a straightforward method designed to collect data using a survey instrument during the quantitative phase, with follow-up on specific results gathered during interviews as part of the subsequent qualitative phase in order to help explain the initial quantitative results in more depth (Creswell & Plano Clark, 2017). Using the explanatory, sequential, mixed-methods design allowed further explanation of identified trends and comparison in the perceptions and implementation of digital technology among participant groups. Integration of the data gathered in this study involved connecting the results from the initial quantitative phase to help plan the follow-up qualitative data collection phase (i.e., interviews). Integration of data occurred at two points during the implementation procedures of an explanatory, sequential, mixed-methods study (i.e., between the qualitative and quantitative phases, and after quantitative and qualitative data are collected). This included determining what questions needed to be further probed and which individuals would be sampled to best represent and explain the quantitative results (Creswell & Plano Clark, 2017).
Definition of Terms

Terms directly related to current research have been defined below and were used throughout this study:

**Assistive Technology (Assistive tech or AT)**

The definition for assistive technology has been worded the same or similarly in several pieces of legislature but amendments to special education under IDEA to has specifically linked the consideration of AT to the Individualized Education Plan (IEP) process (DeCoste & Bowser, 2022). Assistive technology in IDEA (Pub. L. No. 108-446) can refer to devices or services. An assistive technology device has been defined as “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 functional capabilities of a child with a disability” (20 U.S.C. §1401(1)). For this study, the term was used to only describe digital technology devices (e.g., tablet, computer, smartphone) that could be used as a means to increase, maintain, or improve the functional capabilities of an individual with a disability.

**Educational Technology (Ed Tech)**

In K-12 settings, “educational technology” and “instructional technology” have often been used interchangeably. Educational technology or instructional technology can be referred to as the use of technologies – such as digital devices, computers, and software applications – that facilitate learning. Instructional technology involves using different forms of technology to enhance instruction and learning (Kauffman et al., 2011). According to Seels and Richey (1994), instructional technology has been the theory and practice of designing, developing, managing, and evaluating learning resources and processes. For this study, the term “educational
technology” was used to describe digital technology used to engage in instruction and curriculum.

**Information Technology (InfoTech)**

Informational technology (“InfoTech”) has been used as an umbrella term for technology that encompasses the components of computers, networking hardware, software, and network devices that have been the backbone through which educational and many assistive technologies could be delivered (CITES Framework Field Guide: Leadership, 2021).

**Inclusive Technology**

Inclusive educational technology, or “inclusive technology,” has been an emerging term in the field and has often been used by the Center on Inclusive Technology and Education Systems (CITES) and Center for Applied Special Technology (CAST). CAST has been a nonprofit research and development organization dedicated to promoting a universal design for learning (UDL) framework that could be used to provide educational opportunities to all learners, especially those with disabilities. CITES at CAST has been creating and disseminating an evidence-based framework that would help instructional technology and assistive technology programs at local education agencies combine their efforts to make technology work better for students (CITES, n.d.).

Inclusive, accessible technologies have been universally designed to be directly usable or made usable by assistive technology (CITES Framework Field Guide: Leadership, 2021). When the built-in options of technology devices and software have been determined to be insufficient to meet a student's individual needs, interoperability with the assistive technologies would be essential.
Child with a Disability, as defined by IDEIA 2004

A “child with a disability” has been defined within IDEA as a child evaluated in accordance with §§300.304 through 300.311 who has an intellectual disability, a hearing impairment (including deafness), a speech or language impairment, a visual impairment (including blindness), a serious emotional disturbance (referred to in this part as “emotional disturbance”), an orthopedic impairment, autism, traumatic brain injury, another health impairment, a specific learning disability, deaf-blindness, or multiple disabilities, and who, by reason thereof, needed special education and related services. All eligible children with disabilities have the ability to receive a free and appropriate public education, along with special education and related services, under the IDEA (20 U.S.C. §1401), which could include the provision of assistive technology when appropriate.

Limitations

There were limitations attributed to researcher positionality, as a professional with more than 20 years of experience using technology to address the learning challenges experienced by students with disabilities in public schools and an inclination toward pro-innovation bias. Barriers to learning observed during that time included systemic and environmental attitudes about and familiarity with technology, time, training, and motivation. To mitigate risks associated with familiarity, the quantitative data collected using the survey was kept anonymous and a secondary survey was used to collect contact information needed for connecting with volunteer candidates who met the criteria for the follow-up, semi-structured interviews conducted during the qualitative phase.

Another limitation that was considered included factors associated with being the state lead for the AT initiative and regional lead for supporting the speech-language initiative at the
Pennsylvania Training and Technical Assistance Network (PaTTAN) within a statewide network of highly specialized educators (i.e., AT Consultant Network). Professionals in these networks were asked to share the link to the anonymous survey to recruit more participants through a snowball effect. Participants in the study were primarily educators who worked in special education settings and were familiar with the consideration, selection, and use of assistive technology. To mitigate risks associated with familiarity, the quantitative data collected using the survey was kept anonymous. Before engaging in interviews, interviewees were asked to provide their unique perspectives in response to guiding questions during the semi-structured interviews regardless of their experience with technology.

A third limitation was the data pool was limited to educators who taught in public schools in Pennsylvania, so the results may not generalize outside of those factors.

**Summary**

Technology has the ability to enhance teaching and learning and in turn enable students to reach their academic and social potential, engage in personalized learning experiences, and make connections across settings (Gray, et al., 2011). The built-in flexibility of these devices and their associated applications have made them an attractive option for providing support in a variety of areas (Cumming & Draper Rodriguez, 2013). However, even though technology has become increasingly prevalent with its universal design and assistive features, it has continued to be underutilized in educational settings (Lamond & Cunningham, 2019).

Technology has made things easier for most of us and more achievable for individuals with disabilities (Edyburn, 2005), and it may be considered assistive technology for students with disabilities who require it for academic tasks and instructional technology for others. Despite AT's presumed importance in the IEP process, several studies have indicated that
students with disabilities have not been receiving technology devices or services to the extent that might be expected (Okolo & Diedrich, 2014). With the ubiquitous nature of educational technology, the lines between AT and instructional technology have blurred (Michels, 2019). When technology has not been considered as an obvious choice for accessing the curriculum by students with disabilities (Okolo & Diedrich, 2014), it could be difficult to discern when instructional technology needed could to be applied as assistive technology, particularly for students with less severe disabilities. Exploring the perceptions and experiences of educators in their use of educational and assistive technologies in K-12 classrooms with students with disabilities could be used to inform future training needs and targeted technical assistance.
Chapter 2: Literature Review

“Technology continues to profoundly affect the way we work, collaborate, communicate, and succeed. Information technologies impact how people work, play, learn, socialize, and collaborate” (Jobrack, 2011, p. 109).

Overview

Technology has become a driving force that has influenced economic activity, education, and innovation worldwide. With technology becoming ubiquitous in society, it has played an increasingly significant role in the lives of all individuals in the United States, including those with disabilities. Today, when educators think of the terms assistive technology (AT), education technology (ed tech or ET), or universal design for learning (UDL), most have associated them with some form of a computerized piece of equipment or “technology.” However, AT, ET, and UDL have not merely been about the use of technology in education. AT has included a range of “technology” solutions for individuals with disabilities that may have been designed and engineered using some form of technology but did not require a computer chip to function (Simpson et al., 2009). ET has encompassed designing, developing, managing, and evaluating learning processes and resources (Edyburn, 2013; Seels & Richey, 1994), whereas UDL has embraced the flexibility technology has provided, as well as the pedagogy, or instructional practices, used for educating students with and without disabilities (King-Sears, 2009).

Considering what students have needed along the continuum of learning support provided in schools, the need has arisen to take a closer look at the role digital technology has played as a tool for supporting or enhancing effective teaching practices. Additionally, Michels (2019) recommended investigating the gaps in research for addressing how the perceptions and training
of educators affect the consideration process and use of technology by students with disabilities could be applied to future training. To help educators understand the value of integrating technology and how it could be applied throughout the continuum of educational support has required a thoughtful, systematic approach, starting with helping them fully understand when ET becomes AT, including the investigation of the gaps in research for addressing how the perceptions and training of educators affected the consideration process and use of technology by students with disabilities could be used to the development of future training.

**Review of Literature**

A review of the literature was conducted to examine existing research for an overview of how digital technology has been considered or used in the areas of response to intervention (RtI), multi-tier systems of support (MTSS), universal design for learning (UDL), and assistive technology (AT). The themes that emerged from this review of the literature included curriculum accessibility, instructional/educational technology, UDL, AT, and teacher perceptions and professional development. A brief description of RtI, MTSS, UDL, and AT has been provided for further understanding of the continuum of support available to students when technology could be considered as a potential tool and effectively paired with interventions. Rogers’ (2003) Diffusion of Innovations was used as the theoretical framework for helping explain how technology may be integrated within the school environment.

**Background**

Some of the first federal legislation was enacted in the 1970s to ensure students with disabilities had access to education (Day & Huefner, 2003). Federal laws such as the Technology-related Assistance for Individuals with Disabilities Act of 1988 (“Tech Act”) and Education of Handicapped Children Act, passed in 1975, provided guidance on the education of
students with disabilities and in the delivery of AT devices and services (Decoste & Bowser, 2020). During that time, students with disabilities had limited access to education because technology, as we know it today, did not exist, so it was not considered an essential element of general education or the burgeoning field of special education (Day & Huefner, 2003). Before the passage of the Individuals with Disabilities Education Act (IDEA), the curriculum was merely referred to as a general curriculum that all students were expected to master (Wehmeyer, 2006). At present, students with disabilities eligible for special education receive specially designed instruction, accommodations, support, and services as mandated by IDEA 1997 and 2004. These federal laws also stipulated students with disabilities were to be educated in the least restrictive environment possible (34 CFR §300.114-300.120) but must meet eligibility requirements to receive specialized supports and services (34 CFR §300.306(b)), which may include the provision of assistive technology (34 CFR §300.105). Even so, each student’s school environment can vary considerably, and in turn have a significant impact on problem-solving barriers and making decisions regarding assistive technology for individual students (Parette & Peterson-Karlan, 2010).

A lot of effort has been put into increasing the use of technology in schools in the United States over the past decade, in order to foster innovation and global economic competitiveness (McNight et al., 2016). Through federal policies such as Digital Promise, ConnectED and the LEAD Commission, school systems were encouraged to adopt digital conversion initiatives such as 1:1 programs for the rapid integration of technology into the classroom (McNight et al., 2016). The availability of digital technology as a 1:1 device for students was further accelerated by the pandemic, as school districts and other local education agencies had to quickly pivot to safely provide instruction remotely.
In the wake of the pandemic, 86% of teachers reported that schools provided iPads, Chromebooks, or laptops to students at nearly twice the rate (43%) before the pandemic to provide access and close the digital access gaps (Hankerson et al., 2021), which also provided a means for accessing learning management systems and other software and apps needed for interacting with their curriculum remotely. In Pennsylvania, more than 770 eligible school entities received a total of $150 million under a formula outlined in Act 30 of 2020, a state law that authorized the state to use CARES Act funding for purposes that included the purchase of education technology for distance learning (Smith, 2021). Additionally, the pandemic brought to light the inequities in the provision and use of educational technology (Smith, 2021). Having access to technology is an important first step in the digital conversion of school systems; however, for the conversion to be successful, it's crucial to focus on how technology can enhance instruction and learning (McNight et al., 2016).

While the benefits of technology can be enormous for students with disabilities and can help resolve many of the challenges they face (Bouck, 2010), in practice, assistive technology has been more readily provided to students with moderate to severe disabilities who have blatant needs for accessing curriculum than to students with mild disabilities (Thomas et al., 2019). This has often been attributable to a variety of barriers, including a lack of knowledge and understanding of the universal benefits of technology when paired with effective practices. When technology has been incorporated into the instructional design (i.e., lesson planning) from the beginning, educators have been able to provide their students with the tools and accessibility options needed to concentrate on and engage with the content in a more meaningful way.
Related Studies

Similar studies examined the knowledge, skills, and perceptions of general education teachers, special education professionals, and related-services providers of assistive technology for students with disabilities within other states (Michels, 2019, Lamond & Cunningham, 2019, Okolo & Diedrich, 2014, Williamson-Henriques, 2013) and the Department of Defense (Marsters, 2011). Most of these studies were conducted more than eight years ago, not long after the release of the iPad (in January 2010; Apple, 2010) and Chromebook (in May 2011; Android Authority, 2021). Findings from these studies suggested teachers had a positive view of assistive technology (Okolo & Diedrich, 2014) and understood the importance of using assistive technology with students with disabilities (Williamson-Henriques, 2013). Teachers with higher levels of computer literacy and assistive technology knowledge were more inclined to perceive assistive technology as more beneficial (Lamond & Cunningham, 2019), and there was generalized variation in perceptions between subgroups as to the types of training support needed to support the use of assistive technology (Michels, 2019).

Other findings from studies revealed educators had low ratings of their knowledge of specific assistive technology uses and functions and had mixed impressions of the technology support they received (Okolo & Diedrich, 2014). While special education professionals had assistive technology knowledge specific to their profession, the quality and depth of their assistive technology knowledge were similarly limited (Marsters, 2011). The lack of resources, limited planning time, inadequate technical support, disjointed training, poor infrastructure, and uncertainty of how to use AT within their subject domain left general education secondary teachers feeling unprepared for the effective use of devices (Williamson-Henriques, 2013). Training was identified as an ongoing need, including professional development for specific
groups (e.g., administrators, specific teachers/districts, etc.) tailored to a specific technology (e.g., apps, general implementation, etc.) or in specific formats (e.g., online or on-demand learning) to increase the understanding the value of integrating technology, as well as how it could be applied throughout the continuum of support (Michels, 2019).

**Educational Support**

The interrelationship between RtI, MTSS, UDL, instructional or educational technology, and assistive technology has provided increasing support to all or just a few students, depending on which model has been applied or to what degree support has been needed. MTSS has been established as a standards-based, comprehensive school improvement framework that supports all students’ academic, behavioral, and social-emotional growth. Many of the interventions, strategies, and frameworks have aspects fall within one or all of the MTSS tiers (Gamm et al., 2012).

Response to Intervention (RtI) has been a method of assessing the student’s growth rate and level of performance, rather than ability-achievement discrepancy as part of a comprehensive Specific Learning Disability (SLD) identification process (PaTTAN - Response to Intervention (RTI), n.d.). Pennsylvania has been just one of many states that have used this RtI approach. An ecological variation of RtI described by Basham et al. (2010), suggested seamless support for all students withing a tiered framework that provided scientifically based instructional strategies, proactive instructional design, and purposeful use of technology. Schools have been required to demonstrate they have implemented a technically adequate MTSS model to improve academic outcomes for all students and to make empirically based decisions as part of the SLD determination process (PaTTAN - Response to Intervention (RTI), n.d.). Principles for providing support to students proposed by Ford et al. (2001), included focusing on functional
skills for all students, individualization, and educational schedules and placements that would be inclusive and not stigmatizing, as well as provide opportunities for students to feel a sense of accomplishment, and teach practices that respectfully and responsively address the needs of each student (Hitchcock & Stahl, 2003).

According to Wehmeyer (2006), students with severe disabilities needed to be educated in general education classrooms because they would make more progress and benefit from peer-mediated learning strategies. Physical presence was an important part in accessing the general education curriculum compared with attending separate classrooms (Spooner et al., 2006). However, differentiated instruction of the curriculum was limited by the ability of school personnel to identify and modify the curriculum and instruction needed to meet such complex learning needs (Spooner et al., 2006). The collaboration of general and special education personnel led to students with disabilities receiving special education services having greater access to general education expectations and more opportunities for interaction with non-disabled peers (Staples & Edmister, 2014). Although general and special education teachers collaboratively adapt curriculum and classroom procedures to meet the needs of students with disabilities, general education teachers have a wider range of learning needs to consider (Mahoney & Hall, 2017).

Gilmour et al. (2019), pointed out it should not be assumed that exposure to a grade-level general education curriculum leads to improvement for all students with disabilities, and accommodations were not enough to improve academic outcomes for those students. Ensuring progress means all teachers – including those teaching general education – know how to provide accommodations and modifications through pedagogy and practices that reflect a universal
design and high expectations. Within education, pedagogy must include evidence-based practices, but technology can be a tool programmed and designed to fit many purposes.

While the intention of inclusion has been to provide access to the general education classroom for students with disabilities, there were significant questions about whether these students have gained full access to the curriculum (Edyburn & Edyburn, 2012). The findings of a meta-analysis done by Gilmour et al. (2019), revealed a 3-year difference in the reading abilities of students with disabilities compared with their non-disabled peers. Such a gap raised concerns about whether students with disabilities could meaningfully access the general curriculum. Providing access to the general education curriculum to students with severe disabilities did not automatically ensure progress, nor did their presence in a general education classroom ensure inclusion, primarily because students with severe disabilities have not been provided the accommodations and curriculum modifications that would enable them to benefit from that access (Wehmeyer, 2006). A universally designed curriculum specifically designed, developed, and validated to meet a full range of students’ needs could address a wide range of sensory, motor, cognitive, linguistic, and affective abilities and disabilities rather than a narrow range of students in the “middle” of the population (Hitchcock & Stahl, 2003).

**Curriculum Accessibility**

Special education was traditionally intended to deliver specialized educational services to meet unique goals that differed from those of general education (Hitchcock & Stahl, 2003). Special education services have now been aimed at aligning students' skills and abilities within the existing general education system (Hitchcock & Stahl, 2003). All students, including those with severe disabilities, benefitted from instruction provided in general education classrooms because they made more progress and benefitted from peer-mediated learning strategies.
(Wehmeyer, 2006). Evidence suggested when general and special education teachers work collaboratively, curriculum content in self-contained classrooms more closely resembled a general education classroom and there were more opportunities for students with disabilities to interact with non-disabled peers (Staples & Edmister, 2014).

To address a wide range of learning needs in the classroom, educators were called upon to change practices and increasingly consider ways to make the curriculum more universally accessible (Shaheen & Lazar, 2018). For progress to be achieved, all teachers needed the knowledge and skills to provide accommodations and modifications that reflected a universal design and high expectations (Wehmeyer, 2006). When curriculum modifications were provided, students with disabilities were more engaged academically and exhibited fewer behaviors that impeded learning and required teachers to employ classroom management techniques (Lee et al., 2010). When providing access included accommodations, modifications, universal design, and assistive technology, students could engage in any content at varying levels and would be able to participate in a wider range of discussions with peers (Hitchcock & Stahl, 2003).

**Inclusive Practices and Differentiated Instruction**

According to Boyle and Kennedy (2019), instructional practices in inclusive classrooms helped students meaningfully access and actively participate in the general education curriculum. The inclusion of students with disabilities in the general education classroom was one of the ways for ensuring they were educated in the least restrictive setting (Mahoney & Hall, 2017). Differentiated instruction was a method used by teachers to provide a supportive learning environment with a high-quality curriculum and instruction in response to the learning needs of each of their students (Mahoney & Hall, 2017). To address the broader needs found in general education classrooms, general education teachers needed to work collaboratively with special
education teachers to provide adaptation of curriculum or classroom procedures for students with disabilities (Mahoney & Hall, 2017). To achieve this, materials, methods, and assessments must be designed from the start to be flexible and offer support for diverse learning styles (Hitchcock & Stahl, 2003).

Integrating technology that combined necessary features for instruction and learning as well as applying a universal approach when planning and designing lessons could help teachers more readily address the broad range of diverse learning needs found within their classrooms (Lee et al., 2010). When technology was matched to the curriculum and intended skills, it offered students with disabilities the opportunity to be actively engaged in classroom activities and make meaningful progress (Lee et al., 2010). However, for the technology to be used effectively, teachers would need to provide instructional feedback and guided practice as the students to become increasingly proficient in the use of new technology in the context of curricular activities (Okolo & Diedrich, 2014).

**Technology Integration Within School Supports**

Historically, technology in education was thought of as assistive technology (AT) because of its use by students with disabilities (Edyburn, 2013). However, regardless of ability, technology applied to teaching and learning would be referred to as educational (or instructional) technology (Edyburn, 2013). Starting at the level of general education, an increasing amount of school support can be provided along a continuum to provide the right amount of assistance students need for learning. Included within the framework are Multi-Tiered Systems of Support (MTSS), Response to Intervention (RtI), Universal Design for Learning (UDL), and special education, with the latter including specially designed instruction, assistive technology, and related services (Choi et al., 2020).
Within the framework of the MTSS, technology may be used within any of the tiers, but how it is used to access the curriculum plays a role in differentiating between instructional and assistive technology (Michels, 2019). To integrate technology within the principles of RtI, Smith and Okolo (2010) suggested various ways technology could be aligned with specific types of effective instruction and, therefore, strengthen the RtI framework while also enhancing its use as a tool for students with learning disabilities. In particular, they argued the features of explicit instruction were best supported by existing technology, including “increased practice in basic skills, increased academic learning time, feedback and review, and systematic progress monitoring” (Smith and Okolo, 2010, p. 267). Similarly, UDL has exploited the use of technology as a method for increasing engagement and flexibility in instructional delivery, which inherently increases accessibility (Michels, 2019).

**Educational Technology (ET)**

Because of the ubiquitous nature of mobile technology, schools have been increasingly providing technology for classrooms as well as for students to use as 1:1 technology. Educational technology combined with built-in features has allowed for a more personalized user experience while increasing flexibility and accessibility, as well as providing opportunities for review and practice (Smith & Okolo, 2010). Findings from the Project Tomorrow’s Speak Up Research Project for Digital Learning indicated high school students with assigned access to a laptop were more likely to use those devices to personalize their learning process, stay organized, and leverage the technology for more enhanced learning experiences than their peers with no access or only sporadic access (Evans, 2018). And students with disabilities demonstrated statistically significant growth in their reading achievement when using educational technology that included features that increased their access to learning content and helped them feel more engaged in the
literacy activities (Hall et al., 2015). Additionally, when a curriculum-based assessment was built into educational technology, it provided teachers with immediate data collection and analysis needed for progress monitoring and making timely decisions about individualized changes that allowed for greater student progress. Selecting technology that enhances or aligns with the curriculum outcomes should not only complement students’ learning but also truly promote their learning (King-Sears & Evmenova, 2007).

**Universal Design for Learning (UDL)**

When accessibility was considered from the standpoint of removing barriers or adding specific features for individuals with disabilities, UDL offered guidelines for designing environments that can be fully experienced by all (Gossett et al., 2009). Compared with the discrepancy model often used to determine eligibility for special education services, UDL used a completely different stance on the use of technology that emphasized educators should be proactive and flexible in addressing the diverse learning needs of their students (Nepo, 2017). By focusing on flexibility and reducing barriers to learning, UDL stipulated students learn differently, and suggested that students with disabilities – including sensory impairments, learning disabilities, and language and cultural differences – needed environments that support their learning styles (Rogers-Shaw et al., 2018). The key principles of the UDL framework emphasized considering the needs of all students by providing multiple means of engagement, representation, and expression. By using the UDL framework and changing pedagogy, all students could potentially be educated together rather than segregating students with disabilities into separate, self-contained classrooms. Integrating the use of technology would allow all students to take advantage of built-in features that would address a range of learning and offer increased accessibility (Nepo, 2017). One of the reasons why UDL could be implemented today
compared to 1950s or 1970s is that digital technology has provided a high degree of flexibility (Edyburn, 2010). When all students used the same technology in the classroom, it was less stigmatizing for students with disabilities who needed technology for learning and independence. However, the challenge has been to balance the accessibility needs of specific disability groups while maintaining the features of universal design (Gossett et al., 2009).

**Assistive Technology (AT)**

Despite being related, assistive technology (AT) and accessible technology have important differences. The main difference between AT and accessible technology is that AT is specifically designed for disabled people with particular needs (Shaheen & Lohnes Watulak, 2019). When considering AT as a tool or means for accessing the curriculum, a range of no- to high-tech options could be considered, which would also allow teachers to select the tools for that would meet the demands based on a student’s needs and preferences (Zabala, 1995, 2005). Making decisions about compatibility would involve evaluating not only the student’s strengths and needs, but also his or her attitude and interest in it (Zabala, 1995, 2005). This would include considering factors like ensuring the student does not feel stigmatized by using AT that would cause them to stand out from other students, and in turn, lead to abandonment (Bouck, 2010). Teachers would also need to stay focused on the goal of what they would like their students to learn or accomplish, as well as consider the most effective method of access and engagement in the curriculum. For example, to participate in an academic or life skills curriculum, students would need to perform tasks that require them to “remember, interpret symbols, do something, or say something” and must have the ability to use or have access to tools needed to meet educational tasks demands (Parette & Peterson-Karlan, 2010, p. 76). When applied as an intervention strategy, the use of AT has led to improved IEP goal and objective achievement for
students who were having difficulty achieving IEP goals through standard classroom interventions (Watson et al., 2010).

While AT has availed itself of increasing the potential and independence of students with disabilities, keeping pace with rapid changes in the face of determining what students need for accessing and engaging in the curriculum has resulted in increased complexity when including it during decision-making (Thomas et al., 2019). In practice, technologies for students with disabilities have failed to live up to their proclaimed potential for many reasons, including (1) inadequate understanding of the technologies, and (2) a lack of attention to contextual factors related to their use (Bouck, 2010). Additionally, fast-paced innovations have resulted in professionals’ knowledge being limited by an inability to keep up with rapid changes (Thomas et al., 2019). These barriers have made the implementation of AT challenging and limited possibilities for students with disabilities. However, the best way for AT and special education to be effectively used has been through a team approach accompanied by ongoing professional development that addressed the integration of technology (Staples & Edmister, 2014).

**Collaboration**

The collaboration between special education teachers and general education teachers was associated with academic and social success for students with disabilities enrolled in general education (McLaren et al., 2007). When bringing together educators from multiple relevant areas, this collaboration improved understanding of problems by enabling the exchange of perspectives and the formulation of new ideas not considered by a single-discipline group (Boger et al., 2017). General education teachers have often established grade-level or content-specific teams for increased efficiency and continuity. Within special education, multidisciplinary teams
have been dedicated to addressing the individualized needs of students who were eligible for receiving more intensive services and support.

Staples and Edmister (2014) provided an example of the benefit when general and special education teachers worked collaboratively. In their study, this interdisciplinary collaboration resulted in the daily schedule and the curriculum content of the self-contained classroom more closely resembling that of a general education classroom. Additionally, the class library included a wider array of popular grade-level books, and there were more opportunities for peer-mediated learning when students were merged during co-taught literacy instruction. A multidisciplinary team model helped professionals recognize educational challenges from different perspectives for a more comprehensive approach to the effective implementation of AT by students in special education (Watson et al., 2010). Through transdisciplinary collaboration, problems were understood holistically and transformed into innovative, impactful, and transformative solutions (Boger et al., 2017). Using a transdisciplinary model, students with disabilities received greater benefit from comprehensively embedding instruction throughout the day that could be accessed using technology and consistently implemented by all the professionals on the team (Staples & Edmister, 2014).

**Teacher Perceptions and Use of Technology**

More than 30 years after the passage of the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (“Tech Act”), many educators have continued to be underprepared for implementing AT and unclear as to when existing technology should be further customized, or lessons modified, to address diverse student needs and increase engagement (Decoste & Gayl Bowser, 2020). Teacher perception and attitude toward technology have been key factors in the use of technology in classrooms (Marsters, 2011; Williamson-
Henriques, 2013; Okolo & Diedrich, 2014). While technology has offered enormous potential, expectations that exceeded what it could do led to feelings of frustration, dissatisfaction, or abandonment (Bouck, 2010; Van Schyndel et al., 2014).

Although educators have frequently used technology in their personal and professional lives, it has been used less during the instruction of students with disabilities (Okolo & Diedrich, 2014). Teachers who perceived AT to be more useful had higher levels of computer literacy and AT knowledge (Lamond & Cunningham, 2019). Although teachers had positive attitudes toward the use of AT, there was minimal consideration for supporting its use, particularly with students who had disabilities (Okolo & Diedrich, 2014). In the absence of positive attitudes toward technology, its use and potential to assist students with disabilities was severely limited (Bouck, 2010). If educators applied their generalized understanding of the technology they used outside of the classroom, it could increase their confidence in investigating solutions that would lead to better outcomes. In a study by Williamson-Henriques (2013), teachers realized the importance of using AT, but they felt unprepared to use devices effectively because of a lack of resources, limited planning time, inadequate technical support, disjointed professional development, uncertainty as to how to use devices, and poor infrastructure.

The lack of support during implementation of AT and lack of input during the decision-making process were other reasons why AT was abandoned or not used (Bouck, 2010; Van Schyndel et al., 2014). Other barriers to the widespread use of AT included the need for additional professional development, better access to technology, and more funding (Okolo & Diedrich, 2014). Therefore, it was essential for educators to receive the training and tools needed to develop a greater understanding of the characteristics of accessibility, as well as how to
modify materials to meet the needs of students and teach them the skills necessary for lifelong learning.

**Teacher Perceptions and Professional Development**

According to a study by Lamond and Cunningham (2019), teachers who perceived AT to be more useful had higher levels of computer literacy and AT knowledge. Barriers to implementation and use included student factors and a lack of training specific to classroom use or with students, and the software or devices themselves (for basic troubleshooting). Findings from a study by Marsters and Burke (2011) showed the knowledge and skill level of special education teachers and related services professionals was highest for using low-tech devices to support writing but lowest for using high-tech equipment needed for students with vision, hearing, and severe communication disabilities. The variability in the implementation of technology has been attributed to many factors, including the teacher’s perception, knowledge and skill level, training, and support.

Amid problem solving, teachers have tended to look for ways to quickly resolve problems and may have overlooked solutions to educational barriers that involved changing pedagogy (Mahoney & Hall, 2017). Moreover, special educators have needed a clearer understanding of pedagogy and how best to support their students’ individualized needs in relation to the curriculum, task demands, offering plentiful opportunities to learn, and mitigating barriers through the integration of technology (Thomas et al., 2019). Staples and Edmister (2014) examined, the combination of the ongoing professional development (PD) in literacy instruction, increased integration of technology, and collaborative efforts of the team led to a daily schedule that provided richer and more frequent literacy opportunities.
Relative to the value of PD and the needs of the field, the results of the study completed by Michels (2019) showed generalized variation between subgroups. District special education (SPED) administrators perceived services around PD and low incidence services (i.e., evaluations, equipment loans/training) as most beneficial, whereas non-SPED administrators found ongoing student support the most beneficial, and at the district level, coaching around student-related technology was found to be the most beneficial. Across the various groups, responses highlighted PD/training as an ongoing need, including PD for specific groups (e.g., administrators, specific teachers/districts, etc.) tailored to a specific technology (e.g., apps, general implementation, etc.) or in specific formats (e.g., online or on-demand learning). The challenges faced by students with disabilities and their teachers could not be addressed using assistive technology without proper training (Bouck, 2010).

**Theoretical Framework**

Theory can help human beings envision new possibilities and can play a key role in helping us see the world in different ways (Wilson, 1997). According to Wilson (1997), theories should not only fit the data, but they should also fit the surrounding theories and underlying philosophies of other disciplines. When multi-disciplinary teams have come together to problem-solve barriers to learning and match the features of technology to the educational needs of students attending public schools, a framework for theoretical inquiry could include the theory of the diffusion of innovations (Rogers, 2003). Using concepts and frameworks from different disciplines have helped develop theories that were more relevant and contextual, and made the research more relevant (Wilson, 1997). Although innovation or advances in technology may have reflected creative problem solving, it typically has not provided sufficient evidence for guaranteeing effectiveness within the educational setting (Edyburn, 2013).
Rogers’ Theory of the Diffusion of Innovations

Rogers’ (2003) theory of the diffusion of innovations has been a widely used theoretical framework for explaining the variations in the acceptance and use of innovations, such as technology (Sahin, 2006). It has also been used to explain the gradual introduction, awareness, and adoption of ideas or practices within a social system. Rogers (2003), defined diffusion as, “the process in which an innovation is communicated through certain channels over time among the members of a social system” (p. 5). Although diffusion theory has been applied to many fields, Rogers’ theory of the diffusion of innovations has been adopted by researchers who have sought to understand interpersonal influence, persuasion, and propaganda processes, as well as those interested in the spread and social significance of information and communication technologies (Rogers, 2003).

Bouck (2021) pointed out that evidence from academia, disability rights advocates, and the federal government has suggested that the “diffusion of technology accessibility in K–12 has been slow” (p. 86). While theories such as andragogy, Vygotsky’s zones of proximal development, or systems theory could be applied to understanding the perceptions and use of technology in schools, Rogers’ theory of the diffusion of innovations has often applied to better understand persistent problems with slow adoption (Rogers, 2003), such as with assistive technology in education. According to Rogers (2003), the goal of diffusion theory studies has typically been to speed up the process of diffusion, particularly from the standpoint of examining the problem of an innovation that appeared to be beneficial, had benefits to its users, but did not have many users (McGrath & Zell, 2001). Considering the sluggish integration of assistive technologies during the past 20 years (Okolo & Diedrich, 2014; DeCoste & Bowser, 2020; Bouck, 2021), it merited an investigation into what factors would accelerate its adoption, so that
it could benefit all students and make more specialized solutions easier to provide. In Diffusion of Innovations, Rogers’ (2003) described common traits that provided distinctions between groups of “early adopters, early majority, late majority, and laggards” in terms of their innovativeness (Rogers, 2003; Sahin, 2006), and the adoption of technology has had less to do with age compared with a proclivity toward gadgets or the cost-benefit of trading money for time (Edyburn, 2013; Rogers, 2003).

There were five steps in the innovation-decision process in this framework – knowledge, persuasion, decision, implementation, and confirmation – that proceeded in a time-ordered manner (Rogers, 2003; Sahin, 2006). Although an innovation may have been invented a long time ago, it may still be innovative to an individual who has perceived it as new (Sahin, 2006). While accessibility features offered in digital technology were not new, they were re-emerging as an innovative technology that have yet to be widely adopted and used by all educators in public schools. The combination of concepts in social learning theory embedded within the various elements of Rogers’ (2003) Diffusion of Innovations provided a framework for understanding the boundaries, processes, and training needed by public school educators and the practical implications of technology integration. This theoretical framework was used to guide the investigation for identifying educator perception, type of training, and the comfort and knowledge of digital technology related to the consideration and use of technology by students with disabilities attending regular education classrooms. Problem-solving, learning, and motivation all play a role when choosing to personalize learning, mitigate barriers, and optimize the overall experience by integrating technology.
Summary

Although technology has advanced at a rapid rate and mainstream technology has offered a universal design for reaching a broader market, a review of literature from the last 20 years reflected pervasive problems in addressing the needs of students with disabilities despite the possibilities for maximizing outcomes by integrating technology within instructional practices. The use of technology for students with disabilities could provide means to engage in content areas (e.g., literacy, mathematics, science, and social studies), which otherwise would not be achievable (Bouck, 2010). If viewed as a continuum, the interrelationship between RtI, MTSS, UDL, educational technology, and AT has offered increasing levels of support to a range of students. Incorporating assistive and educational technology into meaningful and well-designed instruction could promote learning for students with and without disabilities (King-Sears & Evmenova, 2007). When pondering when educational technology has become assistive technology (AT), the answer could seem obvious to those who know the legal definitions for AT. However, the literature and anecdotes from the field confirmed this shift remained unclear as to when 1:1 devices broadly available to each student should be specifically listed as assistive technology in a 504 plan or IEP. Rogers’ (2003) Diffusion of Innovations provided a conceptual framework for understanding where educators were in their acceptance of technology and the innovation-decision process that can be used to develop training and support in a way that would allow them to feel better prepared as to how consider and use the digital technology (or its accessibility features) needed for student achievement and independence.
Chapter 3: Methodology

“Technology for students with disabilities can only be used if students actually have access to it” (Bouck, 2010, p. 96).

Overview

An explanatory, sequential, mixed-method design was used as a straightforward design consisting of an initial quantitative phase followed by a subsequent qualitative phase that helped to explain and provide additional context to the quantitative results (Creswell & Plano Clark, 2017). Using this approach, quantitative and qualitative data were collected and analyzed to provide a more in-depth picture of the perceptions and use of digital technology by educators with students who had disabilities to mitigate barriers to learning. In the first, quantitative phase of the study, participating Pennsylvania educators in public schools who taught or provided support to students in grades K-12 with IEPs and 504 plans were asked to complete a survey that included closed- and open-ended questions (e.g., demographics, perceptions of technology and accessibility features, the technology used, etc.). In the qualitative follow-up during phase two, results from 11 participant interviews were transcribed verbatim, coded by themes, and then sorted into categories and analyzed to provide additional depth to the identified trends, perceptions, and practices regarding technology perceptions and use found within phase one. Figure 3.1 provides a flowchart representing the explanatory, sequential, mixed-methods design used in this study.
Setting

The teachers surveyed and interviewed for this research study were set within Pennsylvania, who served students in grades K-12, including students who received transition services. The Commonwealth of Pennsylvania had 500 school districts that ranged in size from approximately 200 students to more than 140,000 students. During the 2018-2019 school year, Pennsylvania's 500 school districts and approximately 180 charter schools served 1,723,405 students, which represented 17.3% of the total enrollment. Of these, 297,644 (5 to 21 years old) received special education services.

Participants

The target population for this study were public school educators who instructed students with disabilities in the state of Pennsylvania with the specific sample narrowed to those who supported students with disabilities in grades K-12 (e.g., general and special education teachers, related services personnel, administrators, and AT consultants).

During the quantitative phase, data were collected using a survey distributed to established networks of educators via email or listservs, who were also asked to volunteer for the second phase of qualitative data collection. Snowball sampling was used for a portion of this study, with recipients asked to share the information and link to the anonymous survey with colleagues who fit within the criteria of the study.
As part of the explanatory, sequential, mixed-methods design, participants for the second, qualitative phase were a subset of the initial sample. Purposeful sampling was used to eliminate participants who did not fit the demographic profile for the desired sample through logic that would not allow participants to proceed with the survey if they did not meet the criteria or indicate their agreement to participate. At the end of the anonymous survey, a final question was included to invite participants to volunteer for a follow-up interview, which led to a second survey to collect necessary contact information and additional permissions. The chance to win a $50 Amazon gift card was used as an incentive for those who proceeded to the secondary survey, however, the participants could then indicate whether they were willing to volunteer for a follow-up interview for the qualitative portion of the study.

**Instrumentation**

Instruments for collecting data were specific to the two phases of this explanatory, sequential, mixed-methods study. In phase one, an online survey was developed and distributed via email and listservs. Once the resulting quantitative data was analyzed, a qualitative protocol was developed for conducting semi-structured interviews during the second, qualitative phase of the study.

**Quantitative Phase 1 Instrument**

Quantitative data were gathered using a cross-sectional survey design to research the knowledge, skills, beliefs, and attitudes of educators across the Commonwealth of Pennsylvania in the use and support of AT with K-12 students with disabilities who attended public education classrooms. Most of the survey questions used were with the permission of Dr. Kendra Williamson-Henriques (see Appendix D) and Dr. Aaron Masters (see Appendix E), and the aforementioned research questions guided the process of constructing the questionnaire.
In the study titled, “Secondary Teachers’ Perceptions of Assistive Technology Use for Students with Learning Disabilities,” Dr. Williamson-Henriques (2013) designed quantitative and qualitative instruments to examine secondary general education teachers' views on the use of assistive technology for students with disabilities. In contrast, in the study titled, “An Exploratory Study of Assistive Technology Knowledge, Skills, and Needs Among Special Education Teachers and Related Services Personnel,” Dr. Aaron Marsters aimed at describing and comparing the level of AT knowledge among special education professionals and related service providers, identifying AT training needs, and determining staff perceptions of accessibility and effectiveness of AT technical assistance and support (Marsters, 2011). Dr. Marsters’ questionnaire was also used in a study by Dr. Michael Sharpe titled, “Assistive technology attrition: Identifying why teachers abandon assistive technologies,” to understand why K-12 teachers decrease or discontinue the use of AT in the classroom (Sharpe, 2010).

Survey questions from the studies by Dr. Williamson-Henriques and Dr. Marsters were selected for this study based on the following research questions:

1. How do educators perceive the use of educational and assistive technologies for addressing the needs of students with disabilities?
   a. What are their experiences with educational and assistive technologies?
   b. What do educators perceive as factors that influence AT integration?

2. What knowledge and skills do educators perceive would facilitate the use of assistive technologies?

A questionnaire was designed in the online survey tool Qualtrics to collect data from respondents using a 4-point Likert scale (e.g., 1 indicating strongly disagree, 4 indicating strongly agree) and multiple-choice questions, and included “other” for including unique
responses when appropriate. The survey (see Appendix G) included an introductory item that described the purpose of the study, the time required, how the data was to be used, the benefits of the resulting information, and assurances for maintaining confidentiality and anonymity, and included a method for indicating permission before proceeding to the questionnaire. To ensure consistency among respondents, a definition of the types of digital technology that should be considered when answering the questions was included at the beginning.

The survey was administered electronically and distributed via direct email, listservs, and flyers with a QR code, with respondents encouraged to share the link to the survey with colleagues. Information gathered included demographics (e.g., gender, ethnicity, age, position/role, years of experience, community setting), various aspects of (1) technology knowledge and use, (2) perceptions and beliefs about assistive technology, and (2) supports and barriers to the integration of assistive technology. The resulting data were reviewed and analyzed to determine the perceptions and use of assistive technology by Pennsylvania educators that would help with the planning and development of future training and technical assistance.

**Qualitative Phase 2 Instruments**

Following the quantitative phase, a Qualitative Protocol (see Appendix H) was developed and used to collect qualitative data during the second phase of the study through semi-structured interviews. Participants for the qualitative phase of the study were purposely selected from the quantitative phase of the survey, as some respondents agreed to participate in a follow-up interview by completing a secondary survey that collected contact information. Interviews with participants were conducted by the researcher through remote (i.e., Zoom/teleconference tools) interactions and included 10 open-ended questions intended to elicit the perspectives and opinions of the interviewees, which included the following:
1. When you visit a classroom, what are the first things you look for as signs that the classroom is an effective learning place for students with learning disabilities?

2. Give me an example of one of the most frequently used types of technology in the general education classroom.

3. What are the ways that ways you help teachers more readily use or integrate digital technology in the classroom, particularly when you are not there (i.e., in the classroom)?

4. For the classrooms that are more receptive, do you think the classrooms seem to be more tech savvy?

5. How do you identify the technology needs of students with learning disabilities as it relates to instruction?

6. What has been your biggest challenge(s) as it relates to technology integration within inclusion classes?

Interview participants were selected based on demographic data, specifically educators with more than five years of experience and those who represent rural, suburban, and the three regions of Pennsylvania (i.e., west, central, and east).

**Data Collection and Analysis**

During the first phase, a survey with closed-ended, multiple-choice, and open-ended questions was used to collect quantitative data. This survey was distributed electronically via direct email or listservs to educators across the state. The email correspondence included a cover letter (see Appendix F) that indicated the purpose of the study, the time required to complete the study, and how the data would be used, as well as describing the potential benefit to the field of AT and assurances for maintaining anonymity. Permission was acquired by having participants
indicate their agreement with terms additionally described in the electronic survey before they could proceed.

Quantitative data derived from the instrument was analyzed based on the type of questions and number of variables to determine trends, patterns, and themes that emerged using Qualtrics and Excel. Dedoose data analysis software was used to code, categorize, and analyze the qualitative data based on themes. Integration in this explanatory, sequential study involved connecting the results from the initial quantitative phase to help develop the follow-up qualitative data collection phase.

**Procedures**

The procedures for this research study followed Creswell and Plano Clark’s (2017) four-step process for implementing an explanatory, sequential, mixed-methods design. This included (1) the design and implementation of the quantitative strand, (2) the use of strategies to make connections from the quantitative strand, (3) the design and implementation of the qualitative strand, and (4) the integration and interpretation of the data as mixed methods results. The primary intent in following this design was to use results obtained in the qualitative phase to further explain any quantitatively significant results revealed during the first phase, such as positive performing exemplars, outliers, or surprising results (Creswell & Plano Clark, 2017). This allowed the researcher to return to the participants to gather qualitative data collection to gain a better understanding of the quantitative data previously obtained. Figure 3.2 provided an overview of the procedural steps used to implement a two-phase explanatory, sequential, mixed methods design for this study.
Figure 3.2

Flow Chart of Implementation Procedures

Note. This flow chart reflects the basic four-step procedure for implementing an exploratory, mixed-methods design.

Quantitative Phase: Design and Implementation

Before implementation, permission for conducting this research study was obtained from the Institutional Review Board (IRB) and the quantitative sample was identified. The first step involved designing and implementing the quantitative phase, including collecting and analyzing quantitative data. A survey (see Appendix G) was developed to include a definition for ensuring a mutual understanding of the type of technology that should be considered when responding, and questions for collecting data were designed to answer the aforementioned research questions. The survey (see Appendix G) also included measures (i.e., logic) to eliminate respondents who did not meet the demographic criteria of the intended sample (i.e., educators working with students attending grades K-12 in Pennsylvania public schools). A pilot test of the survey was administered to a small group and changes were made based on feedback. A cover letter (see Appendix F) was used to invite participants to participate by describing the purpose of the study,
the approximate time required to complete the electronic questionnaire, how the data would be used, the potential benefits of the findings, and the assurance that confidentiality and anonymity would be maintained. The survey was distributed via direct email and listservs and administered via an online survey tool (i.e., Qualtrics). Survey respondents were encouraged to share the link with others for wider distribution across the Pennsylvania.

**Connect from the Quantitative Results**

In the second step of the explanatory, sequential, mixed-methods design implementation procedure, specific quantitative data were analyzed and used to identify specific results that warranted further explanation, which helped guide the development of the qualitative strand and helped refine the qualitative and mixed-methods questions. This was the first point of integration for mixing methods.

Integration in this explanatory, sequential study involved connecting the results from the initial quantitative phase to help plan what data needed to be collected during the follow-up qualitative phase (Creswell & Plano Clark, 2017). This included determining which questions needed to be further probed and which individuals could be sampled to best represent and further explain the quantitative results. Data from the survey questionnaire were analyzed to address the research questions using a four-step procedure outlined by Creswell (2019).

First, the response rate was identified and checked for response bias by developing tables that indicated the percentage of responses to the survey and the wave analysis response bias. Second, the identification of general trends and specific quantitative results was done through the process of analyzing and descriptively reporting the aggregated quantitative data. This resulting information was used to determine what data warranted further investigation during the
qualitative phase. A table was created to reflect descriptive statistics (mean, standard deviation) for each question on the instrument.

Next, statistical analysis was used, and the findings described, including general patterns of responses and variation in results. Finally, overall results and insights derived from interpreting the data by summarizing major findings, and results were explained, such as significant and non-significant results. Quantitative results were also used to refine the research questions, and for developing questions for the Interview Protocol.

**Qualitative Phase: Design and Implementation**

The qualitative phase of the study was connected to and depended on the quantitative results to provide additional context (Creswell & Plano Clark, 2017). “Qualitative research is pragmatic, interpretive, and grounded in the lived experiences of people” (Marshall & Rossman, 2016, p. 2). This second phase of the study was executed by collecting and analyzing the associated qualitative data gathered through semi-structured interviews conducted via Zoom. Procedures for this phase included obtaining permissions, purposeful selections of the qualitative sample, and collecting and analyzing the qualitative data. Data from interviews was transcribed verbatim and checked for accuracy, then organized and formatted by type to facilitate analysis. Codes were then developed and used to prepare the data and helped to identify themes. The transcripts were uploaded to Dedoose data analysis software to code and analyze the data and interrelate themes.

**Integrate and Interpret Mixed Methods Results**

During the last step in the explanatory, sequential, mixed-methods design, the results from the quantitative and qualitative phases was interpreted and integrated to determine overall results, insights, and draw integrated conclusions as to what extent the qualitative results
provided additional meaning to the quantitative data (Creswell & Plano Clark, 2017). The data and results were validated by adhering to researcher, participant, and reviewer standards (Creswell, 2019). Results were discussed and represented in tables in Chapter 4, and limitations of the study and implications for future research can be found in Chapter 5.

**Validity Threats**

Creswell and Plano Clark (2017) identified several potential threats to the validity of the explanatory, sequential, mixed-methods design, such as failing to identify which quantitative result to further investigate during the qualitative phase. To mitigate this risk, the quantitative data was thoroughly analyzed and all possibilities for explaining the results were considered (e.g., significant and non-significant predictors, outliers, interesting or surprising results, etc.). Another potential validity threat was in explaining surprising, contradictory quantitative results with qualitative data. To mitigate this risk, the design of the qualitative data collection (interview) questions probed surprising, contradictory, or noteworthy quantitative findings. A third potential validity threat would be in failing to connect the initial quantitative results with the qualitative follow-up. To mitigate this risk, the qualitative sample was purposely selected from the quantitative participants who could provide further explanations of the quantitative data. The data was juxtaposed for making connections and comparisons between the quantitative and qualitative data for mixed methods analysis.

**Ethical Considerations**

Permission to proceed with the study was obtained from the Institutional Review Board (IRB) before engaging in the research study with participants. As part of the research approval process, the IRB reviewed the proposal based on specific criteria to ensure all research
performed at the institution upheld the ethical principles and ensured the safety and protection of participants from undue risks.

Before engaging in the study, permission was obtained from participants stating they were fully informed about the research project, that they had been assured it would be conducted in an ethical manner, that all confidentiality would be honored, and that permission was granted to conduct the research within the specified period. During the qualitative phase, participants were also informed of these same assurances and protections and presented a secondary printed letter delivered via email.

**Summary**

This explanatory sequential mixed methods study sought to examine how digital technology was used in K-12 classrooms to meet the needs of students with disabilities and the relationship between the knowledge, skills, and needs of K-12 educators in Pennsylvania regarding assistive technology. During this two-phase model consisted of first collecting quantitative data and then gathering qualitative data to help elaborate on the quantitative results (Creswell & Guetterman, 2019). The quantitative portion of the study consisted of an electronic questionnaire developed in Qualtrics, which was used to collect and analyze the data. Results from the survey were used to determine which quantitative results to explain and refine the open-ended questions used during the semi-structured interviews. During the qualitative portion of the study data were gathering during semi-structured interviews, which were transcribed verbatim, then coded and analyzed using Dedoose data analysis software. Results from the quantitative and qualitative phases were combined for further analysis needed to make connections and interpret how the qualitative data further explained the general quantitative picture.
Chapter 4: Results

“Just having computers and software in the classroom is not significant; how the educators use those computers and that software to promote learning is far more important” (King-Sears & Evmenova, 2007, p. 6).

Introduction

Providing scaffolded support and various features of digital technology within the context of well-designed and meaningful activities can improve learning for students with and without disabilities (King-Sears & Evmenova, 2007). The effective use of technology can help students of all abilities but can make a significant impact on the challenges faced by students with disabilities (Bouck, 2010). Educators who embed technology when designing lessons can utilize the tools and accessibility options for their students who need to focus on and engage more deeply in the course content without the constraints of their disability. Ongoing professional development, support, and collaboration are several of the factors that promote the integration of technology in classrooms; however, this often depends on the comfort level of educators in using it with their students (Atanga et al., 2019). The purpose of this explanatory, sequential, mixed-method study was to examine the perceptions and use of digital technology by educators who supported the needs of students with disabilities who attended K-12 classrooms and any correlation between the assistive technology knowledge, skills, and needs of K-12 educators within Pennsylvania. The explanatory, sequential, mixed-methods design used consisted of first collecting quantitative data and then gathering qualitative data to help explain or elaborate on the quantitative results. The resulting quantitative data and results provided a general picture of the
research problem. Qualitative data collection was used to further refine and elaborate on the general quantitative picture.

This chapter presents the results of this study. The first section presents a summary of demographic and overall quantitative data derived from the responses of participants to the self-administered, online survey about assistive and educational technology. The second section presents qualitative findings from face-to-face interviews with educators with varying backgrounds that were conducted remotely (via Zoom). Integration of the data from the quantitative findings and qualitative results is discussed in the third section and a summary of the results is presented in the final section.

**Participants**

A total of 125 responses were initiated from individuals from across the state of Pennsylvania, with the results for analysis filtered to the 73 participants who completed the survey to the end. Eleven of the respondents were selected out of those who provided their contact information in a secondary survey and agreed to participate in a follow-up interview with the researcher.

**Demographics**

The majority of the 73 respondents who completed the survey identified as female (n = 62; 84.93%), compared with 11 who identified as male (15.07%). This ratio is representative of a steady feminization of education across the nation as the percentage of female teachers in the United States has risen from 68.69% in 2010 to 71.22% in 2019 (Zippia, n.d.). The majority of the 73 respondents indicated having a master’s degree (n = 68; 93.15%) as the highest degree completed, which outnumbered those with a bachelor’s degree (n = 3; 4.11%) or doctorate (n = 2; 2.74%). According to Zippia (n.d.), in the United States, 64% of teachers earned a bachelor’s
degree and only 15% earned a master’s degree. The largest group of respondents had more than 20 years of experience teaching (n = 28; 38.36%), followed by those who had 10-20 years of experience (n = 26; 35.62%) and those with less than 10 years of experience (n = 19; 26.03%). More than 60% of respondents indicated that they had more than 5 years of experience with educational (n = 57; 78.09%) and assistive technologies (n = 53; 72.61%). As to grade levels, respondents (who were allowed to select all that apply) primarily worked with students in elementary grades (n = 49; 32.23%), followed by high school (n = 45; 29.61%), middle school (n = 39; 25.66%), and transition-age (n = 19; 26.50%). A summary of the demographics for the educators who completed the survey is shown in Table 4.1.

Twenty-three respondents indicated their primary teaching position was other than those listed for that survey item (n = 23; 30.26%). The next largest groups represented were Assistive Technology (AT) Consultants (n = 18; 23.68%) and Speech-Language Pathologists (n = 17; 22.37%). Positions listed as “other” included administrator/supervisor/director of special education (n = 6), autistic support teacher (n = 3), instructional technology coach/specialist (n = 2), special education coach/consultant (n = 2), transition coordinator (n = 2), academic teacher for students with learning disabilities, orientation and mobility, special education learning support for math, special education teacher (learning support co-teacher), training and consultation (TaC) personnel, and special education teacher multiple disabilities. A summary of the current primary positions held by the 73 respondents is shown in Table 4.2. It should be noted the survey data was filtered to only include data from respondents who completed the entire survey (i.e., for a total of 73); however, there were 76 responses indicating the current primary teaching position, as some gave more than one answer.
### Table 4.1

*Demographics of Quantitative Participants*

<table>
<thead>
<tr>
<th>Question Item</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>62</td>
<td>84.93</td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>15.07</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>3</td>
<td>4.11</td>
</tr>
<tr>
<td>Master’s</td>
<td>68</td>
<td>93.15</td>
</tr>
<tr>
<td>Doctorate</td>
<td>2</td>
<td>2.74</td>
</tr>
<tr>
<td><strong>Number of Years Teaching</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5 years</td>
<td>9</td>
<td>12.33</td>
</tr>
<tr>
<td>5-9 years</td>
<td>10</td>
<td>13.70</td>
</tr>
<tr>
<td>10-20 years</td>
<td>26</td>
<td>35.62</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>28</td>
<td>38.36</td>
</tr>
<tr>
<td><strong>Years of Experience Using ET</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>2</td>
<td>2.74</td>
</tr>
<tr>
<td>Fewer than 5 Years</td>
<td>14</td>
<td>19.19</td>
</tr>
<tr>
<td>5-9 years</td>
<td>13</td>
<td>17.81</td>
</tr>
<tr>
<td>10-20 years</td>
<td>29</td>
<td>39.73</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>15</td>
<td>20.55</td>
</tr>
<tr>
<td><strong>Years of Experience Using AT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>2</td>
<td>2.74</td>
</tr>
<tr>
<td>Fewer than 5 Years</td>
<td>18</td>
<td>24.66</td>
</tr>
<tr>
<td>5-9 years</td>
<td>13</td>
<td>17.81</td>
</tr>
<tr>
<td>10-20 years</td>
<td>27</td>
<td>36.99</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>13</td>
<td>17.81</td>
</tr>
<tr>
<td><strong>Grade levels Primarily Worked With</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary</td>
<td>49</td>
<td>32.23</td>
</tr>
<tr>
<td>Middle School</td>
<td>39</td>
<td>25.66</td>
</tr>
<tr>
<td>High School</td>
<td>45</td>
<td>29.61</td>
</tr>
<tr>
<td>Transition</td>
<td>19</td>
<td>12.50</td>
</tr>
</tbody>
</table>

*Note.* Gender, Education, Years of Teaching, Current Primary Teaching Position, Years of Experience Using Education Technology (ET) and Assistive Technology (AT), and Primary Grades Working With (N = 73).
Table 4.2

*Current Primary Teaching Position of Survey Respondents*

<table>
<thead>
<tr>
<th>Role</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education Teacher</td>
<td>1</td>
<td>1.30%</td>
</tr>
<tr>
<td>Special Education Teacher LI/MM</td>
<td>5</td>
<td>6.49%</td>
</tr>
<tr>
<td>Special Education Teacher LI/MS</td>
<td>1</td>
<td>1.30%</td>
</tr>
<tr>
<td>Special Education Teacher VI</td>
<td>4</td>
<td>5.19%</td>
</tr>
<tr>
<td>Special Education Teacher D/HH</td>
<td>3</td>
<td>3.90%</td>
</tr>
<tr>
<td>Special Education Teacher HI</td>
<td>3</td>
<td>3.90%</td>
</tr>
<tr>
<td>AT Consultant</td>
<td>19</td>
<td>24.68%</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>1</td>
<td>1.30%</td>
</tr>
<tr>
<td>Speech-Language Pathologist</td>
<td>17</td>
<td>22.08%</td>
</tr>
<tr>
<td>Other:</td>
<td>23</td>
<td>29.87%</td>
</tr>
<tr>
<td>Total</td>
<td>77</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Note.* Four of the respondents indicated more than one primary teaching position. LI/MM = low-incidence/mild-moderate, LI/MS = low-incidence/moderate-severe, VI = visually impaired, D/HH = deaf/hard of hearing, HI = high incidence.

**Quantitative Results**

The self-administered, online survey consisted of questions that related to the usage of assistive technology, educator attitudes and beliefs about assistive technology, and supports and barriers to assistive technology.

**Usage of Educational and Assistive Technology**

Three questions in the survey were designed to measure aspects of selection and use of assistive technology by educators. These survey items used a four-point scale that ranged from strongly disagree (SD) to strongly agree (SA). Two of the items were stated positively and one was stated negatively. The responses for these items were transformed into a four-point numerical scale to analyze the research questions quantitatively. For the two items stated positively (Q20 and Q21), strongly agree = 4, agree = 3, disagree = 2, and strongly disagree = 1.
Reverse scoring was used for the negatively worded item (Q19) so that it would calibrate with the positive items (i.e., strongly disagree = 4, disagree = 3, agree = 2, and strongly agree = 1).

The percentage of distribution, means, and standard deviations for the survey respondents were computed for each of the three survey items, reflecting their use of AT. The results are shown in Table 4.3. The overall mean for the three items was 3.04, with responses ranging from 2.78 to 3.28, which is reflected in Figure 4.1. More than 62% of participants indicated they disagreed or strongly disagreed with only using AT devices with students after recommendations from the IEP team or by an AT specialist (62.5%). More than 80% of respondents indicated by marking agree or strongly agree that they engaged in AT practices such as providing input on the selection of AT devices during team meetings (83.33%) and differentiating lessons by incorporating AT and built-in accessibility options (84.72%). Table 4.3 summarizes the participants’ responses to their use of AT.

Table 4.3

*Perceptions of Usage of Assistive Technology Usage*

<table>
<thead>
<tr>
<th>Survey Items</th>
<th>Percentage</th>
<th>SD</th>
<th>D</th>
<th>A</th>
<th>SA</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q19. I only use assistive technology devices with students after recommendations from the IEP team or by an AT specialist</td>
<td></td>
<td>19.18</td>
<td>43.84</td>
<td>28.77</td>
<td>8.22</td>
<td>2.74</td>
<td>0.086</td>
</tr>
<tr>
<td>Q20. I provide input on the selection of assistive technology devices during team meetings (e.g., Student Study Teams, 504, IEP).</td>
<td></td>
<td>9.59</td>
<td>6.85</td>
<td>45.21</td>
<td>38.36</td>
<td>3.12</td>
<td>0.91</td>
</tr>
<tr>
<td>Q21. I differentiate a lesson by incorporating assistive technology, including the accessibility options built into the education technology I currently use.</td>
<td></td>
<td>4.11</td>
<td>12.33</td>
<td>36.99</td>
<td>46.58</td>
<td>3.26</td>
<td>0.83</td>
</tr>
</tbody>
</table>
Note. SA = strongly agree, A = agree, D = disagree, SD = strongly disagree; $M =$ Mean, $SD =$ Standard Deviation. Number of Responses, Percentage Distribution, Means, and Standard Deviations for Usage of Assistive Technology Subscale (N = 73).

Figure 4.1

Mean of Responses for the Three Items Related to Assistive Technology Usage

Note. The overall mean for the three items was 3.04 with responses ranging from 2.78 to 3.28

AT used for Reading, Writing, Mathematics, and Organization/Memory

Respondents were asked to indicate all the types of commonly used assistive technology for reading, writing, mathematics, listening, and organization and memory for students with disabilities. Tables 4.4-4.7 show the percentages of teachers who reported using one or more of the listed AT for specific areas or tasks. Figures 4.1-4.5 reflect the data sorted by the percentage of selection (ranking from most to least selected) by respondents for each area.
Table 4.4

Responses to Survey Item for AT Used for Reading (N = 73)

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audiobooks</td>
<td>12.94%</td>
<td>55</td>
</tr>
<tr>
<td>Text readers or text-to-speech</td>
<td>12.71%</td>
<td>54</td>
</tr>
<tr>
<td>Electronic books (e.g., Nook, iPad, Daisy Reader, Kindle, etc.)</td>
<td>10.59%</td>
<td>45</td>
</tr>
<tr>
<td>Large print material</td>
<td>10.12%</td>
<td>43</td>
</tr>
<tr>
<td>Changes in background color</td>
<td>9.88%</td>
<td>42</td>
</tr>
<tr>
<td>Screen magnification software</td>
<td>8.47%</td>
<td>36</td>
</tr>
<tr>
<td>Screen readers (a program that scans the text and converts written text into spoken language via speech synthesis)</td>
<td>6.35%</td>
<td>27</td>
</tr>
<tr>
<td>Magnification technology</td>
<td>6.35%</td>
<td>27</td>
</tr>
<tr>
<td>E-book readers</td>
<td>6.12%</td>
<td>26</td>
</tr>
<tr>
<td>Reading Pen</td>
<td>5.18%</td>
<td>22</td>
</tr>
<tr>
<td>Optical character recognition (OCR)</td>
<td>5.41%</td>
<td>23</td>
</tr>
<tr>
<td>Changes in the spacing of words</td>
<td>4.24%</td>
<td>18</td>
</tr>
<tr>
<td>Other</td>
<td>1.65%</td>
<td>7</td>
</tr>
</tbody>
</table>

AT for Reading. The most selected AT for reading included audiobooks, text readers or text-to-speech, electronic books, and large print material were the four most selected AT used for reading tasks. Media presented in these formats have been a part of special education, predominantly for struggling readers and people with disabilities (Parr, 2012) for many years, these data may also reflect the familiarity with these accessibility options within the broader mainstream market which has occurred with time. Text-to-speech is widely available in a variety of digital tools and uses technology that decodes, then uses speech-generation to read text aloud (Parr, 2012). Text-to-speech has most often fallen under special education or assistive technology because its primary purpose has been to support students who struggle to read, have a reading disorder, or visual impairment that was not preventable nor was it alleviated by traditional interventions (Parr, 2012). For students with disabilities, text-to-speech reduces the attentional demands for decoding, remembering, attributing meaning, and comprehending
information associated with the process of reading (Parr, 2012). Unlike text-to-speech, audiobooks are typically recorded by human voices, which offer ranges of expression and intonation (Parr, 2012). The survey items listed were the most used AT for reading, but respondents had the opportunity to indicate other tools they use. Other technology used for reading that was specified by participants included color overlays, screen-sharing programs, devices used as speech-generating devices (i.e., augmentative alternative communication devices used to compose written work), page reformatting, and apps or websites for leveling the text.

**Figure 4.2**

*AT Used for Reading*

AT for Writing. The four most selected AT for writing included speech recognition software (a.k.a., voice typing, dictation, speech-to-text), spelling and grammar checkers, word processing, and graphic organizers and outlining programs (e.g., brainstorming, mind mapping, etc.). Like the tools mentioned for reading, the assistive technology features for writing are tools that have been available in special education for many years. Audiobooks and e-books are widely available in libraries at schools and in the community. One of the more popular speech-recognition software packages, Dragon Dictation and Naturally Speaking, has been around since
the 1990s (Bell, 2019), but this accessibility feature is offered in most universally designed
digital technology. The survey items listed were the most used AT for writing, but respondents
had the opportunity to indicate other tools they use. Other technology used for writing that was
specified by participants included a smartpen, on-screen braille, and refreshable braille display.

Table 4.5

Responses to Survey Item for AT Used for Writing (N = 73)

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech recognition software (a.k.a., voice typing, dictation,</td>
<td>12.50%</td>
<td>52</td>
</tr>
<tr>
<td>speech-to-text)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spelling and grammar checker</td>
<td>12.26%</td>
<td>51</td>
</tr>
<tr>
<td>Word processor</td>
<td>11.30%</td>
<td>47</td>
</tr>
<tr>
<td>Graphic organizer and outlining programs (e.g., brainstorming,</td>
<td>10.82%</td>
<td>45</td>
</tr>
<tr>
<td>mind mapping, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slant board</td>
<td>9.38%</td>
<td>39</td>
</tr>
<tr>
<td>Word prediction programs</td>
<td>8.89%</td>
<td>37</td>
</tr>
<tr>
<td>Alternative keyboard</td>
<td>6.97%</td>
<td>29</td>
</tr>
<tr>
<td>Proofreading programs</td>
<td>6.73%</td>
<td>28</td>
</tr>
<tr>
<td>Keyguard</td>
<td>6.25%</td>
<td>26</td>
</tr>
<tr>
<td>Digital recorder for note taking (Notability, LiveScribe Pen,</td>
<td>5.77%</td>
<td>24</td>
</tr>
<tr>
<td>Mic Note, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic spell checker without auditory output</td>
<td>3.13%</td>
<td>13</td>
</tr>
<tr>
<td>Electronic spell checker with auditory output</td>
<td>2.70%</td>
<td>11</td>
</tr>
<tr>
<td>Abbreviation expanders</td>
<td>1.92%</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>1.44%</td>
<td>6</td>
</tr>
</tbody>
</table>
AT for Math. The most selected AT for mathematics included several types of calculators (e.g., onscreen, conventional, and talking). Math manipulatives and calculators have been used for making calculations easier since the abacus was first used around 2000 BC and desktop electronic calculating machines were introduced in the mid-1960s, and the predecessor to today’s handheld calculators, the Cal-Tech, was introduced in 1967 (Valentine, 2018). Since that time, calculators became more compact and offer more features for making complex computations accessible to individuals with disabilities. Software and apps that can be used for the full range of higher math calculations needed for complex math, chemistry, and physics formulas using keyboarding, touch screen, or voice recognition, like EquatIO, are beginning to emerge as add-ons and extensions. The survey items listed the most used tools for mathematics, but respondents could select “other” to list other tools they use. Other technology used for math that was specified by participants included iPad and Chromebook apps for writing math work, digital math manipulatives, Coinulator calculators, ModMath, multiplication boards, 100s boards, and enlarged conventional calculators.
Table 4.6

*Responses to Survey Item for AT Used for Mathematics (N = 73)*

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-screen (computer-based) calculator</td>
<td>28.40%</td>
<td>46</td>
</tr>
<tr>
<td>Conventional calculator</td>
<td>25.93%</td>
<td>42</td>
</tr>
<tr>
<td>Talking calculator</td>
<td>10.49%</td>
<td>17</td>
</tr>
<tr>
<td>Calculation chart</td>
<td>9.26%</td>
<td>15</td>
</tr>
<tr>
<td>Graphing tools that work with screen reading technology (MathTrax)</td>
<td>4.94%</td>
<td>8</td>
</tr>
<tr>
<td>Software with a template for math computation</td>
<td>4.94%</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>16.05%</td>
<td>26</td>
</tr>
</tbody>
</table>

Figure 4.4

*AT Used for Mathematics*

**AT for Organization and Memory.** The most selected AT for organization or memory included highlighting text, graphic organizers and mind-mapping tools, storage and organization tools, calendar programs, and task management tools. Highlighting and graphic organizers are organizational tools that can be done without digital technology but are also offered as assistive software and apps specifically designed for individuals with disabilities. The survey items listed were the most used AT for organization, but respondents could select “other” to indicate other
tools they use. Other technology used for memory and organization specified by participants included using apps like Reminder or music apps.

**Table 4.7**

*Responses to Survey Item for AT Used for Organization/Memory (N = 73)*

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highlight text</td>
<td>15.29%</td>
<td>52</td>
</tr>
<tr>
<td>Graphic organizers and mind-mapping tools</td>
<td>12.35%</td>
<td>42</td>
</tr>
<tr>
<td>Storage and organization tools</td>
<td>11.76%</td>
<td>40</td>
</tr>
<tr>
<td>Calendar programs</td>
<td>10.88%</td>
<td>37</td>
</tr>
<tr>
<td>Task management tools</td>
<td>10.29%</td>
<td>35</td>
</tr>
<tr>
<td>Color-coded folders or index tabs</td>
<td>8.82%</td>
<td>30</td>
</tr>
<tr>
<td>Annotation tools that can be used with digital documents (Kami)</td>
<td>8.53%</td>
<td>29</td>
</tr>
<tr>
<td>Digital voice recording</td>
<td>7.94%</td>
<td>27</td>
</tr>
<tr>
<td>Software for the organization of ideas (Kidspiration/Inspiration)</td>
<td>5.88%</td>
<td>20</td>
</tr>
<tr>
<td>Digital notepads (e.g., Notability, Mic Note, AudioNote)</td>
<td>5.88%</td>
<td>29</td>
</tr>
<tr>
<td>Other</td>
<td>2.35%</td>
<td>8</td>
</tr>
</tbody>
</table>

**Figure 4.5**

*AT Used for Organization or Memory*
**Satisfaction with AT skills**

Ten items in the survey were designed to measure aspects of educators’ satisfaction with AT skills. These survey items used a four-point Likert scale that ranged from strongly disagree (SD) to strongly agree (SA). The responses for these 10 items were transformed into a four-point numerical scale to analyze the research questions quantitatively (i.e., strongly agree = 4, agree = 3, disagree = 2, and strongly disagree = 1). Overall, most respondents felt satisfied with their own AT skills. More than 84% of survey respondents were satisfied or extremely satisfied with their ability to discuss the need for AT during team meetings (e.g., Student Study Teams, 504, IEP; 87.67%), explain AT to team members (91.78%), determine when education technology or a 1:1 device should be listed as AT for students with disabilities (i.e., in 504 plan or IEP; 84.93%), and when to include AT services within the IEP (84.93%). Less than 74% of participants were satisfied or extremely satisfied with their ability to match the features of technology to the needs (72.71%) or make informed AT suggestions for students with disabilities (73.97%). Approximately 92% of participants were satisfied or extremely satisfied with their ability to use AT in the special education setting (91.78%), less than 74% were satisfied or extremely satisfied with their ability to use AT in the general education setting (73.97%). Interestingly, only 53.43% were satisfied or extremely satisfied with the AT knowledge of the Child Study Committee (CSC) team. One participant said, “Our resources are limited, so it’s hard to really achieve true ‘buy-in’ from those professionals who aren’t used to AT.” Table 4.8 shows the percentage of educators’ satisfaction with AT skills. A visualization of these data is represented in Figure 4.6.
Table 4.8

*Satisfaction of Assistive Technology Skills.*

<table>
<thead>
<tr>
<th>Survey Items</th>
<th>Percentage</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ED</td>
<td>D</td>
<td>S</td>
<td>ES</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Determine when education technology or 1:1 device should be listed as assistive technology for students with disabilities (i.e., in 504 plan or IEP)</td>
<td>2.74</td>
<td>12.33</td>
<td>60.27</td>
<td>24.66</td>
<td>3.07</td>
<td>0.69</td>
<td></td>
</tr>
<tr>
<td>Explain AT to team members (e.g., Student Study Teams, 504, IEP)</td>
<td>1.37</td>
<td>6.85</td>
<td>63.01</td>
<td>28.77</td>
<td>3.19</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>Discuss the need for AT during team meetings (e.g., Student Study Teams, 504, IEP)</td>
<td>1.37</td>
<td>10.96</td>
<td>53.42</td>
<td>34.25</td>
<td>3.21</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>Match the features of technology to the needs of students</td>
<td>2.74</td>
<td>24.66</td>
<td>47.95</td>
<td>24.66</td>
<td>2.95</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>Make informed AT suggestions for students with disabilities</td>
<td>2.78</td>
<td>23.29</td>
<td>50.68</td>
<td>23.29</td>
<td>2.95</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>Include AT services within the IEP</td>
<td>1.37</td>
<td>13.70</td>
<td>55.16</td>
<td>28.77</td>
<td>3.12</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>AT knowledge of the Child Study Committee team</td>
<td>12.33</td>
<td>34.25</td>
<td>42.47</td>
<td>10.96</td>
<td>2.52</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>Use of AT in the general education setting</td>
<td>8.22</td>
<td>17.81</td>
<td>50.68</td>
<td>23.29</td>
<td>2.89</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>Use of AT in the special education setting</td>
<td>0.00</td>
<td>8.22</td>
<td>58.90</td>
<td>32.88</td>
<td>3.25</td>
<td>0.59</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* ES = extremely satisfied, S = satisfied, D = dissatisfied, ED = extremely dissatisfied; *M* = Mean, *SD* = Standard Deviation; Number of Responses, Percentage Distribution, Means, and Standard Deviations for Satisfaction of Assistive Technology Skills. (N = 73)
Figure 4.6

*Educator Satisfaction of AT Skills*

To measure educators’ perceptions of AT use for students with disabilities, participants were asked to indicate their level of agreement to survey items along a four-point Likert scale that ranged from strongly disagree (SD) to strongly agree (SA). To mitigate acquiescence bias, several items that were intermixed were worded negatively or as absolutes. The responses for these 16 items were transformed into a four-point numerical scale to analyze the research questions quantitatively (i.e., strongly agree = 4, agree = 3, disagree = 2, and strongly disagree = 1). Results displayed in Table 4.9 and Figure 4.7 reflect the data from survey items that were worded as positive statements, and Table 4.10 and Figure 4.8 reflect data from the survey items that were worded as negative statements.

Most agreed or strongly agreed that AT devices and services are considered for all students with disabilities regardless of the type or severity of the disability (80.83%) and that the IEP team considers the student’s needs more than the ready availability of a specific device (75.35%). More than 86% of respondents agreed or strongly agreed that they encourage their
students to use the built-in accessibility options in education technology (93.16%) and disagreed or strongly disagreed that students can only use these options when it is specifically listed as an accommodation or modification for a student with a disability (e.g., documented in a 504 plan or IEP, 86.31%). Additional comments shared by participants relate directly to the blurred view of when educational technology should be listed as assistive technology when it’s needed by students with disabilities but available to all. One survey participant said, “Not all devices with built-in accessibility options need to be listed in IEP. They need to be listed when a student with a disability requires the technology to access the curriculum.” However, other participants said, “Every opportunity for success should be listed in IEPs,” and, “Devices may have accessibility features for students with IEP. These should be listed as used by the student in case they move away from the district and need these features [i.e., text to speech, dictation, etc.].” Both responses indicate an understanding of legal mandates and best practices associated with ensuring tools needed are documented and can be made available regardless of where the student is attending.

All respondents agreed or strongly agreed that general education teachers should use assistive technology in the general education classroom (100%) and most disagreed or strongly disagreed that only special education teachers should implement assistive technology for students with disabilities (95.83%). However, one participant said, “I believe that most teachers believe that AT will be something more they will have to do.” These data suggest all teachers should be using assistive technology for students with disabilities.

All respondents agreed or strongly agreed that AT enables students with disabilities to access the curriculum (100%) and learn more readily in class (100%). And almost all agreed or strongly agreed that the availability of AT devices for students with disabilities is important in
their class (97.27%), are useful for all core academic classes (98.61%), help students with disabilities complete their assignments in their classes (97.23%), and that they have seen students make academic progress because of their use of AT (98.61%). These data indicate technology is perceived as a helpful tool for accessing and completing assignments in core academic classes. One participant said, “AT should be used to help, but – in some cases – the students still need to learn the basic skills that they are lacking,” which is a critical point when using assistive technology as one of many tools for accomplishing tasks and ensuring it is paired with research-based methods and best teaching practices.

Most respondents disagreed or strongly disagreed that using AT slows the pace of learning for the entire class (88.88%), can cause disruptions in the classroom (69.44%), and makes students reliant on the tool and negatively affects their skill development (93.05%). They also disagreed or strongly disagreed that the District provided 1:1 devices that have built-in accessibility options that a student needs to complete tasks, and do not need to be listed as assistive technology in IEPs or 504 plans (72.23%). Participant comments included:

I ‘agreed’ that AT may cause disruptions in the classroom, but I do not feel that is a reason to discontinue use of the AT. That is simply an observation.

In response to the questions about AT disrupting class or slowing the pace, I answered these questions with the lens of when the technology itself is the barrier – for example, when the internet is spotty, when the tool is not updated, and the user or support person is still in the process of learning how to use it. I answered the questions based on the barriers encountered in the general education setting.
These statements reflect pervasive issues with a technology infrastructure that decreases the likelihood of technology integration unless there is sufficient support to problem-solve or resolve these issues.

**Table 4.9**

*Educator Attitudes and Beliefs about AT – Responses to Positively-worded Items (N = 72)*

<table>
<thead>
<tr>
<th>Survey Items</th>
<th>Percentage</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>D</td>
<td>A</td>
<td>SA</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>I encourage my students to use the built-in accessibility options in education technology.</td>
<td></td>
<td>0</td>
<td>6.85</td>
<td>46.58</td>
<td>46.58</td>
<td>3.4</td>
<td>0.61</td>
</tr>
<tr>
<td>When deciding on AT for a specific student, the IEP team considers the student's needs more than the ready availability of a specific device.</td>
<td></td>
<td>0</td>
<td>24.66</td>
<td>38.36</td>
<td>36.99</td>
<td>3.12</td>
<td>0.78</td>
</tr>
<tr>
<td>The availability of AT devices for students with disabilities is important in my class.</td>
<td></td>
<td>0</td>
<td>2.74</td>
<td>49.32</td>
<td>47.95</td>
<td>3.45</td>
<td>0.55</td>
</tr>
<tr>
<td>AT devices and services are considered for all students with disabilities regardless of the type or severity of the disability.</td>
<td></td>
<td>2.74</td>
<td>16.44</td>
<td>45.21</td>
<td>35.62</td>
<td>3.14</td>
<td>0.78</td>
</tr>
<tr>
<td>AT devices are useful for all core academic classes.</td>
<td></td>
<td>0</td>
<td>1.39</td>
<td>45.83</td>
<td>52.78</td>
<td>3.51</td>
<td>0.53</td>
</tr>
<tr>
<td>AT enables students with disabilities to access the curriculum more readily.</td>
<td></td>
<td>0</td>
<td>0</td>
<td>32.88</td>
<td>67.12</td>
<td>3.67</td>
<td>0.47</td>
</tr>
<tr>
<td>AT devices help students with disabilities learn more readily in my class.</td>
<td></td>
<td>0</td>
<td>0</td>
<td>47.95</td>
<td>52.05</td>
<td>3.52</td>
<td>0.5</td>
</tr>
<tr>
<td>General education teachers should use AT in the general education classroom.</td>
<td></td>
<td>0</td>
<td>0</td>
<td>41.67</td>
<td>58.33</td>
<td>3.58</td>
<td>0.49</td>
</tr>
<tr>
<td>Overall, AT devices help students with disabilities complete their assignments in my class.</td>
<td></td>
<td>1.39</td>
<td>1.39</td>
<td>54.17</td>
<td>43.06</td>
<td>3.39</td>
<td>0.59</td>
</tr>
<tr>
<td>I have seen students make academic progress because of their use of assistive technology.</td>
<td></td>
<td>0</td>
<td>1.39</td>
<td>45.83</td>
<td>52.78</td>
<td>3.51</td>
<td>0.53</td>
</tr>
</tbody>
</table>

*Note. SA = Strongly Agree, A = Agree, D = Disagree, SD; M = Mean, SD = Standard Deviation*
Figure 4.7

Attitudes and Beliefs about AT – Responses to Positively-worded Items

<table>
<thead>
<tr>
<th>Survey Items</th>
<th>Percentage</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Students can only use the built-in accessibility options in education technology when it is specifically listed as an accommodation or modification for a student with a disability (e.g., documented in a 504 plan or IEP).</td>
<td>41.1</td>
<td>45.21</td>
<td>12.33</td>
<td>1.37</td>
<td>1.74</td>
<td>0.72</td>
</tr>
<tr>
<td>Only special education teachers should implement AT for students with disabilities.</td>
<td>72.22</td>
<td>23.61</td>
<td>2.78</td>
<td>1.39</td>
<td>1.33</td>
<td>0.6</td>
</tr>
<tr>
<td>Using AT slows the pace of learning for the entire class.</td>
<td>44.44</td>
<td>44.44</td>
<td>6.94</td>
<td>4.17</td>
<td>1.71</td>
<td>0.77</td>
</tr>
<tr>
<td>AT can cause disruptions in the classroom.</td>
<td>31.94</td>
<td>37.5</td>
<td>29.17</td>
<td>1.39</td>
<td>2</td>
<td>0.82</td>
</tr>
<tr>
<td>The use of AT makes students reliant on the tool and negatively affects their skill development.</td>
<td>61.11</td>
<td>31.94</td>
<td>5.56</td>
<td>1.39</td>
<td>1.47</td>
<td>0.67</td>
</tr>
<tr>
<td>District provided 1:1 devices that have built-in accessibility options that a student needs to complete tasks, and do not need to be listed as assistive technology in IEPs or 504 plans.</td>
<td>30.56</td>
<td>41.67</td>
<td>22.22</td>
<td>5.56</td>
<td>2.03</td>
<td>0.87</td>
</tr>
</tbody>
</table>
**Note.** SA = strongly agree, A = Agree, D = Disagree, SD; M = Mean, SD = Standard Deviation; Number of Responses, Percentage Distribution, Means, and Standard Deviations for Educator Attitudes and Beliefs about Assistive Technology – negatively stated items (N = 72).

**Figure 4.8**

*Attitudes and Beliefs about AT – Responses to Negatively-worded Items*

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**Supports and Barriers to Assistive Technology**

Eight survey items were included to measure the types of support and barriers for educators when implementing AT for students with disabilities. These survey items used a four-point scale that ranged from strongly disagree (SD) to strongly agree (SA). Six of the items were stated positively and two were stated negatively to mitigate potential acquiescence bias when responding. The responses for these items were transformed into a four-point numerical scale to analyze the research questions quantitatively (i.e., strongly agree = 4, agree = 3, disagree = 2, and strongly disagree = 1). Almost 81% agreed or strongly agreed that professional learning in their education agency (i.e., school, district, Intermediate Unit, etc.) supported the implementation of assistive technology, education technology, and information technology to improve student learning.
More than 80% of respondents indicated they agreed or strongly agreed that professional learning in their education agency (i.e., school, district, Intermediate Unit, etc.) supports the implementation of assistive technology, education technology, and information technology to improve student learning. However, only 52.05% agreed or strongly agreed that the roles and responsibilities regarding AT, accessibility, and technology procurement are well defined by their education agency, and only 53.44% said their education agency provides adequate training in and knowledge of assistive technology for my classroom needs. Several respondents commented about training, including how “more training needs to be done for special education teachers and regular education teachers,” particularly on new features and how to use assistive technology in general education. This information suggests that although training has been provided, there may need to be a greater focus on how to use assistive technology in the classroom and better defining roles and responsibilities associated with assistive technology.

Almost 80% agreed or strongly agreed that they would use assistive technology more frequently if there were more support from a specialist to help them with problems that arise (79.45%) and that they need more opportunities to collaborate with colleagues in their discipline on how to use assistive technology (79.46%). Another 69.86% of respondents agreed or strongly agreed they needed access to more resources (e.g., personnel, pre-made lessons, technical support) to be able to use the available assistive technology resources effectively as part of their instructional day. Only 17.81% agreed or strongly agreed that they are reluctant to use AT because it frequently did not work correctly, and only 8.22% agreed or strongly agreed that AT required too much time to use during class. One participant said, “I definitely think that there needs to be more help from people who are skilled in using the technology. I learn it, then start to use it and have a lot of questions. I also think that more group meetings would be helpful.” These
data suggest participants are willing to use technology and that the benefits outweigh some of the drawbacks, but that collaboration and support play a vital role in technology integration, particularly when problems arise.

**Table 4.11**

*Percentage of Distribution, Means, and Standard Deviations for Supports and Barriers to Assistive Technology Integration (N = 73)*

<table>
<thead>
<tr>
<th>Survey Items</th>
<th>Percentage</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q33. Professional learning in my education agency (i.e., school, district,</td>
<td>SD</td>
<td>D</td>
<td>A</td>
<td>SA</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Intermediate Unit, etc.) supports the implementation of assistive technology,</td>
<td>4.11</td>
<td>15.07</td>
<td>56.16</td>
<td>24.66</td>
<td>3.01</td>
<td>0.75</td>
</tr>
<tr>
<td>education technology, and information technology to improve student learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q34. The roles and responsibilities regarding AT, accessibility, and technology procurement are well defined by my education agency (i.e., school, district, Intermediate Unit, etc.).</td>
<td>6.85</td>
<td>41.10</td>
<td>36.99</td>
<td>15.07</td>
<td>2.60</td>
<td>0.82</td>
</tr>
<tr>
<td>Q35. My education agency (e.g., school, district, intermediate unit, etc.) provides adequate training in and knowledge of assistive technology for my classroom needs.</td>
<td>12.33</td>
<td>34.25</td>
<td>34.25</td>
<td>19.18</td>
<td>2.60</td>
<td>0.93</td>
</tr>
<tr>
<td>Q37.1. I would use assistive technology more frequently if there were more support from a specialist to help me with problems that arise.</td>
<td>6.85</td>
<td>13.70</td>
<td>58.90</td>
<td>20.55</td>
<td>2.93</td>
<td>0.78</td>
</tr>
<tr>
<td>Q37.2. I am reluctant to use assistive technology because it frequently does not work correctly.</td>
<td>41.10</td>
<td>41.10</td>
<td>15.07</td>
<td>2.74</td>
<td>1.79</td>
<td>0.79</td>
</tr>
<tr>
<td>Q37.3. I need access to more resources (e.g., personnel, pre-made lessons, technical support) to be able to use the available assistive technology resources effectively as part of my instructional day.</td>
<td>10.96</td>
<td>19.18</td>
<td>60.27</td>
<td>9.59</td>
<td>2.68</td>
<td>0.79</td>
</tr>
<tr>
<td>Q37.4. Assistive technology requires too much time to use during class.</td>
<td>52.05</td>
<td>39.73</td>
<td>8.22</td>
<td>0.00</td>
<td>1.56</td>
<td>0.64</td>
</tr>
</tbody>
</table>
Q37.5. I need more opportunities to collaborate with colleagues in my discipline on how to use assistive technology.

<table>
<thead>
<tr>
<th>Mean Score (scale 1-4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.01</td>
</tr>
<tr>
<td>2.6</td>
</tr>
<tr>
<td>2.6</td>
</tr>
<tr>
<td>2.93</td>
</tr>
<tr>
<td>1.79</td>
</tr>
<tr>
<td>2.68</td>
</tr>
<tr>
<td>1.56</td>
</tr>
<tr>
<td>3.05</td>
</tr>
</tbody>
</table>

Note. SA = strongly agree, A = Agree, D = Disagree, SD; M = Mean, SD = Standard Deviation.

**Figure 4.9**

*Supports and Barriers to Assistive Technology Integration*

Respondents were also asked to indicate up to three options for what is currently working (see Table 4.12) and up to three options for improving AT use (see Table 4.13). Figure 4.10 juxtaposes the data from table 4.12 for what’s working and table 4.13 for what’s needed to improve AT use. Training on how to use AT devices, how to appropriately consider and include AT within the IEP, and how to use it in special and general education settings was listed among the top six important options for improving AT use, as well as what is currently working. The top three choices for what was currently working included training on how to use AT devices, how to use AT in special education settings, and the availability to borrow devices to try. Other top choices for what is currently working to improve AT use included training on how to implement AT in special education settings and the availability of devices that can be borrowed for a trial period. Interestingly, “nothing is working” for 8% of participants.
The top three choices for improving AT implementation included training on how to measure successful AT use, how to use AT in general education settings, and how to use AT devices. Other top choices for improving AT use were training on how to measure the success of AT implementation and how to use AT in general education setting. One participant said, “If we could change the term AT to something like Learning Style Profile, it would help others see it as something we all use in our own ways.” Another said, “I think there needs to be better communication between IT and AT. I wish IT or Ed Tech had a better understanding of AT.” This information suggests training on how to use AT devices is important, but that training on how to use AT in general education settings is not being generalized to general education settings. Further, not only is there a need for ideas for implementing or integrating AT in general education, but also a way to clearly measure success that can be directly attributed to AT use.

Table 4.12

Responses to Survey Item for Options That are Currently Working to Improve Assistive Technology Use (N = 73)

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training to use AT devices</td>
<td>22.92%</td>
<td>33</td>
</tr>
<tr>
<td>Training on how to implement AT in the special education setting</td>
<td>15.97%</td>
<td>23</td>
</tr>
<tr>
<td>Availability of devices that can be borrowed for a trial period</td>
<td>15.97%</td>
<td>23</td>
</tr>
<tr>
<td>Training on how to appropriately consider &amp; include AT within the IEP</td>
<td>12.50%</td>
<td>18</td>
</tr>
<tr>
<td>Training on how to implement AT in the general education setting</td>
<td>8.33%</td>
<td>12</td>
</tr>
<tr>
<td>Nothing is working (Only check this one)</td>
<td>8.33%</td>
<td>12</td>
</tr>
<tr>
<td>Training on how to measure the success of AT implementation</td>
<td>5.56%</td>
<td>8</td>
</tr>
<tr>
<td>Training on how to conduct AT assessments</td>
<td>5.56%</td>
<td>8</td>
</tr>
<tr>
<td>Training to troubleshoot/initiate repairs of broken/malfunctioning equipment</td>
<td>4.86%</td>
<td>7</td>
</tr>
</tbody>
</table>
Table 4.13

*Responses to Survey Item Important Options for Improving Assistive Technology Use (N = 73)*

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training on how to measure the success of AT implementation</td>
<td>19.05%</td>
<td>40</td>
</tr>
<tr>
<td>Training on how to implement AT in the general education setting</td>
<td>17.62%</td>
<td>37</td>
</tr>
<tr>
<td>Training to use AT devices</td>
<td>14.76%</td>
<td>31</td>
</tr>
<tr>
<td>Training on how to appropriately consider &amp; include AT within the IEP</td>
<td>12.86%</td>
<td>27</td>
</tr>
<tr>
<td>Training on how to conduct AT assessments</td>
<td>11.90%</td>
<td>25</td>
</tr>
<tr>
<td>Training on how to implement AT in the special education setting</td>
<td>10.48%</td>
<td>22</td>
</tr>
<tr>
<td>Availability of devices that can be borrowed for a trial period</td>
<td>7.62%</td>
<td>16</td>
</tr>
<tr>
<td>Training to troubleshoot/initiate repairs of broken/malfunctioning equipment</td>
<td>5.71%</td>
<td>12</td>
</tr>
<tr>
<td>Nothing is needed (Only check this one)</td>
<td>0.00%</td>
<td>0</td>
</tr>
</tbody>
</table>

**Figure 4.10**

*Training and Equipment Availability for Improving AT Use: Comparison of What was Needed vs. What was Currently Working*

*Note.* Data reflected in this figure juxtaposes the data from Table 4.12 (blue) for what was working and table 4.13 (green) for what was needed to improve AT use.

**Qualitative Results**

The following section presents the results of qualitative data derived from responses to open-ended questions from the survey and face-to-face interviews conducted remotely (via Zoom). Answers to the open-ended questions from the interviews were analyzed using a multi-step process (Creswell & Guetterman, 2019). Face-to-face interviews were conducted remotely with 11 educators who completed the survey and who represent various backgrounds. It should
be noted that pseudonyms were generated to ensure anonymity. The interviewees who represented various educator roles included Dora James (an instructional assistant), Krista Rogers (a building administrator), Jennifer Davidson (a speech-language pathologist), Mona Rice (a teacher of the Deaf and Hard of Hearing), Jacob Warner (an instructional technology coach) and six assistive technology (AT) specialists (Clinton Weber, Tara McLaughlin, Traci Clayton, Nadine Yates, Katie Schmidt, and Heather Massey). Each of the AT specialists described the various professional roles held before their current position (i.e., speech-language pathologist, teacher of the deaf and hard of hearing, special educator, occupational therapist, instructional technology coach, learning media specialist) and represented perspectives and practices from the various regions of Pennsylvania.

The interviews lasted approximately 20 to 60 minutes. Nine of the 11 participants were female and two were male. The interviews were recorded and transcribed. The transcriptions were then examined carefully and analyzed using the procedures explained in chapter 3. First, the answers to the open-ended questions were reviewed and organized into tables to determine initial themes and potential codes. A set of codes were developed by the researcher based on the subset of answers. Coding consisted of assigning descriptions or inferential signals to data segments to facilitate condensing and categorizing the data (Miles, Huberman, & Saldaña, 2014). Codes were displayed graphically in a color-coded matrix using Dedoose data analysis software to further identify issues or themes. Within the responses to the eight open-ended questions, color coding was used to classify comments that expressed similar explanations and thoughts among participants. If six or more interviewees stated the same keywords or described semantically related concepts, the comment or idea was coded according to the associated theme. Responses that did not pertain directly to the interview questions were not coded. From the
seven overarching themes emerged. Those themes and the related codes are listed in Table 4.14, and a visual representation of the associated values is shown in Figure 4.11.

**Table 4.14**

*Number and Percentages of Codes Identified*

<table>
<thead>
<tr>
<th>Identified Codes</th>
<th>%</th>
<th>Code Count</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elements of an Effective Learning Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>12.6%</td>
<td>107</td>
</tr>
<tr>
<td>Engagement</td>
<td>3.8%</td>
<td>32</td>
</tr>
<tr>
<td><strong>Technology Integration Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception: Tech is helpful</td>
<td>3.4%</td>
<td>35</td>
</tr>
<tr>
<td>Comfort Level (unspecific)</td>
<td>6.5%</td>
<td>55</td>
</tr>
<tr>
<td>Comfortable</td>
<td>4.9%</td>
<td>42</td>
</tr>
<tr>
<td>Uncomfortable/overwhelmed</td>
<td>6.7%</td>
<td>57</td>
</tr>
<tr>
<td>Description of ineffective use</td>
<td>5.6%</td>
<td>48</td>
</tr>
<tr>
<td>Interpersonal dynamics</td>
<td>7.2%</td>
<td>61</td>
</tr>
<tr>
<td>On-demand resources</td>
<td>4.4%</td>
<td>37</td>
</tr>
<tr>
<td>Support &amp; follow-up</td>
<td>11.2%</td>
<td>95</td>
</tr>
<tr>
<td>Training</td>
<td>10.1%</td>
<td>86</td>
</tr>
<tr>
<td><strong>Elements of Technology Use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decision-making</td>
<td>6.5%</td>
<td>55</td>
</tr>
<tr>
<td>AT software or app</td>
<td>2.8%</td>
<td>29</td>
</tr>
<tr>
<td>Built-in accessibility feature</td>
<td>4.9%</td>
<td>42</td>
</tr>
<tr>
<td>Equipment/hardware</td>
<td>8.1%</td>
<td>69</td>
</tr>
</tbody>
</table>

**Figure 4.11**

*Codes and Visual Representation of the Associated Percentages*
**Theme #1: Access and Engagement**

Nearly 15% of comments by the interviewees to the eight open-ended questions were concerning access, engagement, or equity within the context of the elements of an effective learning environment. When specifically asked to identify things that they look for when first entering the classroom, each participant described various aspects that reflected their professional background or related to the support they provide to students. These elements included the availability of technology, a consistent schedule with predictable routines, visuals that support learning in various ways, and a physical arrangement having clearly defined areas for learning that are accessible to all students, including alternative seating options. With respect to student behavior, participants Clinton Weber, Nadine Yates, and Krista Rogers described aspects of meaningful engagement in classroom activities, and Jacob Warner elaborated that there should be “a clear learning goal or objective, so that way everything that they're doing kind of aligns to that objective of what they're trying to accomplish.”

Six participants described attributes associated with equity, inclusion, and the variability in student abilities found within the classroom. Participants Katie Schmidt, Heather Massey, and
Dora James emphasized educators should create high expectations of their students regardless of ability, and students should have the tools and opportunities they need to participate to their fullest potential. Clinton Weber said, “The law has always said that each student should have the same access to the same materials as their peers.” Within the range of potential, participants Tara McLaughlin, Dora James, and Mona Rice provided more detail by mentioning we should adapt things according to age and ability level because within our schools, some “students are still working on cause and effect and understanding,” while others are engaging in general curriculum with captioning built into tools like PowerPoint. Participant Admin underscored the vision of an effective learning environment by stating, “I truly love when I go [into a life skills classroom] and they're using their hands, and they're telling me about what they just did or where they just went.”

**Theme #2: Technology Integration Factors**

Another theme that emerged identified factors associated with provisions needed for successful integration and implementation of assistive technology. In relation to the perceptions of educators about technology, of the 44 comments made by interviewees concerning perceptions of assistive technology or accessibility features, 35 expressed it was helpful. Among descriptive statements recorded, Jennifer Davidson said, “I see the progress that everyone talks about in research, so it’s real. It really happens.” Katie Schmidt related a student “learned so much more from Grammarly than [he] did from [his] English teacher as to why things were wrong.” While technology cannot replace good teaching, it can provide immediate feedback that reinforces the concepts that are taught.

Throughout the interviews, all participants described situations that reflected varying levels of comfort and familiarity with the use and integration of technology in classrooms.
Challenges to integrating technology within classrooms were reflected in nearly 14% of responses, including factors related to ineffective use of technology, reluctance when educators are not comfortable with the technology, equipment issues, and time constraints. Interestingly, Nadine Yates said, “I think the majority [of educators] in our district have a really positive attitude and really have the kids’ interest in heart, but some of them come with a lot of extra work.” The perceived complexity of technology, the amount of time required, and the difficulty of problem-solving were all found to be factors that limited buy-in by those who were not yet comfortable using it. Jacob Warner said, “The more complex it was and the longer it took to learn the tool, or if it wasn’t super accurate or they weren’t having immediate success, that often led to abandonment, or even the teachers just being like, ‘Well, it doesn’t really work anyway, why would I do this?’” The pandemic also added a layer of complexity to the perceptions and use of technology, many educators either “retired or [were] adapting some of your things to be more technological” (Nadine Yates).

Two interviewees also commented on pervasive issues that were more specific to equipment that derail technology integration, including spotty WiFi, device management issues (e.g., not charged), and limitations that stem from a need for increased collaboration with IT staff. The issue of time constraints was also identified as a barrier to the use of technology. Nadine Yates said, “Sometimes, I think that some people get a little bitter about the time constraints that are beyond what they think is reasonable for certain students.” Jacob Warner said, “[Technology] takes a long time before you can get good enough to kind of make it fun.”

Comfort level with technology, knowledge, and willingness to implement technology was also mentioned factors in nearly 17% of the comments. As expected, most participants noted the implementation of technology was greatest in classrooms where staff were comfortable with
technology, willing to try new ways of doing things, and treated it like “just another tool” in their toolbox rather than as a “centerpiece.” These influential traits can also have a ripple effect. Mona Rice said, “[the teacher’s] enthusiasm and her willingness to try it also gave confidence to the rest of the team, because then they felt like if there’s a problem, I can go and ask her and she’s going to be willing to come and help.” Although people are using technology to do a variety of things such as making presentations, Katie Schmidt said, “Most people are only using the basics.” However, from a training perspective, Traci Clayton said, “People are a little bit more tech-savvy with the technology that they have,” which helps with buy-in. Clinton Weber said, “[Educators] have to feel comfortable enough with what I’m talking about to try it with their students.”

Training, follow-up, and the provision of on-demand resources accounted for more than 21% of comments made by participants as positive factors in the integration of technology. Training and support that demystifies technology are important. Dora James said, “Teachers don’t know what’s available or are aware that it’s simpler than they think.” Descriptions of collaboration and various aspects of interpersonal dynamics were evident throughout the interviews with all 11 participants. Within the context of training and follow-up, three participants described how interpersonal dynamics contributed to the implementation of AT. Among these things were establishing relationships with teachers, knowing how to speak with them, understanding roles and responsibilities, and having responsive support. Following the identification, acquisition, training, and support in the use of an appropriate AT device, a student is subsequently able to use AT to complete the same task that was previously difficult or impossible (Edyburn, 2020). Six interviewees described a successful approach to AT training and follow-up included teachers and students, as well as parents, as appropriate. This is consistent with best practices and allows those being trained the benefit of relying on each other for support.
Theme #3: Elements of Technology Use

Of the 229 comments provided by interviewees concerning equipment, software, apps, and AT practices, 66 were dedicated to trialability and decision-making about AT. The most common pieces of equipment mentioned by participants were Chromebooks and iPads, and the most common software, apps, and extensions, many of which are associated with supporting literacy – particularly those offering text-to-speech and dictation (i.e., speech-to-text).

Determining when assistive technology is required is done through team collaboration and decision-making, which begins when students have identified needs. Dora James said:

A lot of times, it’s just seeing the students who are struggling and then recognizing that they are struggling – not because they’re not trying, but because something needs to happen so some sort of scaffold needs to be in existence – some sort of process – and sometimes, it’s technology. And so, at that point, a lot of times, some collaboration will happen.

When identifying the technology needs of students with disabilities, all 11 participants identified various components related to a process for considering the need for AT in relation to accessing the curriculum. Each described how school professionals make decisions as part of a team (e.g., during IEP meetings) and their role in considering which AT is needed. Traci Clayton said, “The SETT [Student, Environment, Tasks, Tools] framework is a really important piece as to where we look at the instruction [and] what kind of task that student is asked to do.” Family and student involvement in the process of gathering information and making decisions was stressed by Katie Schmidt.

Six interviewees specifically named the SETT framework as a tool used to organize information gathered during this process. The SETT framework, developed by Dr. Joy Zabala
(2005), was one of several tools used to gather information, problem-solve, and prioritize what students need most in terms of what tasks they are expected to perform in the educational setting. Using the SETT framework helped organize information gathered by the team and assist with decisions about what needs to be provided. It was often the case that teams revisited and reconsidered what was needed by reviewing the information from the SETT framework and updating the information at subsequent meetings (“re-SETT”).

Gathering data to establish a baseline, determining the effectiveness of AT prior to the procurement process, and developing a plan for implementation were also key factors in successful implementation. Trialability of AT was an essential component of decision-making that eight participants discussed throughout their interviews, and Nadine Yates said, “Having a trial period is super helpful, especially when you’re trying to determine what is an appropriate fit for the student and the tasks that need to be completed.”

Participants whose primary role was as an AT specialist also stressed the importance of establishing a baseline to help determine the effectiveness of AT and related progress, as well as ensuring the students, parents, and professionals working with the student can provide feedback.

After I go through a SETT process or use some kind of tool to help the team determine what they want to go through trials, I have a very detailed implementation plan. Who is doing what? Where are you getting that from? Who’s responsible for repairs and upkeep, and who’s responsible for trainings? This is something we want to revisit every school year. This assistive technology implementation plan [is] part of your IEP now, so we want to make sure every year, ‘Is this tool still working?’ If it’s not working, what other tools do we need to support it. … I found that schools and parents now are just so much
more willing to work with that, because they know exactly who’s responsible for what (Katie Schmidt).

Integration and Interpretation of Mixed Methods Results

To make connections between the qualitative findings and the quantitative results, the data were interpreted and integrated to determine overall results, gain insights, and draw conclusions as to what extent the qualitative results further explain the quantitative data (Creswell & Plano Clark, 2017). A joint display was used to present the integrated data and juxtapose the qualitative findings with the quantitative results, which then facilitated mixed-methods inferences drawn from combining the two data (Creswell & Guetterman, 2019). Table 4.15 shows the qualitative and quantitative findings together in relation to the themes identified during the interviews. In addition to the side-by-side representation, several responses from the final open-ended survey item (i.e., What other comments do you have regarding the use of education technology and/or assistive technology in relation to students with disabilities in your classroom?) have been included.

Based on the near 100% survey response rate from survey respondents, there was clear evidence that the use of assistive technology was perceived as important, and the presence and availability of technology were mentioned as one of several factors for promoting access and engagement within an effective learning environment during interviews. One survey participant said, “I firmly believe AT needs to be highlighted and used more consistently in education at all levels.” Although there was the perception that AT is important, it has still been overlooked for students who have less obvious needs, as another survey participant said, “While I believe students with the highest level of need for AT do have access, there are many students who could benefit from AT and are not given access.” Nearly 17% of comments by interviewees were
concerning access, engagement, or equity within the context of the elements of an effective learning environment, as well as ensuring educators engage in practices that reflect high expectations regardless of ability. Figure 4.15 juxtaposes the quantitative and qualitative data reflecting educator perspectives on assistive technology and elements of an effective learning environment.

**Table 4.15**

*Joint Display Representing the Integration of the Quantitative and Qualitative Results – Access and Engagement*

<table>
<thead>
<tr>
<th>Qualitative Interview Findings</th>
<th>Quantitative Results of Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.8% of comments were concerning access, engagement, or equity within the context of the elements of an effective learning environment. (Factors mentioned in 11 of 11 interviews: terms used included device, technology, assistive technology, AAC, schedules/routine, visual/picture support, cues on desk, centers/areas/stations, mixed in/like everyone else, physical environment, available/within reach, engaged, meaningful, high expectations, participate in curriculum.)</td>
<td>100% agreed AT enables students with disabilities to access the curriculum and learn more readily. 98.61% agreed AT devices are useful for all core academic tasks. 97.23% agreed AT devices help students with disabilities complete assignments. 98.61% agreed they have seen students make academic progress because of AT.</td>
</tr>
</tbody>
</table>

While most participants felt confident in their ability to use technology, based on the response to the survey and information gathered during interviews, there were concerns about the comfort level and use of AT by the members of their teams or classroom staff. Based on the descriptions of all 11 interviewees, the unsurprising conclusion was: Whether or not AT was used by educators in classrooms depended on comfort level, buy-in, willingness, or openness to try new things with technology.

Most participants felt satisfied with their ability to use AT in special education (92%) and general education classrooms (74%), and the use of technology does not require extra time.
However, during interviews, time constraints for learning to use and integrate technology (e.g., “one more thing”) was frequently expressed by participants who provided training and support. One survey respondent said, “I would love to incorporate these more into my classroom. It takes time to train [myself and my students] on how/when to best use them. I think they could be very useful to all.” Although most agreed professional development supports the use of AT, ET, and IT, which improves student learning, a little more than one-half indicated their education agency did not provide enough training in and knowledge of AT for classroom use.

Almost 80% of survey respondents agreed they would use AT more frequently if there were more support from a specialist to help when problems arise. Consistent with best practices, interview participants identified successful approaches to the training and support provided to teachers and students, as well as parents, as appropriate. One survey respondent said, “I like using assistive technology in my classroom. I would like to learn more about different devices and how they can be utilized.” However, from the perspective of a respondent who must be in a technology support role, “I wish teachers asked for more support. They don’t give much feedback when asked what is needed.” More time for collaboration was identified as needed in both the quantitative and qualitative data. Descriptions of ineffective technology use described by participants can be directly attributed to the need for training, support, and the need for a clearer delineation of the roles and responsibilities regarding AT, accessibility, and technology procurement. Figure 4.16 displays the quantitative and qualitative data reflecting attitudes, beliefs, and practices regarding factors that influence the factors for technology integration.
Table 4.16

*Joint Display Representing the Integration of the Quantitative and Qualitative Results – Technology Integration Factors*

<table>
<thead>
<tr>
<th>Qualitative Interview Findings</th>
<th>Quantitative Results of Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comfort Level</strong></td>
<td></td>
</tr>
<tr>
<td>16.76% of the comments mentioned comfort level with technology, knowledge, and willingness as factors in implementing technology</td>
<td></td>
</tr>
<tr>
<td>(Factors mentioned in 11 of 11 interviews: terms used included comfort level, comfortable, uncomfortable, enthusiasm, willingness, buy-in, open, mindset.)</td>
<td></td>
</tr>
<tr>
<td>91.78% felt satisfied with their ability to use AT in special education settings and explain AT to team members</td>
<td></td>
</tr>
<tr>
<td>73.97% felt satisfied with their ability to use AT in general education settings.</td>
<td></td>
</tr>
<tr>
<td>53.43% were satisfied with the AT knowledge of the Child Study Team.</td>
<td></td>
</tr>
<tr>
<td><strong>Challenges</strong></td>
<td></td>
</tr>
<tr>
<td>12.3% of responses described challenges to integrating technology within classrooms, including factors related to ineffective use of technology, reluctance when educators are not comfortable with the technology, equipment issues, and time constraints associated with learning to use or integrate AT.</td>
<td></td>
</tr>
<tr>
<td>(Factors mentioned in 11 of 11 interviews: terms used included challenge/barrier, time, one more thing, lack of knowledge, don’t know what’s available, spotty WiFi/Internet, [equip] not charged.)</td>
<td></td>
</tr>
<tr>
<td>17.81% agreed that they are reluctant to use AT because it does not work properly.</td>
<td></td>
</tr>
<tr>
<td>52.06% agreed that roles and responsibilities regarding AT, accessibility, and technology procurement are well defined by their education agency.</td>
<td></td>
</tr>
<tr>
<td>79.45% agreed they would use AT more frequently if there were more support from a specialist to help when problems arise.</td>
<td></td>
</tr>
<tr>
<td>91.78% disagreed that AT requires too much time to use during their class.</td>
<td></td>
</tr>
<tr>
<td>79.46% agreed they need more time to collaborate with colleagues.</td>
<td></td>
</tr>
<tr>
<td><strong>Training, Follow-Up &amp; Resources</strong></td>
<td></td>
</tr>
<tr>
<td>21.3% of comments made by participants were also identified training, follow-up, and the provision of on-demand resources as positive factors in the integration of technology</td>
<td></td>
</tr>
<tr>
<td>80% agreed PD at their education agency supports the use of AT, ET &amp; IT to improve student learning.</td>
<td></td>
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</tbody>
</table>
53.43% agreed their education agency provides adequate training in and knowledge of AT for classroom needs.

More than 80% of educators felt AT devices and services should be considered for all students with disabilities. One survey participant said, “Each and every IEP team should consider assistive technology during every annual IEP, as student needs may have changed over time.”

When making decisions about assistive technology, most participants felt confident in their ability to discuss the need for AT during team meetings (88%), match the features of technology to the needs of the student (73%), make informed AT suggestions (74%), and determine when ed tech should be categorized as AT (85%). The SETT framework was identified as a tool for helping with the AT consideration process. Ten of 11 interviewees described some form of decision-making process (e.g., consideration of AT using SETT framework and data collection), including determining needs related to academic tasks, data collection, and borrowing devices to try, as well as the need to review this information at least annually. One interviewee also elaborated on how the use of an implementation plan supports the use of AT by specifying roles and responsibilities. This seems particularly important considering only 52% of survey participants indicated roles and responsibilities regarding AT, accessibility, and technology procurement are well defined by their education agency (e.g., school, district, Intermediate Unit,
etc.). Figure 4.17 juxtaposes the quantitative and qualitative data comparing attitudes, beliefs, and practices that reflected elements of technology use and decision-making.

**Table 4.17**

*Joint Display Representing the Integration of the Quantitative and Qualitative Results – Elements of Technology Use*

<table>
<thead>
<tr>
<th>Qualitative Interview Findings</th>
<th>Quantitative Results of Survey</th>
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<tbody>
<tr>
<td>6.5% of comments described a decision-making process (e.g., consideration of AT using SETT framework and data collection), including borrowing devices to try</td>
<td>80.83% agreed AT devices and services should be considered for all students with disabilities.</td>
</tr>
<tr>
<td>(Factors mentioned in 10 of 11 interviews: terms used included SETT framework/process, team/group decision(s), consider AT, data, [device] trials, feedback, baseline, implementation plan, revisit every year, [descriptions of feature matching].)</td>
<td>84.93% felt satisfied with their ability to determine when ed tech or a 1:1 device should be listed as AT in a 504 plan or IEP.</td>
</tr>
<tr>
<td>15.8% of comments mentioned specific hardware, software, apps, extensions, or accessibility features. (Factors mentioned in 11 of 11 interviews: terms used included Chromebook, iPad, 1:1 devices/program names of specific software, apps, extension, add-ons, features.)</td>
<td>87.67% felt satisfied with their ability to discuss the need for AT during team meetings.</td>
</tr>
<tr>
<td>80.83% agreed AT devices and services should be considered for all students with disabilities.</td>
<td>73.97% felt satisfied with their ability to make informed AT suggestions for students with disabilities.</td>
</tr>
<tr>
<td>84.93% felt satisfied with their ability to determine when ed tech or a 1:1 device should be listed as AT in a 504 plan or IEP.</td>
<td>72.61% felt satisfied with their ability to match the features of technology to the needs of the student.</td>
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</table>

**Summary**

This chapter reported the results of the self-administered survey and 11 interviews. Results reported for the self-administered survey included the means and standard deviations for responses to each of the items that related to the usage of educational and assistive technology, educator attitudes and beliefs about assistive technology, and supports and barriers to assistive technology integration. It also reported the demographics and the assistive technology used for reading, writing, mathematics, and organization/memory.
The qualitative part of the study consisted of semi-structured interviews with eight educators from various backgrounds, including the themes identified within the context of the eight interview questions and the response count for each theme. The results and several implications of the study will be discussed in the following chapter.
Chapter 5: Discussion

During an interview, Rogers explained, “It is people sharing their experiences with an innovation with others who haven't yet adopted that ultimately is what convinces most people to adopt a new idea” (McGrath & Zell, 2001, p. 388).

Introduction

Assistive technology has the potential to provide greater independence using universally designed and specialized technologies that mitigate or alleviate the impact of a disability (Edyburn, 2015). Yet there continues to be a gap between what we know works and what needs to happen in the classroom. Beyond what is stipulated in the law, there is no clear distinction between technology for students with disabilities and education technology, largely because many of today’s technologies that can be considered assistive for students with disabilities also benefit all students (e.g., computer-based concept maps, virtual manipulatives, and software programs; Bouck, 2010).

Most students have access to and use technology, which not only provided additional flexibility when differentiating instruction, but also provided access using the same equipment as peers. Using everyday technology and the built-in accessibility features can be a starting point for helping students with disabilities before further personalizing their AT with more robust software, features, and options. It should be noted the starting point is highly individualized and should begin with the most appropriate tool for independently completing tasks to the greatest degree possible. Further, combining the accessibility features built into digital technology with intensive teaching and strategies, that can be used with and without technology, can enhance the
effectiveness of instruction and have a major impact on access and engagement for students with disabilities.

**Summary of Study**

An explanatory, sequential, mixed-methods design was used to investigate the perception and use of technology by Pennsylvania educators who support the needs of students with disabilities. In this study, 73 Pennsylvania educators completed an online survey designed to collect quantitative data, which included two open-ended items for adding comments. Following the survey, 11 educators having various backgrounds participated in semi-structured interviews, which provided qualitative data. Both data sets were analyzed and integrated to answer the following research questions:

1. How do educators perceive the use of educational and assistive technologies for addressing the needs of students with disabilities?
   a. What are their experiences with educational and assistive technologies?
   b. What do educators perceive as factors that influence AT integration?
2. What knowledge and skills do educators perceive would facilitate the use of assistive technologies?

**Research Question 1**

*How do educators perceive the use of educational and assistive technologies for addressing the needs of students with disabilities?* Results of the study indicated nearly all educators believe assistive technology is useful for all core academic classes and should be used by students with disabilities in general or special education settings. The availability of AT is important because it enables students with disabilities to access the curriculum, complete their assignments, and make academic progress.
**Sub-question 1.** *What are their experiences with educational and assistive technologies?*

Printed media presented in text-to-speech, e-books, and audiobooks have been a part of special education, primarily as an intervention to support struggling readers or those with disabilities (Parr, 2012) for many years, and math tools such as highlighting and graphic organizers are available as digital alternatives to existing non-digital tools. The AT preferences identified in a ranked order by educators reflected a familiarity with known tools used as supports in education and the accessibility options within the broader mainstream market which have refined with time.

**Sub-question 2.** *What do educators perceive as factors that influence AT integration?*

Most educators felt AT devices and services should be considered for all students with disabilities (81%). They also felt confident that they were able to discuss the need for AT during team meetings (88%), match the features of technology to the needs of the student (73%), make informed AT suggestions (74%), and determine when ed tech should be categorized as AT (84%). The SETT framework was identified as a tool for helping with the AT consideration process. Developing an implementation plan further supports the successful integration of AT by identifying roles and responsibilities.

Although educators felt the implementation of AT did not require too much time to use during class (80%), qualitative findings reflected concerns with time constraints for learning to use AT, the perception that it was “one more thing,” and there was insufficient time dedicated to regular collaboration with colleagues. Additionally, almost 80% of survey respondents indicated they needed more time to collaborate with colleagues.
Research Question 2

What knowledge and skills do educators perceive would facilitate the use of assistive technologies? Research findings suggest there is a need for a greater focus on the assessment of needs for AT, how to measure its effectiveness, the use of assistive technology in the classroom, and better defining roles and responsibilities associated with AT. Although adequate training was provided through their education agencies supporting the use of technology in student learning, there is a need for training and knowledge in the implementation and integration of AT in classrooms. Quantitative results suggested training on how to use AT devices and its use in special education settings were two of the factors currently working for AT use, but training on the use in general education settings was needed to improve AT implementation. Additionally, not only is there a need for ways to use AT in general education, but there should also be a way to measure the success of AT implementation. As far as what is currently working and options for improving AT use, training on the use of AT devices and how to include them in the IEP was among the four top options for each survey item.

Application of Theoretical Framework to Findings

Diffusion of Innovations (Rogers, 2003) provided a theoretical framework for how innovations were adopted by individuals and then diffused through various networks. According to Rogers, diffusion studies were typically used to examine issues with the adoption of an innovation (McGrath & Zell, 2001). Since assistive technology integration has been relatively stagnant for more than 20 years, it was necessary to examine what factors would accelerate its adoption, so that its use would benefit all students and make more specialized solutions easier to provide. Although the pandemic was briefly mentioned by a few interview participants,
descriptions hinted at how it created an immediate need for (and expedited the provision of) 1:1 devices, which in turn enabled students to access their education remotely.

Diffusion was defined as “the process in which an innovation is communicated through certain channels over time among members of a social system” (Rogers, 2003, p. 5) and innovation can be new or merely new to the adopter. Within the realm of education, Rogers’ theory of the diffusion of innovations helped to explain why assistive technology has been quickly adopted by some educators but required more time to adopt by others.

Adopter categories described ideal types of common traits associated with an individual’s receptiveness to innovation (e.g., ideas, processing, or products). Rogers (2003) identified these categories as Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. During the semi-structured interviews, the interviewees described scenarios that related to traits found within the adopter categories described by Rogers. Innovators were considered those first to adopt new ideas and had a high-risk tolerance for setbacks. Known for their successful, discrete use of innovation, early adopters played a key role as opinion leaders in the adoption process since potential adopters look to them for advice and information about the innovation. Dora James described a teacher as just such an early adopter and opinion leader:

I just think she’s amazing in all areas; most of my great examples come from her. She uses technology in a way that does not have technology be the centerpiece. It’s just another tool in her toolbox, and that’s what I love about it is that it’s a very natural sort of progression, and that’s how she uses it and that’s what happens. And I think that’s kind of how it should be.

By sharing thoughts how most of the great examples came from her colleague and that technology was “just another tool in her toolbox” closely related to the description of someone
who would be an early adopter and possibly an opinion leader who could influence adoption and
the use of technology in classrooms. At the other end of the spectrum are laggards, who were
often resistant to innovation, required a greater level of support, and take the most time to adopt.
As a building administrator, Krista Rogers shared her “biggest challenge, is the people that don't
feel comfortable with it [technology]. They're just not going to use it.” Rogers explained what
ultimately convinces most people to adopt a new idea is having others who share their
experiences with the innovation with those who have not yet adopted it (McGrath & Zell, 2001).

Social systems and communication networks helped to explain the influences that led to
favorable conditions for adoption, as well as factors that served as obstacles. Those who acted as
change agents and opinion leaders played a critical role in whether an innovation was adopted.
Nadine Yates related the following example from working with a new teacher:

It was kind of an out-of-the-box way to do things for the student. And [the teacher] didn’t
tell me until it was wildly successful that, ‘I totally doubted this until I saw the growth in
the student.’

This description by in doing things in an “out-of-the-box way” with someone who
“totally doubted this until [they] saw the growth in the student,’ described an innovator working
with someone who may be within the early adopter or early majority groups that required more
evidence of success before adoption.

Change agents may also be innovators, but not always the case, as teasing out the
difference would be needed to ensure there was a dynamic equilibrium that maintains an
accelerated yet sustainable rate of adoption. Another critical piece was having enough adopters
so that the rate of diffusion would be self-sustaining, and dependent on the nature of the
interpersonal communication networks (McGrath & Zell, 2001). Change agents, such as
instructional technology coaches and assistive technology specialists, made interpersonal connections and training others to build their capacity and self-reliance for technology integration.

When explaining how innovations diffuse, it was important to consider the influence of an organization, as well as individual decision making, which included expanding diffusion theory to incorporate implementation and discrete adoption decisions (McGrath & Zell, 2001). The innovation-decision process consisted of gathering and seeking information to reduce uncertainty about the advantages and disadvantages of the innovation. The five main steps of the innovation-decision process “usually occur in a time-ordered sequence of knowledge, persuasion, decision, implementation, and confirmation,” and the perceived attributes of innovation include its relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003, p. 21).

This process was similar to the consideration process used by schools to determine the need for assistive technology. Many of the interviewees described using the SETT framework to gather information, including matching features of technology to what the student needs to do and collecting data to determine the effectiveness of the technology being tried (prior to procurement). Approximately 73% of survey respondents indicated they can discuss the need for AT, make informed AT suggestions, and match the features of technology to the needs of the student. The adoption or rejection of innovations by individuals or by an entire social system could also play an important part in the diffusion of new ideas (Rogers, 2003), and the length of decision periods varies by adopter characteristics and interpersonal dynamics within various social networks.
Within the context of education, training and follow-up support of assistive technology were essential elements in the decision-making and adoption process. Implementation would be crucial when an organization is involved (McGrath & Zell, 2001). After a decision to adopt, a lot could go wrong before the new innovation could be fully implemented. Developing relationships, understanding the complexity of needs of potential adopters, and enlisting the assistance of opinion leaders would help accelerate adoption. When describing the AT follow-up process used, Traci Clayton said, “I’m trying to just build relationships with the teachers, so that they know what I do, and they know how I can help them. I think that’s the biggest part, is just knowing that there’s someone there to help you out. You’re not doing this on your own.” This statement reinforced many important interpersonal aspects for helping educators move from one adoption category to the next.

**Summary and Discussion of Results**

Overall, AT was viewed positively and there was a high rate of diffusion of technology among participants. Based on the results presented in chapter four, as well as the summary presented in the paragraphs above, educators perceived assistive technology as necessary for students with disabilities but needed ideas and varying levels of support for technology to be fully integrated across settings. In general, educators thought AT devices and services should be available to all students with disabilities. They felt confident in discussing AT needs during team meetings, matching technology features to students' needs, and making decisions based in part on those features.

Descriptions provided during interviews were consistent with the adopter categories described by Rogers in the Diffusion of Innovations (Rogers, 2003). When the pandemic accelerated the infiltration of technology into classrooms as 1:1 technology, it also caused many
educators to decide whether to retire or quickly adapt practices to be more technological. The successful integration of AT would be dependent on the identification and enlistment of individuals, who can further accelerate its integration. This could include a specialist (e.g., AT, Instructional Technology Coach, SLP, ToDHH, etc.) or a building-level peer who would be able to provide immediate support for day-to-day problem solving and inspiration. Professional Learning Communities and grade-level or content-specific teams have often been ways to develop social networks and relationships for a more immediate level of support.

Findings indicated a need to develop training that focuses on assessing the need for AT, evaluating its effectiveness, integrating AT into the classroom, and defining roles and responsibilities related to AT. Survey results indicated that educators felt the implementation of AT did not require a lot of time to use during class, but qualitative findings highlighted concerns related to time constraints for learning how to use it and the perception that it was “one more thing.” Insufficient time for collaborating with colleagues was found in both the quantitative and qualitative data. Understanding how technology could be integrated throughout within existing educational support provided in schools and how it could be applied would require a thoughtful, systematic approach.

The consideration, procurement, and integration within schools was highly dependent on the policies driven by administrators. The policies of an LEAs were significant variables, which help to reframe the diffusion problem to consider how innovation diffusion could occur within organizations. To increase the diffusion process of assistive technology, inclusive technology networks would need to be created for fostering the communication between AT, ET, IT, and administrators who play key roles in the purchasing and use of technology, as well as its many applications.
Limitations of the Study

Study limitations are potential weaknesses or flaws in a study that the researcher has identified that could be useful information to other researchers who may want to do a similar or replication study (Creswell & Guetterman, 2019). There were notable limitations to this study with respect to methodology, analysis, and generalizability.

Limitations in Methodology

Working at PaTTAN serving on the AT and Speech-Language initiatives, most respondents were AT (one-third) or SLPs (one-third). Very few were in general education. Interviewees came from varied backgrounds; however, most directly supported the training and use of AT in some capacity.

Limitations in Analysis

The response rate was 58.4% and survey results were limited to only those fully completed. Researcher bias played a dual role in the interpretation of the results because I used my experience and expertise in AT to interpret data that related to educational practices observed within school settings. Also, in Rogers’ (2003) terms, as a professional who has creatively considered solutions to barriers to learning and communication, including the use of technology, I am prone to “pro-innovation bias” in my interpretations. Further, my primary background is in special education as a related services provider, and I have no first-hand knowledge of the pedagogy, practices, or workload demands associated with being a general education teacher.

Limitations in Generalization

Findings are limited to Pennsylvania educators and primarily represent the perspectives of special educators who support the needs of students with disabilities attending Kindergarten
through 12th grade in public schools. The primary focus was on the use and application of educational and assistive technologies.

**Implications of Future Educational Research**

Future research should focus on areas of intersection between Multi-Tiered System of Supports (MTSS), Universal Design for Learning (UDL), and AT to develop a supplemental framework that assists in the decision-making process when determining support. The MTSS is a systemic, continuous-improvement framework that uses data to solve problems and make decisions at all levels of the educational system to support students. UDL provides a framework for teaching and learning for ensuring all students have an equal opportunity for achievement. Assistive technology is defined by special education law as equipment or services that are needed for students with disabilities to increase, maintain, or improve their functional capabilities. A comprehensive look at guidance provided within MTSS, UDL, and AT within current practices is needed to identify how educators can use a more comprehensive approach to the consideration and practical implementation of the tools and strategies students need from the onset of learning challenges.

Another study might focus on the connections between the provisions and descriptions of technology in the National Education Technology Plan (NETP), International Society for Technology in Education (ISTE) Standards, and Individuals with Disabilities Education Act (IDEA) to develop a comprehensive view of how their alignment and guidance can be used in all aspects of education (i.e., general education and special education). The NETP is an educational technology policy document for the United States that encompasses new developments in education technology and explains how technology can be used to improve equity for all students. The ISTE Standards define competencies for learning, teaching, and leading by
comprehensive guidance for effectively using technology in schools. The IDEA provides legal
guidance for ensuring all children with disabilities receive a free, appropriate public education to
meet their unique needs and prepare them for further education, employment, and independent
living. A comprehensive review of the NETP, ISTE Standards and federal guidance provided in
IDEA would provide a comprehensive framework for addressing the learning needs of students
of all abilities.

A third study might use aspects of the Rogers’ (2003) Diffusion of Innovations and
organization theory to investigate the use of technology by educators and how current practices
align with the substitution, augmentation, modification, and redefinition (SAMR) model, ISTE
Standards, and Quality Indicators for Assistive Technology (QIAT) indicators and matrices. The
SAMR model identifies degrees of technology integration, arranged roughly in order of
sophistication and transformative power. For a more comprehensive investigation of educator
knowledge needed for successful integration of technology, the Technological Pedagogical and
Content Knowledge (TPACK) model would be an alternative framework to the SAMR model.
The QIAT indicators and matrices include specific competencies that would be useful across a
variety of educational settings. Applying Rogers’ (2003) theory of the diffusion of innovations
and organization theory to focus on areas of intersection between processes and procedures
found in schools and their alignment with SAMR/TPACK, ISTE Standards, and QIAT indicators
and matrices would provide a way to look at look at the in consider the influencing factors for
integrating technology within all settings of education.

Summary
Educators in this study recognized that assistive technology was helpful for all core academic classes, helped students complete their assignments, and assisted them in making academic progress. Results indicated a variety of hardware and software were being used by educators, but qualitative data suggested integration depended on the comfort level of the teacher, as well as other staff working with the students. Many of the tools identified were accessibility features that have been available for more than 20 years or are a substitute for existing non-digital items. Many schools used software that included built-in features that increased accessibility which were often overlooked because of a lack of familiarity or perceived to conflict with pedagogy but would warrant further exploration into the ways that students could use them to engage fully in the curriculum, reflect their personal learning style, and increase accessibility. Students with disabilities could access the curriculum more readily and learn more efficiently when AT was available.

The use of technology was a part of national policy and indicated as a support in special education law, which would suggest its use would be supportive at all educational levels. It would be essential to have technologies that are inclusive, accessible, and could be used directly by users or made so by AT. This would require interoperability with other AT devices that can support individuals' needs when IT hardware and software are not enough. In order to promote the diffusion process of assistive technology, inclusive technology networks should be created to foster intentional communication between AT, ET, IT, and administrators who play a key role in the purchases and uses of technology. Such a collaboration would result in inclusive technology ecosystems that not only meet the needs of students with disabilities but would benefit all students.
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https://doi.org/10.1080/15391523.2019.1566037

Graduate School of Computer and Information Sciences.

https://nsuworks.nova.edu/gscis_etd/301


https://doi.org/10.1177/1053451218819201


Appendix A

IRB Approval

Date: 4-4-2022

IRB #: IRB-FY2022-34
Title: Mixed-methods Analysis of Supporting Students with Disabilities in Public Schools: Where Does Digital Technology Fit Within the Continuum of Supports?
Creation Date: 8-16-2021
End Date:
Status: Approved
Principal Investigator: Tammy Cooke
Review Board: West Chester University Institutional Review Board
Sponsor:

Study History

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Key Study Contacts

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Appendix B

Informed Consent

Project Title: When Ed Tech Becomes Assistive Tech

Investigator(s): Tammy Thompson-Cooke; David Backer

Project Overview:

Participation in this research project is voluntary and is being done by Tammy Cooke as part of her doctoral dissertation. This research project is intended to examine the ways digital technology is used in K-12 classrooms to support the needs of students with disabilities and the correlation between the assistive technology (AT) knowledge, skills, and needs of K-12 educators within Pennsylvania. This research is a requirement of the doctoral degree at the West Chester University.

The results of this study will be used to describe the level of AT knowledge among K-12 educators (i.e., general and special education professionals and related service providers), determine staff perceptions of the availability and effectiveness of AT technical assistance and support, and identify AT training needs within Pennsylvania. This research will help also create a clearer picture of how digital technology is being used to mitigate learning barriers and highlight exemplary practices in the field that will inspire educators to consider and use tech for increasing achievement & independence.

The results should be beneficial to a variety of key stakeholders supporting the learning needs of K-12 students, as well as professionals in the field of special education, who are working to improve the use of assistive technology with individuals with disabilities.

Participation will take about approx. 20 min for the anonymous online survey. Survey respondents can also volunteer for a follow-up interview, which will take approximately 30-60 min.

If you would like to take part, West Chester University requires that you agree and sign this consent form.
You may ask Tammy Cooke any questions to help you understand this study. If you don’t want to be a part of this study, it won’t affect any services from West Chester University. If you choose to be a part of this study, you have the right to change your mind and stop being a part of the study at any time.

1. **What is the purpose of this study?**
   - The purpose of this study is to examine the ways digital technology is used in K-12 classrooms to support the needs of students with disabilities and the correlation between the assistive technology knowledge, skills, and needs of K-12 educators within Pennsylvania.

2. **If you decide to be a part of this study, you will be asked to do the following:**
   - Distribute survey through listserv and networks
   - Participate in an anonymous survey that should take approx. 20 min to complete
   - Asked to volunteer for a follow-up interview of approximately 30-60 min

3. **Are there any experimental medical treatments?**
   - No.

4. **Is there any risk to me?**
   - None, participation is voluntary, and participants can terminate their participation at any time without negative consequences. Data collected through the survey is anonymous and only aggregate results shared. Any identifying information gathered through interviews will be anonymized and original transcripts will be kept in a locked cabinet, then destroyed after three years.

5. **Is there any benefit to me?**
   - There will be no direct benefit to participants. The outcome of the study is to create a clearer picture of how digital technology is being used to mitigate learning barriers, highlight exemplary practices, and identify future assistive technology training and technical assistance needs.

6. **How will you protect my privacy?**
   - Recordings from volunteer participants will be recorded digitally and then, transcribed, coded, and analyzed.
   - Your records will be private. Only Tammy Cooke, David Backer, and the IRB will have access to your name and responses.
   - Your name will **not** be used in any reports.
   - Records will be stored as a password protected file on a thumb drive kept in a locked cabinet at 333 Technology Drive, Malvern PA 19355.
   - All identifiable information will be anonymized or redacted.
   - Records will be destroyed Three Years After Study Completion

7. **Do I get paid to take part in this study?**
   - No.
8. **Who do I contact in case of research related injury?**
   - For any questions with this study, contact:
     - **Researcher:** Tammy Cooke at 415-244-7070 or tc921646@wcupa.edu
     - **Faculty Sponsor:** David Backer at 610-436-2326 or dbacker@wcupa.edu

9. **What will you do with my Identifiable Information/Biospecimens?**
   - Not applicable.

For any questions about your rights in this research study, contact the ORSP at 610-436-3557.

I, _____________________________________________ (your name), have read this form and I understand the statements in this form. I know that if I am uncomfortable with this study, I can stop at any time. I know that it is not possible to know all possible risks in a study, and I think that reasonable safety measures have been taken to decrease any risk.

[Signature]

Subject/Participant Signature

Date

[Signature]

Witness Signature

Date
Appendix C

Letter of Support

RE: Tammy Thompson-Cooke

August 13, 2021

Dear Members of the Institutional Review Board,

Tammy Cooke has permission to conduct her research “Mixed-methods Analysis of Supporting Students with Disabilities in Public Schools: Where Does Digital Technology Fit Within the Continuum of Supports?” by accessing the professional networks established by the PaTTAN initiatives for gathering information as it relates to the needs of assistive technology initiative. I have been advised of the scope of the research and how the data will be collected. I also understand that all information to be gathered will be collected in a confidential and appropriate manner. I understand permission is contingent upon approval from West Chester University’s institutional Review Board.

Sincerely,

[Signature]

Rebecca Fogle
Director
Pennsylvania Training and Technical Assistance Network (PaTTAN)
333 Technology Drive | Malvern, PA 19355
610-265-7321 | 800-441-3215 ext. 7214
www.pattan.net
Appendix D
Williamson-Henriques Permission

7/11/2021
Mail - Tammy Thompson-Cookie - Outlook

Re: Assistive Technology Survey Instrument
Kendra Williamson <kendrioteach@yahoo.com>
Sun 7/11/2021 10:19 AM
Re: Tammy Thompson-Cookie <tcookie@pattan.org>

Tammy!

Yes, you can use the and modify the survey. Thank you for submitting your request. Many blessings to you as you move forward in your program.

Thank you,
Kendra Williamson-Henriques PhD

Owner
Woodsmen's Montessori
http://www.woodsmensmontessori.com

Founder & CEO
Teacher2Teacher Consulting, LLC
https://www.teacher2teacherconsulting.com/
336.346.7084

On Sunday, July 11, 2021, 09:11:34 AM EDT, Tammy Thompson-Cookie <tcookie@pattan.org> wrote:

Dear Dr. Williamson-Henriques,

I am a doctoral candidate at West Chester University researching the use of digital technology by students with disabilities in public school settings. I also work at Pennsylvania Training and Technical Assistance Network (PaTTAN); and one of my roles is serving as the state lead for the assistive technology initiative.

During my doctoral research, I came across your dissertation, "Secondary Teachers' Perceptions of Assistive Technology Use for Students with Learning Disabilities." I am in the process of conducting a related research study, exploring educators’ experiences, practices, and perceptions of the use of technology for K-12 students with disabilities. Additionally, I hope to use the research findings to inform future training plans.

I was wondering if you would allow me to use and modify your survey instrument as it relates to my research.

Thank you for your consideration and I look forward to hearing from you.

Kindest regards,

Tammy Thompson-Cookie, MS CCC-SLP | Educational Consultant
Pennsylvania Training and Technical Assistance Network (PaTTAN)
333 Technology Drive | Malvern, PA 19355
610.875.7105 (direct line) | 800.441.3215 x05
www.pattan.net

The mission of the Pennsylvania Training and Technical Assistance Network (PaTTAN) is to support the efforts and initiatives of the Bureau of Special Education and to build the capacity of local educational agencies to serve students who receive special education services.
Appendix E

Marsters Permission

7/11/2021
Mail - Tammy Thompson-Cooke - Outlook

Re: Assistive Technology Survey Instrument

Marsters, Aaron, Dr, CN, OSD/DoDEA-Europe <Aaron.Marsters@DoDEA.Edu>
Sat, 9/20/2021 12:12 PM
To: Tammy Thompson-Cooke <tcooke@pattankop.net>
Cc: Cooke, Tammy <tcooke@pattankop.net>

Hello Tammy,

Thank you for the email and your interest in my dissertation. You are welcome to use and modify the survey instrument. Good luck with your research. I look forward to reading it when it is completed. Let me know if I can offer additional assistance.

Respectfully,

Aaron Marsters
Assistive Technology ISS
Europe East

From: Tammy Thompson-Cooke <tcooke@pattankop.net>
Sent: Thursday, July 8, 2021 5:24 PM
To: Marsters, Aaron, Dr, CN, OSD/DoDEA-Europe
Cc: Cooke, Tammy
Subject: Assistive Technology Survey Instrument

***This message originated from outside of DoDEA***

Dear Dr. Marsters,

I am a doctoral candidate at West Chester University researching the use of digital technology by students with disabilities in public school settings. I also work at Pennsylvania Training and Technical Assistance Network (PaTTAN) and one of my roles is serving as the state lead for the assistive technology initiative.

During my doctoral research, I came across your dissertation, "An Exploratory Study of the Assistive Technology Knowledge, Skills, and Needs Among Special Education Teachers and Related Service Personnel." I am in the process of conducting a related research study, exploring educators' experiences, practices, and perceptions of the use of technology for K-12 students with disabilities. Additionally, I hope to use the research findings to inform future training plans.

I was wondering if you would allow me to use and modify your survey instrument as it relates to my research.

Thank you for your consideration and I look forward to hearing from you.

Kind regards,

Tammy Thompson-Cooke, M.S., C.C.C.-SLP | Educational Consultant
Pennsylvania Training and Technical Assistance Network (PaTTAN)
323 Technology Drive | Malvern, PA 19355
610-879-7205 (direct line) | 800-443-3225 ext. 7205
www.pattankop.net

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Appendix F

Survey Invitation Letter

Good afternoon,

My name is Tammy Thompson-Cooke, and I am a doctoral student at West Chester University. I am also an Educational Consultant at PaTTAN serving on the Assistive Technology (AT) initiative.

I am currently investigating the use of technology by educators who teach or support students attending public schools in Pennsylvania. To that end, I have developed a survey aimed at understanding professionals' perceptions and use of technology with students with disabilities. The data and information collected from my dissertation will also be used to determine future training needs and resources as part of the AT initiative training plan.

I am trying to reach as many public-school educators across the state as possible, and I could use your help in spreading awareness of this research opportunity. I would greatly appreciate it if you would share this email in hopes of a broader reach that better represents what is happening in Pennsylvania.

Educators (i.e., general and special education professionals and related service providers) working with K-12 students attending public schools are invited to participate in this survey study aimed at understanding staff perceptions of the availability and effectiveness of AT technical assistance and support and identifying AT training needs within Pennsylvania. More info about the study: https://bit.ly/3Ddpr8C

This survey will take approximately 15-20 minutes to complete.


Feel free to share this email with others who might be interested in responding. Link to the sharable flyer: https://bit.ly/3nvanxQ

All survey responses will remain ANONYMOUS, but participants who complete the survey may share their email address with us to enter a raffle for one of two $50 Amazon gift cards as a thank you for your participation.

Recognizing there may be little direct individual benefit to you personally, we greatly appreciate your time and input. This will assist in developing and improving future programs for continuing education for personnel development.

There are no anticipated risks to participating in this study. Surveys and all data will be destroyed within five years. Only group data will be reported; therefore, no reference will be made in oral or written reports that could link you to the study.
Should you have any questions at this time or in the future, please contact the primary investigator Dr. David Backer at dbacker@wcupa.edu.

Thank you so much for your time and consideration! I greatly appreciate *any* help you can provide!

Tammy Thompson-Cooke, M.S., CCC-SLP
tc921646@wcupa.edu
tcooke@pattan.net
Appendix G

Survey Questions

Perceptions: Edtech and AT

Start of Block: Introduction

Q1
Please take approximately 20 minutes of your time to complete this questionnaire about educational and assistive technology (AT). Your input is critical in the effort to improve the consideration and use of AT. This research is a requirement of the doctoral degree at West Chester University, West Chester. If you decide to participate in this survey, there are no known risks, and responses will not be personally linked to you. No personally identifiable information will be kept. If you complete the survey, you will be eligible for a $50 Amazon gift card. There will be two drawings at the conclusion of the study as a token of appreciation for your time.
If you have any questions about the research study itself, please contact my advisor Dr. David Backer, Wayne Hall Office 930, 125 W Rosedale Avenue, West Chester, PA 19383, 203-917-7416; email: dbacker@wcupa.edu. If you have questions about your rights as a research subject, please contact Institutional Review Board Office, West Chester University, Ehinger Annex 113, West Chester, PA 19383; email: irb@wcupa.edu. This research has been reviewed according to the West Chester University IRB procedures for research involving human subjects. For more info about the study: https://bit.ly/3Ddpr8C.

Your participation indicates that you are at least 18 years of age; are an educator working with students attending grades K-12 in Pennsylvania public schools, the research has been explained to you; your questions have been fully answered, and you freely and voluntarily chose to participate in this research project.

☐ Agree (1)
Q2 Definition of Terms

Educational Technology (Ed Tech):

The terms educational technology and instructional technology are often used interchangeably in K-12 settings. Educational technology or Instructional technology refers to the use of technologies, such as digital devices, computers, and software applications, that facilitate learning. The term 'ed tech' will be used in the survey to refer to this category of technology.

Assistive Technology (AT) as defined by The Individual with Disabilities Education Improvement Act (IDEIA) re-authorized in 2004 states:

The term ‘assistive technology device means any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability.

Child with a Disability as defined by IDEIA 2004 states:

Child with a disability means a child evaluated in accordance with §§300.304 through 300.311 as having an intellectual disability, a hearing impairment (including deafness), a speech or language impairment, a visual impairment (including blindness), a serious emotional disturbance (referred to in this part as “emotional disturbance”), an orthopedic impairment, autism, traumatic brain injury, another health impairment, a specific learning disability, deaf-blindness, or multiple disabilities, and who, by reason thereof, needs special education and related services.

Learning Disability:

The term specific learning disability refers to a student having an educational disability in reading, writing, or math. A learning disability does not include a learning problem that is primarily the result of visual, hearing, or motor disabilities, mental retardation, emotional disturbance, or of environmental, cultural, or economic disadvantage.

Please answer the following questions about assistive technology based upon these definitions. Please note that assistive technology is a broad term. Assistive technology includes items that may not typically be considered “technology” (i.e., pencil grips and graphic organizers), and includes high-tech items (i.e., iPads, laptops, reading pens, and speech-to-text). However, the part of the focus of this research is on the use of digital technology that can be used as assistive technology.

End of Block: Introduction

Start of Block: Demographics

Q3 Demographic Questions: Please indicate your response by selecting the choice which best matches your answer.
Q4 Which County in Pennsylvania do you work in?

▼ Adams (10) ... York (72)

Q5 Gender

- Male (1)
- Female (2)
- Non-binary / third gender (3)
- Prefer not to say (4)

Q6 Number of years teaching.

- Less than 5 years (1)
- 5-9 years (2)
- 10-20 years (3)
- More than 20 years (4)

Q7 What is the highest level of education you have completed?

- 4-year College Degree (1)
- Master's Degree (2)
- Doctoral Degree (3)
Q8 Current primary teaching position

☐ General Education Teacher (1)
☐ Special Education Teacher Low-Incidence/Mild-to-Moderate (2)
☐ Special Education Teacher Low-Incidence/Moderate-to-Severe (3)
☐ Special Education Teacher Visually Impaired (4)
☐ Special Education Teacher Orientation & Mobility (5)
☐ Special Education Teacher Deaf/Hard of Hearing (6)
☐ Special Education Teacher High Incidence (7)
☐ Occupational Therapist (8)
☐ Physical Therapist (9)
☐ Speech-Language Pathologist (10)
☐ AT Consultant (11)
☐ Other: (12) ________________________________________________

Q9 Grade levels you primarily work with

☐ Elementary (1)
☐ Middle School (2)
☐ High School (3)
☐ Transition (4)
Q10 How many years of experience do you have using instructional/educational technology?

- None (1)
- Fewer than 5 years (2)
- 5-9 years (3)
- 10-20 years (4)
- More than 20 years (5)

Q11 How many years of experience do you have using assistive technology?

- None (1)
- Fewer than 5 years (2)
- 5-9 years (3)
- 10-20 years (4)
- More than 20 years (5)

Q12 Estimate the amount of instructional/educational technology training in hours you have received in the last 2 years.

- 0 (1)
- 1-10 hours (2)
- 10-20 hours (3)
- 20-30 hours (4)
- 30-40 hours (5)
- Greater than 40 hours (6)
Q13 Estimate the amount of assistive technology training in hours you have received in the last 2 years.

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

Q14 Do you network or share ideas with others in the field of Instructional/Educational Technology, AT, or both (e.g., Listserv, Professional organizations, other staff members, etc.)?

- Yes (1)
- No (2)

Skip To: Q16 If Do you network or share ideas with others in the field of Instructional/Educational Technology, AT, or both (e.g., Listserv, Professional organizations, other staff members, etc.) = No

Q15 Please list of the ways you network with others.

________________________________________________________________

Q16 Do you have any specialized assistive technology training or certifications (College coursework, school-level professional development, RESNA, ATP, ATACP, etc.)?

- Yes (1)
- No (2)
Q17 Please list your specialized training or certifications.
________________________________________________________________

End of Block: Demographics

Start of Block: Usage of AT

Q18 PART ONE: Usage of Assistive Technology
Assistive technology (AT) is any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability. The following questions ask about your knowledge and use of computer applications and assistive technology devices.

Instructions: For each item in this section, please select the response that best indicates your level of agreement or disagreement with each statement.

Q19 I only use assistive technology devices with students after recommendations from the IEP team or by an AT specialist.

- Strongly disagree (4)
- Disagree (3)
- Agree (2)
- Strongly agree (1)
Q20 I provide input on the selection of assistive technology devices during team meetings (e.g., Student Study Teams, 504, IEP).

- Strongly disagree (1)
- Disagree (2)
- Agree (3)
- Strongly agree (4)

Q21 I differentiate a lesson by incorporating assistive technology, including the accessibility options built into the education technology I currently use.

- Strongly disagree (1)
- Disagree (2)
- Agree (3)
- Strongly agree (4)

Q22 Listed below are some of the commonly used types of Assistive Technology (AT) for students with Learning Disabilities. For questions 23-27, please mark the types of AT you have used with your students.
Q23 AT for Reading

- Audiobooks (1)
- Electronic books (e.g., Nook, iPad, Daisy Reader, Kindle, etc.) (2)
- E-book readers (3)
- Reading Pen (4)
- Optical character recognition (OCR) (5)
- Text readers or text-to-speech (6)
- Changes in background color (7)
- Screen magnification software (8)
- Large print material (9)
- Magnification technology (10)
- Changes in the spacing of words (11)
- Screen readers (a program that scans the text and converts written text into spoken language via speech synthesis) (12)
- Other (13) ____________________________
Q24 AT for Writing

☐ Word processor (1)
☐ Spelling and grammar checker (2)
☐ Proofreading programs (3)
☐ Graphic organizer and outlining programs (e.g., brainstorming, mind mapping, etc.) (4)
☐ Speech recognition software (a.k.a., voice typing, dictation, speech-to-text) (5)
☐ Word prediction programs (6)
☐ Abbreviation expanders (7)
☐ Slant board (8)
☐ Keyguard (9)
☐ Alternative keyboard (10)
☐ Digital recorder for note taking (Notability, LiveScribe Pen, Mic Note, etc.) (11)
☐ Electronic spell checker with auditory output (12)
☐ Electronic spell checker without auditory output (13)
☐ Other (14) _________________________________
Q25 AT for Mathematics

☐ Talking calculator (1)

☐ Conventional calculator (2)

☐ On-screen (computer-based) calculator (3)

☐ Graphing tools that work with screen reading technology (MathTrax) (4)

☐ Calculation chart (5)

☐ Software with template for math computation (6)

☐ Other (7)______________________________________________

Q26 AT for Listening

☐ Conventional tape recorder/player (1)

☐ FM amplification device (2)

☐ Laptop for note taking (3)

☐ Other (4)______________________________________________
Q27 AT for Organization/Memory

☐ Task management tools (1)

☐ Storage and organization tools (2)

☐ Annotation tools that can be used with digital documents (Kami) (3)

☐ Calendar programs (4)

☐ Digital voice recording (5)

☐ Digital notepads (e.g., Notability, Mic Note, AudioNote) (6)

☐ Highlight text (7)

☐ Color-coded folders or index tabs (8)

☐ Graphic organizers and mind-mapping tools (9)

☐ Software for organization of ideas (Kidspiration/Inspiration) (10)

☐ Other (11) ________________________________
Q28 Thinking about your skills with assistive technology (AT), how satisfied are you...

<table>
<thead>
<tr>
<th></th>
<th>Extremely dissatisfied (1)</th>
<th>Dissatisfied (2)</th>
<th>Satisfied (3)</th>
<th>Extremely satisfied (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>with your ability to determine when education technology or 1:1 devices should be listed as assistive technology for students with disabilities (i.e., in 504 plan or IEP)? (1)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with your ability to explain AT to team members (e.g., Student Study Teams, 504, IEP)? (2)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with your ability to discuss the need for AT during team meetings (e.g., Student Study Teams, 504, IEP)? (3)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with your ability to match the features of technology to the needs of students? (4)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with your ability to make informed AT suggestions for students with disabilities? (5)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with your ability to include AT services within the IEP? (6)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with your ability to evaluate the effectiveness of AT services for a student with disabilities? (7)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with the AT knowledge of the CSC team? (8)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with your ability to use AT in the general education setting? (9)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>with your ability to use AT in the special education setting? (10)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
Q29 PART TWO: Attitudes and Beliefs About Assistive Technology
Instructions: For each item in this section, please select the response that best indicates your level of agreement or disagreement with each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Agree (3)</th>
<th>Strongly agree (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I encourage my students to use the built-in accessibility options in education technology. (1)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Students can only use the built-in accessibility options in education technology when it is specifically listed as an accommodation or modification for a student with a disability (e.g., documented in a 504 plan or IEP). (2)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>When deciding on assistive technology for a specific student, the IEP team considers the student’s needs more than the ready availability of a specific device. (3)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>The availability of assistive technology devices for students with disabilities is important in my class. (4)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Assistive technology devices and services are considered for all students with disabilities regardless of the type or severity of the disability. (5)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Assistive technology devices are useful for all core academic classes. (17)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Assistive technology enables students with disabilities to access the curriculum more readily. (7)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Assistive technology devices help students with disabilities learn more readily in my class. (8)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>
Q30 Instructions: For each item in this section, please select the response that best indicates your level of agreement or disagreement with each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>General education teachers should use assistive technology in the general education classroom. (9)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Only special education teachers should implement assistive technology for students with disabilities. (10)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Using assistive technology slows the pace of learning for the entire class. (11)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Assistive technology can cause disruptions in the classroom. (12)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The use of assistive technology makes students reliant on the tool and negatively affects their skill development. (13)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Overall, assistive technology devices help students with disabilities complete their assignments in my class. (14)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I have seen students make academic progress because of their use of assistive technology. (15)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>District provided 1:1 devices that have built-in accessibility options that a student needs to complete tasks do not need to be listed as assistive technology in IEPs or 504 plans. (16)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q31 Please list any additional comments you have about your attitude and beliefs about assistive technology and educational technology.

________________________________________________________________

End of Block: Attitudes and Beliefs about AT

Start of Block: Supports and Barriers to AT
Q32 PART THREE: Supports and Barriers to Assistive Technology Instructions: For each item in this section, please select the response that best indicates your level of agreement or disagreement with each statement.

Q33 Professional learning in my education agency (i.e., school, district, Intermediate Unit, etc.) supports the implementation of assistive technology, education technology, and information technology to improve student learning.

- Strongly disagree (1)
- Disagree (2)
- Agree (3)
- Strongly agree (4)

Q34 The roles and responsibilities regarding AT, accessibility, and technology procurement are well defined by my education agency (i.e., school, district, Intermediate Unit, etc.).

- Strongly disagree (1)
- Disagree (2)
- Agree (3)
- Strongly agree (4)
Q35 My education agency (e.g., school, district, intermediate unit, etc.) provides adequate training in and knowledge of assistive technology for my classroom needs.

- [ ] Strongly disagree (1)
- [ ] Disagree (2)
- [ ] Agree (3)
- [ ] Strongly agree (4)
Q36 If you answered ‘strongly agree’ or ‘agree’ to question 35, please mark all training that apply.

- in a college course(s) (1)
- in-service training(s) on the general use of assistive technology (2)
- in-service training(s) on the use of a particular assistive technology product/device (3)
- instructional material(s) that came with a particular assistive technology product/device (4)
- webinar(s) or other web-based support (5)
- online modules (6)
- professional learning communities (7)
- no initial training on a particular assistive technology product/device, but technical support or coaching after I was already using this product/device (8)
- technical support from my school or an agency (9)
- informally from a colleague (10)
- Other (11) ________________________________
Q37 Instructions: For each item in this section, please select the response that best indicates your level of agreement or disagreement with each statement.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Agree (3)</th>
<th>Strongly agree (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would use assistive technology more frequently if there were more support from a specialist to help me with problems that arise.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>I am reluctant to use assistive technology because it frequently does not work correctly.</td>
<td></td>
<td></td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>(2)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>I need access to more resources (e.g., personnel, pre-made lessons, technical support) to be able to use the available assistive technology resources effectively as part of my instructional day.</td>
<td></td>
<td></td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>(3)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Assistive technology requires too much time to use during class.</td>
<td></td>
<td></td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>(4)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>I need more opportunities to collaborate with colleagues in my discipline on how to use assistive technology.</td>
<td></td>
<td></td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>(5)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>
Q38 Choose **up to three** important options for improving AT use.

- [ ] training to use AT devices (1)
- [ ] training on how to conduct AT assessments (4)
- [ ] training on how to appropriately consider and include AT within the IEP (5)
- [ ] training on how to implement AT in the general education setting (6)
- [ ] training on how to implement AT in the special education setting (7)
- [ ] training on how to measure the success of AT implementation (8)
- [ ] training to troubleshoot or initiate repairs of broken or malfunctioning equipment (9)
- [ ] availability of devices that can be borrowed for a trial period (10)
- [ ] nothing is needed (Only check this one) (11)

Q39 Choose **up to three** options that are currently working to improve AT use.

- [ ] training to use AT devices (1)
- [ ] training on how to conduct AT assessments (4)
- [ ] training on how to appropriately consider and include AT within the IEP (5)
- [ ] training on how to implement AT in the general education setting (6)
- [ ] training on how to implement AT in the special education setting (7)
- [ ] training on how to measure the success of AT implementation (8)
- [ ] training to troubleshoot or initiate repairs of broken or malfunctioning equipment (9)
- [ ] availability of devices that can be borrowed for a trial period (11)
- [ ] nothing is working (Only check this one) (12)

*End of Block: Supports and Barriers to AT*
Q40
PART FOUR: Additional Comments
What other comments do you have regarding the use of education technology and/or assistive technology in relation to students with disabilities in your classroom?

__________________________________________________________________________

End of Block: Additional comments
Appendix H
Follow-up Interview Questions and Consent

Purpose:
The purpose of the study is to examine the ways digital technology is used in K-12 classrooms to support the needs of students with disabilities and the correlation between the assistive technology knowledge, skills, and needs of K-12 educators within Pennsylvania.

Benefits and Risks
The risks associated with participation are minimal. Risks include time spent on the interview and any discomfort with a question. The researcher respects your right to not answer any questions that make you feel uncomfortable.

There are no direct benefits to you from participation. However, your willingness to participate will contribute to a doctoral student learning how to conduct research.

Participation is Voluntary. You may refuse to participate or stop your participation in the exercise at any point.

Confidentiality. Your name will be kept confidential, and the information collected will be used only for this study. The interview will be recorded via zoom. Your name and identifying information will not be associated with any part of the exercise. Information from this interview will only be used for the study. All data will be encrypted and stored securely. All your information and interview responses will be kept confidential.

Participant’s Rights
1. I understand that informed consent is required of all persons participating in this study.
2. All procedures have been explained to me and all of my questions have been answered to my satisfaction.
3. Any risks and/or potential discomforts have been explained to me.
4. Any benefits have been explained to me.
5. I have been told that I may refuse to participate.
6. All information that is obtained in connection with this project and that can be identified with me will remain confidential as far as possible within legal limits. Information gained from this study that can be identified may be released to no one other than the Principal Student Researcher-in-Training, Tammy Thompson-Cooke
7. The information will ONLY be used for the purposes of my doctoral research study.
8. I understand that I may contact the following persons if I have any questions or concerns:
   a. Student Researcher: Tammy Thompson-Cooke at tc921646@wcupa.edu
   b. Professor: Dr. David Backer at dbacker@wcupa.edu
Interview with Special Education Teachers
Id Number: ________

Introduction

Thank you for agreeing to allow me to interview you. I am interested in learning about assistive technology practices from a special education teacher’s perspective. I have a few guiding questions but if anything that I ask is uncomfortable or unclear please let me know.

1. What is your role, how long have you been working in this position, and what is your educational background?

2. When you visit a classroom, what are the first things you look for as signs that the classroom is an effective learning place for students with learning disabilities?

3. What assistive devices and technologies have you worked with or are familiar with in the classroom setting (for example, software programs)?

4. Give me an example of one of the most frequently used types of technology in the general education classroom.

5. What are the ways that ways you help teachers more readily use or integrate digital technology in the classroom, particularly when you’re not there (i.e., in the classroom)?

6. For the classrooms that are more receptive, do you think the classrooms seem to be more tech savvy?

7. How do you identify the technology needs of students with learning disabilities as it relates to instruction?

8. What has been your biggest challenge(s) as it relates to technology integration within inclusion classes?

9. Please share what professional development activities/or training ideas you have provided for general education teachers and what specific steps you would take to promote and encourage continued professional development in the area of assistive technology? –

10. Do you feel it helps to train teachers, students, or both?
Thank you again for making time to participate in this interview. Your responses are critically important in this study.