SPECIAL EDUCATION TEACHER PERSPECTIVE ON IMPLEMENTATION OF ASSISTIVE TECHNOLOGY AMONG STUDENTS WITH HIGH-INCIDENCE DISABILITIES

by

Olga Volkov

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

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APPROVED BY:

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Abstract

The purpose of this hermeneutic phenomenological study was to describe the experiences of implementing assistive technology with students who have high-incidence disabilities for special education teachers at a large school district. The theory guiding this study was Bandura's self-efficacy theory. Self-efficacy is one's belief in one's capabilities to organize a course of action to achieve a desired outcome. Self-efficacy determines how individuals think, behave, and self-motivate. Previous studies that investigated technology utilization in schools found that teachers' self-efficacy is one of the key factors in determining and predicting technology integration. The study employed hermeneutic phenomenology as its research methodology. A central question of the study is what are the lived experiences of special education teachers who implement Assistive Technology (AT) with students who have high-incidence disabilities. The study was conducted in a diverse school district serving more than 9,000 special education students. The district also provides all special education teachers AT training and has significant resources to address the needs of students with high-incidence disabilities. The data sources were interviews, focus groups with special educators, and documents. The data were analyzed using van Manen's hermeneutic phenomenology approach. Eight themes were generated. The themes were Differences in AT Implementation Depending on Students' Age, Technical Difficulties, Conflicting Demands in Special Education, Students' Technology-Related Operational Skills, Coaching, Feedback, Fear, and Work-Life Balance. The data analysis revealed empirical, practical, and theoretical implications along with recommendations for future research.

Keywords: assistive technology, special education, high-incidence disabilities

Copyright Page

Dedication

I dedicate this to my husband, my kids, and my parents, who inspired me to pursue a Doctorate degree and supported me every step of the way.

Acknowledgments

I want to express my sincere gratitude to the individuals who have contributed to the successful completion of this dissertation. Their guidance, support, and expertise have been invaluable throughout this journey. I sincerely appreciate my Committee Chair, Dr. Alexandra Barnett, and Committee member Dr. Randal Dunn. Your insightful comments and suggestions have greatly enriched the quality of this work.

To all the faculty members and mentors at Liberty University who have supported me on this academic journey, I am indebted for your commitment to excellence in education and your willingness to invest in your students' growth.

I am also grateful to all my students who taught me compassion, love, and determination lessons. You are the reason why I am in this.

Thank you.

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List of Abbreviations

Active Implementation Framework (AIF)

Americans with Disabilities Act (ADA)

Assistive technology (AT)

Assistive technology Services (ATS)

Attention Deficit/ Hyperactivity Disorder (ADHD)

Augmentative and Alternative Communication (AAC)

Cognitive Theory of Multimedia Learning (CTML)

Human Activity Assistive Technology (HAAT) model

Individual Educational Plan (IEP)

Individuals with Disabilities Education Act (IDEA)

Multimedia Design Framework (MDF)

Other Health Impairment (OHI)

Quality Indicators for Assistive Technology (QIAT)

Specific Language Impairment (SLI)

Specific Learning Disability (SLD)

Speech-to-Text (STT)

Technological Pedagogical Content Knowledge (TPACK)

Technology Acceptance Model (TAM)

Text-to-Speech (TTS)

Universal Design of Learning (UDL)

CHAPTER ONE: INTRODUCTION

Overview

While for most people, technology simplifies tasks for people with disabilities, technology enables possibilities. In educational settings, Assistive Technologies (AT) such as hearing aids, alternative communication devices, text-to-speech software, among other technological solutions are crucial in providing students with free appropriate public education (IDEA, 2004). In the United States, every student who is eligible for special education services is also eligible to receive assistive technology (Assistive Technology Act, 2004; IDEA, 2004). Unfortunately, certain categories of students such as students with high-incidence disabilities are less likely to receive AT and AT services (Bouck & Long, 2021; Edyburn, 2005; Quinn, 2009). Teachers' perceptions of AT and their self-efficacy in implementing technology often inhibit teachers from considering technology for their students with disabilities (Li et al., 2019). The responsibility of implementing AT falls primarily on special education teachers, which can feel overwhelming as it is a rapidly changing field that requires continuing education and, most importantly, teachers' willingness to step outside their comfort zones to explore technology (Kennedy & Boyle, 2017). The goal of this study was to explore teachers' motivation to consider and implement assistive technology among students with high-incidence disabilities in special education. This chapter will provide background knowledge on how the issue of assistive technology underutilization among students with high-incidence disabilities evolved. It will also frame the study by stating its problem, purpose, and significance. Research questions and definitions will be presented.

Background

The underutilization of assistive technology among students with high-incidence disabilities is a significant issue in special education (Atanga et al., 2020; Evmenova et al., 2023; McNicholl et al., 2021). This section examines the evolution of assistive technology over time to help gain a better understanding of the issue of underutilization. Additionally, this section provides a social and theoretical context of the study.

Historical Context

The history of AT can be traced to ancient times when rudimentary tools were used to aid individuals with disabilities. Some examples of AT in the form we see today are glasses invented in Italy in 1200 or the first wheelchair developed in China in the 5th century (Kamenetz, 1969). Assistive technology evolved from improving the functional capabilities of individuals to enabling technologies that facilitate tasks for people with different needs, abilities, and cultures (Zallio & Ohashi, 2022).

Today's technology supports the individual needs of students in the classroom, and it affords educators a way to address a range of previously overlooked students' needs (Edyburn, 2013). These needs include meaningful access to instruction and content, communication with the world, mobility, and the need to be included in the life of a community. Technology development in the last 50 years has been nothing short of breathtaking (Bouck, 2017). However, while it provided many opportunities, it also created a gap between technology-based products and empirical research supporting the use of these products with students with high-incidence disabilities (Israel et al., 2014; Kennedy & Deshler, 2010).

Over the last couple of decades many barriers to technology implementation have significantly reduced, e.g., cost reduction of hardware and software and widespread Internet

access (Bulman & Fairlie, 2016). Simultaneously, the market for educational technology exploded with technology-based tools, leaving administrators, teachers, and families with an abundance of products that help solve a range of students' needs (Okolo & Diedrich, 2014).

Over 35 years ago, Congress passed the first document establishing and promoting assistive technology in special education – the Technology Related Assistance Act of 1988, also known as the Tech Act. Later, the principles and language of the Tech Act were incorporated into the Individuals with Disabilities Education Act (2004). IDEA (2004) states that while developing an Individual Education Plan (IEP) for students qualified to receive special education services, a multidisciplinary team must consider whether the student may benefit from AT and AT services, which then should be included as part of the IEP.

Despite the importance of AT and its relative availability and variety, several studies suggest that students with disabilities are not receiving AT and AT services to the degree that might be expected (Bouck et al., 2011). Bouck and colleagues reported that only 8% of 300,000 students with high-incidence disabilities who participated in the National Longitudinal Transition Study 2 reported receiving AT. Quinn et al. (2009) further investigated the issue of AT underutilization. They confirmed that approximately 87% of students who received AT in their study had low-incidence disabilities, and less than 15% of AT users had high-incidence disabilities (Ahmed, 2018; Bouck & Long, 2021; Quinn et al., 2009).

Researchers have voiced concern over the years about the lack of guidance for special educators on the instances where AT is to be considered and instructions on AT implementation. An overwhelming number of studies confirm that teachers are interested in AT implementation and consider it important (Ahmed, 2018; Evmenova et al., 2023; Lamond & Cunnigham, 2020). Studies also document that teachers feel that they are not prepared and that they lack knowledge

on how to match students and technology, how to support a successful implementation, and how to facilitate a natural integration of AT in their classroom (Atanga et al., 2020; Jones & Hinesmon-Matthews, 2014; Malcolm & Roll, 2017). Even when teachers have access to professional development in the area of AT, they need to be motivated to use AT and they need to have strong technology self-efficacy skills in order to effectively implement AT (Alghamdi, 2022; Holden & Rada, 2011; Siyam, 2019). If special education teachers refuse to accept the technology, their students will not accept it either (Nam et al., 2013).

Social Context

The importance of assistive technology in special education is long recognized and documented in legislative documents and research (Bouck & Long, 2021; Fernández-Batanero et al., 2022; Olakanmi et al., 2020). Unfortunately, despite the technological boom of recent years, AT has not been taken full advantage of in the educational settings, especially for students with high-incidence disabilities (Karlsson et al., 2018). In the United States, in the 2021-2022 school year, 7.2 million students participated in special education; 67% are students with high-incidence disabilities. These students generally have learning, behavioral, attention, and mild cognitive disabilities (O'Brien et al., 2019). The main commonality among students identified as having high-incidence disabilities is that they have poor academic performance. According to several studies, over 4.5 million students across the United States could improve their lives and reduce difficulties in academic activities by using AT (Adebisi et al., 2015; Isgett & Wang, 2021).

Students with high-incidence disabilities often have difficulties in reading, writing, and mathematics, which could be negated or mitigated with AT (Kennedy & Boyle, 2017). When using assistive technology in school, students have better post-school outcomes in the areas of jobs, wages, and participation in postsecondary education (Bouck et al., 2012). It is important to

remember that several conditions must be met to implement assistive technology successfully. When choosing an AT, an educational team must consider a student's strengths and weaknesses, where and when they are expected to use the technology, what activities will occur, and how the AT will enable a student to achieve educational goals (Zabala, 1995).

The successful implementation of AT is not just about the technology itself. It is intricately linked to student's operational, functional, strategic, and social skills when using a particular AT device or software. Likewise, the teacher's role cannot be overlooked in AT consideration and implementation. Teachers' beliefs and motivation play a pivotal role in considering AT and teaching students the necessary skills to be successful with AT (Holden & Rada, 2011).

Theoretical Context

In recent decades, many initiatives have promoted technology use in education, notably highlighted by the Every Student Succeeds Act (2015). Subsequent studies have explored various elements contributing to the successful integration of technology in educational settings. These elements include factors associated with teachers and students, technology and practices using technology, policies, legislation, and support from district and school administrations (Groff & Mouza, 2008; National Educational Technology Plan, 2017). While all the factors are important, the role of the teacher appears to be the most crucial as the teacher remains the main facilitator of technological transformation in the classroom (Backfish et al., 2020; Cheng et al., 2020; Tschannen-Moran & Hoy, 2001).

Many factors can potentially motivate teachers to integrate technology. According to the expectancy-value theory of motivation, one of the central factors that predicts an individual's course of action and persistence in this course is a person's value beliefs (Schunk, 2020).

Furthermore, self-efficacy theory provides insights into sources of personal beliefs about one's capabilities (Cheng et al., 2020). Several studies investigating technology underutilization in schools found that teacher self-efficacy is a key factor in determining and predicting technology integration (Compeau & Higgins, 1995; Isikli & Sezer, 2022; Siyam, 2018). Some studies looked at teachers' perceptions of AT and found that while teachers acknowledge the importance of AT, they do not feel prepared to implement it (Atanga et al., 2020; Lamond Cunnigham, 2020).

Siyam (2018) used the Technology Acceptance Model (TAM) to explore factors that impact special education teachers' decision to implement AT and found that self-efficacy, time, and access affect the actual use of technology the most. These findings were further supported by Li et al. (2019). The researchers looked at the factors contributing to technology implementation through several frameworks that outline essential competencies to effective technology integration, such as the previously mentioned TAM and the more recent one -Technological Pedagogical Content Knowledge (TPACK). Both studies confirmed that technology self-efficacy was important in predicting teachers' use of technology. However, studies that attempt to identify and explain how technology self-efficacy is constructed among special education teachers who work with students with high-incidence disabilities have not been conducted.

Self-efficacy is grounded in the social cognitive theory developed by Bandura (1993, 1999). Self-efficacy is "belief in one's capabilities to organize and execute the courses of action required to produce given attainments" (p.3, Bandura, 1997). In essence, if one believes that he or she is incapable of performing a task or activity, then he or she is less likely to attempt to carry out said action. Self-efficacy determines how individuals think, behave, and self-motivate. There are four sources of self-efficacy construct: mastery experience, vicarious experience, social persuasion, and physiological or affective state (Bandura, 1997).

Accentuating the concept of self-efficacy and recognizing its power to predict one's behavior, this study's goal is to explore teachers' experiences that may impact their self-efficacy concerning technology implementation among students with high-incidence disabilities. Morris et al. (2017) reviewed 82 empirical studies that measured and conceptualized the sources of teaching self-efficacy and proposed that there may be additional sources of teaching self-efficacy. Self-efficacy is a highly contextual construct and should be referenced to specific tasks and not just general self-efficacy (Henson, 2002). Exploring how attributes of innovations affect one's technology self-efficacy makes it possible to investigate and identify factors that contribute to special education teachers' implementation of AT (Rogers, 2003).

Furthermore, it is acknowledged in the research that high-incidence disabilities are also called "hidden" disabilities. These types of disabilities are less recognized and understood by teachers and other students (Evans et al., 2015; Moriña & Carnerero, 2022; Skär, 2010; Wilkins et al., 2016). The researchers documented that "hidden" disabilities are the ones that caused the strongest feelings of insecurity among participants of the research.

It is important to understand if and how teachers' perceptions of disability affect their teaching self-efficacy. This information informs stakeholders on how to increase AT usage among students with high-incidence disabilities. This study will be guided by Bandura's (1997) four sources of self-efficacy; however, it will have an exploratory nature to identify the roots of teachers' beliefs in their pedagogical, content, and technological knowledge.

Problem Statement

The problem is that the implementation of quality assistive technology services is underrepresented among students with high-incidence disabilities. AT implementation in

educational practice largely depends on teachers' pedagogical behavior (Lamond & Cunningham, 2020). While researchers have identified financial restraints and insufficient information/professional development as barriers to AT implementation (Fernández-Batanero et al., 2022; Lamond & Cunningham, 2022), studies have suggested that even when these factors are addressed, it does not guarantee successful AT implementation by teachers (Evmenova et al., 2022). This issue is particularly pronounced for students with high-incidence disabilities, who constitute one of the largest groups of students with disabilities served under IDEA (2004), according to the National Center for Educational Statistics (2022).

The rapid expansion of technology-based solutions in education is happening at a pace that outdoes the rate of research in the field. The often high profitability of new educational technologies adds another layer of complexity. These factors contribute to a multifaceted problem characterized by incomplete and contradictory information, diverse opinions from many stakeholders, economic burdens, and complex interconnectedness (Kennedy & Boyle, 2017). As a result of such intricacies in the field, one should not be surprised to hear that barriers exist in technology implementation in areas such as (1) developing sustainable buy-in, (2) ensuring fidelity of implementation, (3) research-to-practice dilemmas (Evmenova et al., 2022).

Teacher self-efficacy has emerged as a crucial factor in determining teachers' perseverance in implementing AT (Atanga et al., 2020; Harper et al., 2017). Thus, there is a need to explore and address the factors contributing to teachers' lack of confidence in utilizing AT effectively despite the available resources and support. This empirical investigation contributes to filling the gap in the literature and provides valuable insights for enhancing the implementation of AT in educational settings.

Purpose Statement

The purpose of this hermeneutical phenomenological study is to describe the experiences of implementing assistive technology with students who have high-incidence disabilities for special education teachers at a large school district. At this stage in the research, the implementation of AT is defined as the provision and use of AT to empower students with high-incidence disabilities to overcome limitations, access information, communicate, and engage in daily activities more effectively.

Significance of the Study

This study describes special education teachers' experience when considering and implementing AT. This research will contribute to exploring and describing factors affecting teachers' self-efficacy when implementing AT with students with high-incidence disabilities. When considering AT, a deeper understanding of teachers' extrinsic and intrinsic motivation will allow changes that may lead to wider implementation of AT among students with high-incidence disabilities.

The theoretical significance of this study is anchored in further expanding the theory on which it is based. Self-efficacy is a powerful construct that is able to predict one's behavior and motivation. By understanding how contextual factors and attributes of innovation, behaviors of administrators, and organizational changes in the process of adopting a new technology affect teachers' technology self-efficacy, this study will enhance self-efficacy theory through a lens of an active implementation framework (Holden & Rada, 2011; Fixsen et al., 2009; Rogers, 2003).

The empirical significance of the study lies in its ability to clarify contextual influences on special education teachers' self-efficacy as it relates to AT implementation. Participants'

responses to interview questions and focus group discussion, along with information from documentation, yielded observable data that further supported this study's empirical value (van Manen, 2014). Overall, this study seeks to fill the gap in the literature that explores the facilitators and barriers to AT implementation among students with high-incidence disabilities.

Practical implications resulting from this study allow educational stakeholders to increase access to general education for students with high-incidence disabilities and will improve their overall educational experience. Furthermore, themes derived from described educators' experiences equip and empower future research to investigate the field of AT implementation. Moreover, school administrators, educational leaders, and policymakers hear the voices of special education teachers on this pressing issue. Describing the experiences of teachers and addressing teachers' negative experiences provides access to assistive technology for students with high-incidence disabilities and their families, which in turn promotes their inclusion. Furthermore, AT implementation advances students' educational outcomes by improving their academic performance (Bouck et al., 2020; Keelor et al., 2023; Malcolm et al., 2017), increasing engagement and motivation (Rizk & Hillier, 2022), and enhancing social skills (Emerling et al., 2021; Murry, 2018; McNicholl et al., 2021; Tamakloe & Agbenyega, 2017).

Research Questions

Assistive technology has the potential to improve the quality of education for all students and promote the inclusion of students with disabilities (Adebisi et al., 2015; Bouck et al., 2012; Isgett & Wang, 2021). Unfortunately, AT continues to be underutilized, especially among students who have "hidden" disabilities such as reading and writing deficits, mathematics learning disabilities, speech and language disabilities, and emotional and behavior disorders

(Ahmed, 2018; Atanga et al., 2020; Bouck & Long, 2021; Emerling et al., 2021; Fernández-Batanero et al., 2022; Keelor et al., 2023). Special educators play a crucial role in the rate of adoption and implementation of AT (Atanga et al., 2020; Evemnova et al., 2023; Harper et al., 2017; Lamond & Cunningham, 2020). Their beliefs, motivations, and perceptions seem to determine whether the technology will be implemented. Therefore, in this study, I describe teachers' experiences to explore the factors that affect teachers' motivation, perception, and beliefs about AT, along with the AT adoption rate for students with high-incidence disabilities.

The research questions for this study are derived from both the problem and purpose statement, as these questions created a guide to the qualitative research that was concerned with making practical recommendations for administrators, assistive technology specialists, and other educational stakeholders on increasing teachers' AT consideration and implementation (van Manen, 2014). The research questions have been stated broadly in line with qualitative research's attributes to ensure the study's interrogative nature (Creswell & Baez, 2021). Furthermore, creating a broad research question that begins with "What" aligns with the phenomenological method of inquiry design and overall qualitative design chosen for this study (van Manen, 2014).

Central Research Question

What are the lived experiences of special education teachers who implement AT with students who have high-incidence disabilities?

Sub-Question One

How do special education teachers describe mastery experiences when implementing assistive technology with students with high-incidence disabilities?

Sub-Question Two

How do special education teachers describe vicarious experiences when implementing AT with students with high-incidence disabilities?

Sub-Question Three

How do special education teachers describe verbal persuasion when implementing AT with students with high-incidence disabilities?

Sub-Question Four

How do special education teachers describe physiological feedback when implementing assistive technology with students with high-incidence disabilities?

Definitions

1. *Assistive Technology* - 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 (IDEA, 2004)
2. *High-incidence disabilities* - Students who qualify for special education services under categories such as emotional and/or behavior disorders, learning disabilities, mild intellectual disability, and, in some cases, high-functioning autism, attention-deficit hyperactivity disorder and speech and language impairment (Gage et al., 2012).
3. *Teacher's self-efficacy* - A teacher's judgment of his or her abilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated (Tschannen-Moran & Hoy, 2001).

4. *Quality AT services in education* are defined as services that align with the recommendations of the Quality Indicators for Assistive Technology Consortium in all six areas: (1) administration, (2) consideration, (3) assessment, (4) IEP development, (5) implementation, and (6) evaluation of effectiveness (Zabala, 2000).

Summary

The underutilization of AT among students with disabilities is a significant problem (Ahmed, 2018; Atanga et al., 2020; Bouck & Long, 2021; Emerling et al., 2021; Fernández-Batanero et al., 2022). Despite government initiatives to provide access to technology and the research community to establish quality standards for the industry, the situation continues to prevail, especially among students with high-incidence disabilities. Special education teachers are the key element in promoting AT implementation in schools. Teachers' beliefs, perceptions, and motivation directly affect teachers' behavior in implementing technology. This study's goal is to investigate the factors facilitating or hindering AT implementation among students with high-incidence disabilities and is rooted in Bandura's self-efficacy theory. The study aims to provide recommendations to district and school administrators on how to increase AT implementation among students with high-incidence disabilities to ensure their full inclusion and participation.

CHAPTER TWO: LITERATURE REVIEW

Overview

In the modern world, our lives are surrounded by technology. It empowers people to be more productive and effective; however, for people with disabilities, one of the most basic purposes of technology is to facilitate social integration and participation. Assistive technology is an avenue by which people with disabilities are able to access desired environments and be more independent. Among the many examples of assistive technology are wheelchairs, hearing aids, spectacles, prostheses, and speech-to-text, text-to-speech software. According to the World Health Organization, disability is an interaction between a person's functioning, health condition, and contextual factors (WHO, 2007). In other words, disability is defined by what demands various environments place on the person. Assistive technology has the potential to negate the severity of disability by allowing a person to interact with the environment freely. In the context of special education, assistive technology has the potential to provide students with disabilities access to general education while creating an inclusive educational system.

A systematic literature review was conducted to explore the factors that may contribute to or hinder the implementation of AT among students with high-incidence disabilities. This chapter offers a review of the research on this topic. In the first section, the self-efficacy theory will be discussed. Next, a review of recent literature on AT and the benefits of AT implementation among students with high-incidence disabilities will be addressed. Lastly, the literature surrounding current findings on the factors contributing to or hindering successful AT implementation among special education teachers, including financial limitations and lack of professional development, will be addressed. Finally, a gap in the literature is identified, and

more research is needed that captures the experiences of special education teachers with the implementation of AT among students with high-incidence disabilities. This knowledge is imperative in order to identify factors contributing to AT implementation among students with high-incidence disabilities.

Theoretical Framework

The theoretical framework of this study is mainly grounded in Alber Bandura's social cognitive theory (1993). The social cognitive theory attempts to explain human behavior through the triadic reciprocality of three factors: personal variable (self-efficacy), behavioral, and environmental factors (Schunk, 2020). As a result of this reciprocality, the agentic perspective is central to social cognitive theory. Bandura (1993) believed that people are not only products of their environment but also producers of it. People produce their own environment as they actively choose the course of action and, therefore, create their own experiences (Bandura, 1993).

One of the key concepts of social cognitive theories is self-efficacy. Bandura (1993) defined self-efficacy as individuals' belief about their ability to control their functioning levels and the events that impact their lives. In other words, what teachers believe about their capabilities and what they can produce directly correlates with their actions (Bandura, 1999; Tschannen-Moran & Hoy, 2001). Skinner (1961) noted that people avoid unpleasant experiences, including the anxiety and fears that may arise when using new technology. On the other hand, Bandura's (1999) self-efficacy theory suggests that individuals are more likely to engage in new activities if they have confidence in their ability to perform the task successfully. According to Bandura (1999), when faced with challenges, perceived self-efficacy will

determine one's self-hindering or self-enhancing thinking and thus will affect how much effort should be put into achieving a specific goal. The underlying theory of this study is that teachers' self-efficacy beliefs regarding assistive technology play a vital role in their acceptance and effective use of technology in the classroom (Albion & Ertmer, 2002; Angers & Machtmes, 2005).

The four factors that are believed to be the main influences on one's level of self-efficacy are mastery experiences, vicarious experiences, verbal persuasion, and somatic and emotional states (Bandura, 1993, 1999). These factors must be considered in the context of individual beliefs and perceptions of teachers and in the context of the whole organization's implementation (Holden & Rada, 2011; Fixsen et al., 2009).

Mastery experiences, also called performance accomplishments, are probably the most important source of self-efficacy since they are based on a person's experience (Shortridge-Baggett, 2000). A repeated feeling of mastery and success enhances self-efficacy, while regular failure hinders it. Mastery experiences are especially important at the beginning stages of the learning process. Once a person develops a strong self-efficacy, one failure does not have much impact on self-efficacy. The effects of failure depend on the stage in the learning process and the total pattern of the experiences (Bandura, 1997; Morris et al., 2017; Shortridge-Baggett, 2000). For example, mastery experience can be especially powerful if the task is considered particularly demanding. On the contrary, the need for considerable effort and overreliance on help from others can impede the influence of experience on self-efficacy (Bandura, 1997; Morris et al., 2017).

Vicarious experience refers to the process of observing the experience of others (Bandura. 1997). Seeing others perform the task successfully increases one's self-efficacy,

though to a lesser degree than direct experience. A critical element of vicarious experience is the similarity of a role model or comparison group to an observer. The more similar it is to the model, the bigger its effect on the observer. Another significant aspect is the more openly models struggle with the task, the more this experience enhances the observer's self-efficacy (Morris et al., 2017).

Verbal or social persuasion can also influence self-efficacy (Bandura, 1997; Morris et al., 2017; Shortridge-Baggett, 2000). This source of self-efficacy is most often used because it is easy to use (Shortridge-Baggett, 2000). People try to convince others that they can succeed in a difficult task by providing instructions, suggestions, praise, and encouragement. However, an essential detail is the perceived knowledge and credibility of the person giving feedback. Another major determinant of verbal persuasion is how the feedback is framed. The messages that are more specific and sincere have more powerful effects. People are especially prone to the impact of verbal persuasion when they have little experience in the domain. A person's self-beliefs can be more readily undermined by negative feedback than strengthened by positive encouragement (Badura, 1997; Morris et al., 2017).

Lastly, the somatic and emotional state, also known as the physiological and effective state, refers to the human body's response to a specific activity. Such states may include stress, fatigue, anxiety, depression, or feelings of excitement. People use the information about their physiological and emotional states to judge their capacity to perform an activity. For example, in a task that requires strength and perseverance, one can interpret fatigue and pain as signs of low physical efficacy (Bandura, 1997; Shortridge-Baggett, 2000).

In determining other sources of self-efficacy, it is imperative to remember that self-efficacy is deeply rooted in understanding that human behavior is reciprocally influenced by

environment and personal factors (Bandura, 1993; Morris et al., 2017). According to Bandura's theory, at the heart of social cognition are five interrelated human capabilities: (1) symbolizing, (2) forethought, (3) vicarious capabilities, (4) self-regulatory, and (5) self-reflective capabilities (Bandura, 1997; Gist & Mitchell, 1992; Morris et al., 2017). Gist and Mitchell (1992) expanded on Bandura's research of self-efficacy. They focused on various external and internal factors contributing to how people interpret the experience based on their skills and knowledge and depending on the environmental factors.

Related Literature

The literature review aimed to present a comprehensive picture of AT's historical and legal development in the United States while also providing an overview of principles of integrating technology into the learning environment. In addition, it provides a comprehensive overview of the needs of students with high-incidence disabilities. The review also reflects the discussion on the most effective AT for this population of students.

Overview of Theories Related to Assistive Technology and Disability

Assistive technology exists within the realm and construct of disability. AT is there to enhance the lives of people with disabilities. As a result, various theories and models have been proposed to guide AT development, implementation, and assessment. According to the World Report on Disability, "disability is complex, dynamic, multidimensional, and contested" (p.3, 2011). Contested refers to challenges in coming to a conclusion regarding the definition of disability (Federici & Scherer, 2012). When discussing disability, many surrounding and supporting issues arise, such as individual functioning and how they are measured, social

barriers, digital divide, objective quality of life and subjective well-being, activity performance versus participation, human rights, morbidity, and mortality.

The three most commonly discussed models of disability are the medical model, the social model, and the biopsychosocial model. The basic characteristic of the medical model is that disability is viewed as a medical condition or failure of a bodily system (Retief & Letšosa, 2018). Therefore, people with disabilities should be treated by medical professionals and should be excused from any social commitment and responsibilities (Petasis, 2019). From a medical model point of view, AT serves as a remedy or intervention to mitigate the disability (Federici & Scherer, 2012).

On the contrary, the social model of disability developed by Mike Oliver in 1983 viewed disability as a result of negative societal attitudes (Petasis, 2019). The physical, economic, and social barriers faced by people with disabilities are not deficits in their bodily functioning but rather constructed by society's social, cultural, and ideological beliefs and attitudes. In this context, assistive technology becomes a bridge that can close the gap between the individual's capabilities and bodily functioning and societal expectations, demands, and structures (Federici & Scherer, 2012).

The biopsychosocial model of disability links the medical and social models (Petasis, 2019). It accepts that disability is caused by physical or biological problems that need to be treated by medical experts. At the same time, it is society's responsibility to find ways to include people with disabilities in social, economic, and political activities and provide them with equal opportunities (Bath et al., 2014). From a biopsychosocial model, AT can be both a remediation and compensation tool. While AT can provide access to certain activities, it can also offer interventions to improve a person's functioning (Federici & Scherer, 2012).

The construct of disability is also documented in key documents such as The United Nations (UN) Convention on the Rights of Persons with Disabilities (CRPD) (2006). This document recognizes that disability occurs at the intersection of the person and the context in which they live. Therefore, the extent of disability may differ based on the context. This document describes the rights of persons with disabilities and recognizes the equal protection and equal benefits of the law to all people with and without disabilities (CRPD, 2006). Furthermore, the document acknowledges AT as one of many opportunities necessary to reduce the disabling influence of many environments and mentions AT in many sections of the CRPD (2006).

Inspired by this document and its advocacy for the social inclusion of persons with disabilities, several AT frameworks emerged. One of the most commonly referred to is the human activity assistive technology (HAAT) model (Hersh & Johnson, 2008). This model describes a human performing activity in the environment using AT. This model emphasizes the contextual and personalized nature of AT. Irrespective of whether the HAAT model is applied to a device design, an assessment resulting in AT recommendation, or an outcome evaluation, the order of consideration and integration of the HAAT elements is consistent (Hersh & Johnson, 2008). It always starts with identifying the need or activity followed by determining a human's characteristics that affect the activity's performance or engagement. The contextual elements are considered next. The AT design or recommendation comes last, emphasizing the role of AT as an enabler to perform or engage in the activity in a certain context (Hersh & Johnson, 2008).

Other fundamental frameworks in the field of AT are the person-environment-occupation (PEO) model and the ecological model (Cook & Polgar, 2015). Both models focus on the interaction between the individual and its environment and serve as a means to ensure a person's

well-being and increased functionality. The PEO model focuses on the optimal fit between the person, their environment, and their occupation or daily activities, while the ecological model emphasizes the interactions between the person, the technology, and the environment (Cook & Polgar, 2015; Strong et al., 1999).

Another cluster of models developed to guide AT assessment, implementation, and evaluation focuses on the user's perception of the technology. The Technological Acceptance Model (TAM) was originally developed by Davis (1993), and it addressed the determinants of computer acceptance (Lee et al., 2003). This model focuses on perceived usefulness and ease of use and how these factors influence one's decision to utilize technology. Later, this model was adopted in various domains, including AT. This model inspired the matching person and technology model, where environmental factors, consumer personal and psychosocial factors, and functions and features of desirable technologies come together (Scherer et al., 2005).

All current frameworks have shortcomings and are not perfect, mainly because various models focus on multiple aspects and fail to include and account for the spectrum of all environmental, personal, and technological variations (Hersh & Johnson, 2008). Another layer of complexity hides in definitions. Definitions allow for the framing of the construct of interest while conveying what to include or exclude from the definition (Cook & Polgar, 2015). Unfortunately, in jurisdictions where AT funding is supported through the government, definitions also guide what AT is based on what is eligible for financing. Therefore, some practical definitions of AT do not align with theoretical models of AT and disability. However, the above-mentioned models provide different perspectives on the relationships between AT and disability. They inform AT solutions' design, assessment, implementation, and evaluation, ensuring they are effective and meaningful to the end-user.

Evolution of Various Categories of Assistive Technology

Technology is mostly associated with various machines and computers; however, people with disabilities use specific types of technology to meet a wide range of their needs (Wendt & Lloyd, 2011). The following technology categories are considered the most common uses of technology as AT: augmentative and alternative communication (AAC), adapted computer access, devices to assist listening and seeing, environmental control, adapted play and recreation, sitting and positioning, mobility and powered mobility, prosthetics, and technology to improve students' learning (Went & Lloyd. 2011; Woodward & Rieth, 1997). Assistive technology has been evolving to address the specific needs of people with disabilities as the awareness of those needs grows and technology develops. To better understand the historical development of AT, one must better know what each category of AT is and which needs it addresses.

Many people with disabilities have difficulties communicating with people in the environment. These challenges could stem from physical, intellectual, motor-planning, sensory, and other issues. An AAC device could assist these people with receptive and expressive language (Alper & Raharinirina, 2006; Went & Lloyd. 2011; Woodward & Rieth, 1997). Some AAC devices could be high-tech with speech-generating and word prediction capabilities while utilizing a range of signal sensing and acquisition methods used in conjunction with the existing high-tech AAC platforms for individuals with a speech disability, including imaging methods, touch-enabled systems, mechanical and electro-mechanical access, breath-activated methods, and even brain–computer interfaces (Elsahar et al., 2019). In contrast, others could be as simple as low-tech communication boards using manual signs and finger spelling (Went & Lloyd. 2011).

In today's world, computers are a crucial aspect of school, employment, and personal productivity. However, people with disabilities may have limited access to computers. To operate a personal computer, a user must be able to see the screen, activate keys on a keyboard, and control a mouse, touchpad, or trackball. Alfredsson Ågren et al. (2020) reframed computer access to internet access. According to Eurostat (2023), 96% of young people in Europe and the USA use access to the internet daily. Young people with and without disabilities use the internet daily for social media, communication, playing games, and obtaining information (Alfredsson Ågren et al., 2020). The AT application area of adapted computer and mobile technology access aims to increase the capabilities of people who face challenges and limitations in navigating computer and mobile devices and accessing the internet (Alfredsson Ågren et al., 2020; Went & Lloyd, 2011). Adapted and alternative access solutions include a wide array of tools. Some examples are alternative input devices (e.g., trackball and joysticks, head wands and mouth sticks, eye-tracking systems, braille displays, adaptive keyboards, and switch access), various software solutions (e.g., screen readers, screen magnification, speech recognition software, on-screen keyboards, word prediction software), mobile technology solutions (e.g., VoiceOver and TalkBack, voice control, magnification gestures, switch access for mobile devices), and web accessibility tools (e.g., extensions that provide users the means to adapt web content according to their preferences and need, and well-developed principles when developing websites, ensuring access for all) (Alfredsson Ågren et al., 2020; Went & Lloyd, 2011).

Another big cluster of tools is technology, which assists with listening and seeing. Assistive listening devices amplify auditory signals and can be directly attached to the body (Went & Lloyd, 2011). Other assistive listening devices include auditory trainers, speech and

telephone amplifiers, or FM and inductance transmission systems. For people who are deaf, video captioning, text telephones, and other devices that convert speech to text are available.

AT, which supports people with visual impairments, aims to magnify and clarify images (Kuriakose et al., 2022; Went & Lloyd, 2011). These devices and software help individuals with limited vision by enhancing contrast, enlarging prints, and providing tactile or auditory cues for visual information. Some examples of AT for visually impaired people are Braillers, screen readers, screen magnifiers, and speech recognition tools that can be installed on other devices (Kuriakose et al., 2022; Went & Lloyd, 2011). Furthermore, navigation solutions for blind and visually impaired people are important to be able to navigate their environments. Navigation solutions may include personal use devices and tools built into the environment. For example, personal use or wearable devices include smart canes, electronic orientation aids, position locator devices, electronic travel aids, smart glasses with software that provides real-time text and picture recognition, auditory feedback, and voice controls (Kuriakose et al., 2022).

Another category of AT that is developing at a fast pace is environmental controls, which refer to electronic or computerized systems controlled via switch access, speech recognition, eye tracking, and even brain-computer interface (Bissoli et al., 2019; Went & Lloyd, 2011). These systems allow people with limited mobility or insufficient control of their upper extremities to manipulate their environments (e.g., air conditioning, adjustable bed frames, lighting, security systems, appliances, etc.). These technologies are important because they allow a person to regain independence and many choice-making opportunities (Bissoli et al., 2019; Went & Lloyd, 2011).

Difficulties with controlling, manipulating, moving, sensing, and otherwise experiencing toys and play activities can prevent young children with disabilities from developing critical

skills in the areas of cognition, language, mobility, sensations, and emotions (Rasmussen et al., 2023; Went & Lloyd, 2011). One strategy commonly used to expand the play repertoire of children with disabilities is to use switch-adapted electronic toys (Rasmussen et al., 2023). In order to help kids experience sports activities, various adaptations could be used, starting from a specialized sports wheelchair to hand-powered bikes and adapted tricycles (Carbone et al., 2021).

Seating and mobility AT is at the heart of the efficient use of many different ATs for people with limited mobility. For example, a person typically cannot use AAC, an adapted computer, or environmental controls without proper AT for seating and mobility (Went & Lloyd, 2011). Seating and mobility tools ensure accurate movements that make a person more efficient, save energy, and prevent fatigue. Gowran et al. (2020) argued that wheelchair and seating assistive technology are interconnected with people's life satisfaction, inclusion, and productivity. Furthermore, inappropriate seating can lead to pressure injuries, which can lead to further health complications and even death (Cook et al., 2020). Examples of seating and mobility technologies include beanbag chairs, chair inserts, footrests, leg separation, or standing aids.

Mobility aids can be manual or power-operated. Such technology aims to facilitate, replace, or augment walking, allowing people more mobility (Cook et al., 2020; Went & Lloyd, 2011). Examples of mobility include lifts, powered and non-powered wheelchairs, scooters, walkers, and, in recent years, exoskeletons (Plaza et al., 2023). Furthermore, adopted automobiles, vans, and other types of personal vehicles provide people with disabilities access to many activities related to education, employment, and recreation (Cook et al., 2020; Went & Lloyd, 2011).

Technologies that serve to enhance or replace the function of limbs and other body parts are referred to as prosthetics (Cook et al., 2020; Went & Lloyd, 2011). Examples of prosthetics are cochlear implants, electro-larynxes, myoelectric hands, speech-generating devices, and upper and lower extremities prosthetics. While these technologies improve functionalities, they also affect body image. Another consideration when using prosthetics with children is that prosthetics must accommodate the child's growth (Cook et al., 2020; Went & Lloyd, 2011).

Lastly, technology that assists students' learning is also considered AT (Florian, 2013). Technology has long been used in education and is often referred to as "educational technology" or "instructional technology." These terms are used interchangeably. However, if technology is the only way a student can access curriculum, it becomes an assistive technology (Svensson et al., 2021). Technology is an integral part and one of the main supporting principles of Universal Design for Learning (UDL). UDL is a set of principles designed to provide equal opportunities to all students with all abilities (Florian, 2013). Assistive technology can provide access to the curriculum for students with reading, writing, and math difficulties while also providing evidence-based remediation (Florina, 2013; Svenssonet al., 2021). In recent years, the equipment and applications for supporting reading, writing, and math have also been available on tablets and smartphones, which has improved accessibility even more than computers have (Svenssonet al., 2021).

Historical Development of Assistive Technology

While assistive technology was first documented in law with the Technology-Related Assistance for Individuals with Disabilities Act of 1988 in the United States, its rudimentary forms existed long before that (Wendt & Lloyd, 2011). Bryant and Bryant (2003) divided the development of AT into three different historical periods: (1) the foundation period covering

events before 1900, (2) the establishment period from 1900 through 1972, and (3) the empowerment period from 1973 through today. However, Guan et al. (2020) highlighted that from 2000 to 2019, the educational paradigm shifted towards artificial intelligence (AI), which is also reflected in assistive technology. As AI is more integrated, a new era may be established.

The foundation period starts with humans creating the first tools. During the Stone Age, humans used sticks to assist with injured legs (Cook & Polgar, 2015). The history of the wheelchair traces back over millennia, with evidence of wheeled furniture in ancient Chinese and Greek civilizations. In the USA, the prototype for a manual wheelchair was developed in 1868 (Bryant & Bryant, 2003). It was first used during the Civil War to provide mobility to soldiers with amputated legs.

The 1800s also marked the foundation for services for people with disabilities (Wendt & Lloyd, 2011). In 1817, Thomas Hopkins Gallaudet founded the first school for deaf students. In 1834, Louis Braille finished his literary code for people who were blind so they could interpret printed text (Wendt & Lloyd, 2011). At the same time, Dr. Bloomer created the first institute for individuals with physical disabilities. Fundamental inventions of the 19th century paved the way for the first electronic devices, such as the Bell's amplifier. The creation of phonographs later led to enabling learning through listening to recordings.

The AT establishment period is characterized by establishing the disability disciplines as specific entities (Bryant & Bryant, 2003). Interdisciplinary approaches to advancement in education, science, and psychology allowed for a deeper understanding of the causes, preventions, and implications of disabilities. The impacts of war stimulated many developments in AT. Many people were coming back injured from battles, and the government had to provide support (Wendt & Lloyd, 2011). In 1918, the United States Congress passed the Soldier

Rehabilitation Act to help war veterans return to normal lives. Technological advances continued at the same time and allowed for many breakthroughs in the development of AT. Examples of such technologies are the Optophone, the first reading machine for blind people, speech synthesis, and the transistor that laid a foundation for AAC (Bryant & Bryant, 2003). Big advancements were introduced in the field of architectural accessibility. Through the establishment period, World Wars I and II, Korea and Vietnam wars brought a growing number of people with disabilities (Wendt & Lloyd, 2011). Re-integration of these people into society was a pressing issue. It required a lot of effort from people with disabilities, their families, advocacy groups, and the government, but as a result, many organizations that exist today were established. Some examples are the American Association on Intellectual and Developmental Disabilities, the American Speech-Language-Hearing Association, the Arc, the Council for Exceptional Children, and United Cerebral Palsy (Wendt & Lloyd, 2011).

The empowerment period started in 1973 with the addition of Section 504 to the Rehabilitation Act. This important legislation acknowledges disability rights as a civil rights issue (Bryant & Bryant, 2003). The technological innovations continued to drive the advancement of AT. In 1974, close-circuit television was used for the electronic magnification of print, and the first compact Braille electronic calculator appeared. Two years later, the Kurtzweil reading machine was created to make text accessible to blind people. At the same time, IBM launched a special needs unit that has adapted technology for individuals with disabilities (Bryant & Bryant, 2003). Later, the invention and improvement of the microprocessor led to reduced size, lower cost, and increased functionality of AT devices. Most importantly, the technology could be more mobile and portable, such as in the case of AAC devices (Cook & Polgar, 2015).

The next wave that significantly altered AT's service delivery is access to the Internet. It allowed AT-related information to be readily available anywhere and at a lower cost (Wendt & Lloyd, 2011). Today, AI technology is ready to revolutionize AT service delivery once again. AI capabilities allow more customized and functional support for people with disabilities (Guan et al., 2020).

Disability Legislation Related to Assistive Technology

Considerable attention has been directed to the use of AT in the context of Federal legislation. The Rehabilitation Act was one of the essential pieces of legislation to address the utilization of AT (Cook & Polgar, 2015). First, Section 504 prohibited discrimination based on disability and mandated reasonable accommodations for employees and students with disabilities who worked or studied in federally funded organizations. Consequently, it triggered two fundamental changes: (1) architectural barriers were reduced, and (2) people with disabilities had a more personalized approach. For example, Individualized Written Rehabilitation Programs were introduced to ensure the provision of appropriate AT devices and services (Cook & Polgar, 2015; Wendt & Lloyd, 2011). Another paramount change was in Section 508, which mandated that all electronic and information technology developed, procured, maintained, or used by the federal government be accessible to people with disabilities (Rehabilitation Act of 1973).

The Telecommunications Accessibility Enhancement Act of 1988 further increased the accessibility of media and telecommunication systems for people with hearing and speech impairments (Cook & Polgar, 2015). As a result of this legal development, telecommunication devices for deaf people were developed. These devices allowed the processing of typed input and output through a visual text display (Wendt & Lloyd, 2011).

Another paramount document resulting from the civil rights movement is the Americans with Disabilities Act (ADA) of 1990. This document required public and private organizations to accommodate people with disabilities. It necessitated businesses to offer equal opportunities to all qualified personnel, which implies the provision of appropriate AT when needed (Wendt & Lloyd, 2011). Furthermore, it requires improved accessibility to public transportation, stores, hotels, restaurants, and other places of public accommodations. Increased accessibility promoted accessibility design, the type of AT primarily focusing on modifying the built environment to accommodate individuals with disabilities (ramps, elevators, lifts, accessible restrooms, braille signs, etc. (Cook & Polgar, 2015).

The civil rights movement also significantly altered and affected education as well. The provision of AT for people with disabilities in educational settings is supported by the Individuals with Disabilities Education Act and The Americans with Disability Act. In 1997, The Individuals with Disabilities Education Act (IDEA) was reauthorized and included a specific requirement for schools to consider assistive technology as part of a student's individualized education plan (IDEA, 2004). In 2004, The Assistive Technology Act was reauthorized, providing funding for assistive technology services and devices for individuals with disabilities (Assistive Technology Act, 2004). In 2015, The Every Student Succeeds Act (ESSA) further strengthened the utilization of assistive technology by allowing schools to use federal funds to purchase assistive technology and services. The most recent development in AT law is The 21st Century Assistive Technology Act, which aims to increase access to assistive technology for individuals with disabilities, improve the quality and availability of assistive technology services, and promote greater independence and participation in all aspects of life for people with disabilities (21st Century Assistive Technology Act, 2022).

Assistive Technology in Education

A plethora of assistive technology varies depending on the AT's function. Many devices and software are aimed at providing access to curriculum and inclusion of students (Harper et al., 2017; Hunt, 2021; Nordström et al., 2019; Taylor et al., 2022). Among such are hearing aids, alternative augmentative devices, voice-over software, wheelchairs, etc. (Hunt, 2021). However, there is another category of AT that provides access to the curriculum for students with "invisible" disabilities, such as learning disabilities. Word recognition and voice recognition software provide access to curriculum to one of the largest IDEA (2004) categories of students with special needs - students with specific learning disabilities (Harper et al., 2017; Keelor et al., 2023; National Center for Education Statistics, 2022; Nordström et al., 2019; Taylor et al., 2022).

Assistive Technology implementation not only provides access to the curriculum and promotes the inclusion of students with disabilities but also further advances educational outcomes by improving the academic performance of students with various disabilities (Bouck et al., 2020; Keelor et al., 2023; Malcolm et al., 2017), increasing engagement and motivation (Rizk & Hillier, 2022), and enhancing social skills (Emerling et al., 2021; Murry, 2018; McNicholl et al., 2021; Tamakloe & Agbenyega, 2017).

In light of recent legislative development, the current advancement in promoting a universal design for learning (UDL) framework, and various functions that AT can serve, special attention has been paid to what a good decision-making process about integrating technology into academic learning for students with exceptionalities is (Kennedy & Boyle, 2017). To take full advantage of AT, kids should be evaluated and matched with the right device, be provided with the device itself, and be taught how to use the technology in the right place at the right time. Assistive technology also refers to assistive technology services, which are defined by the

Technology-Related Assistance for Individuals with Disabilities Act of 1988 as "any services that directly assist an individual in the selection, acquisition, or use of an assistive technology device" (29 U.S.C. §2202, para. 3).

Assistive technology services (ATS) are necessary for the consideration of AT, the assessment of AT needs, documentation in IEP, implementation of AT, evaluation of effectiveness, AT transition, administrative support, and professional development and training for AT. Furthermore, all the advancements in technology development and the research indicate that current and pre-service teachers need professional development opportunities in assistive technology, triggering universities and school districts to integrate technology into the curriculum (Ahmed, 2018; Alghamdi, 2022; Atanga et al., 2020; Evmenova et al., 2022; Lamond & Cunningham, 2020; Siyam, 2019). In response to that need, the quality indicators for ATS were developed to support educators' delivery of high-quality assistive technology services (Zabala et al., 2000).

Principles for Integrating Technology into the Learning Environment

The academic community dedicated a fair amount of time to developing the principles of technology integration in the learning environment to assist teachers in matching students and technology. Three published examples of guiding principles for integrating technology are described below. The first one is the TECH model described by King-Sears and Evmenova (2007). TECH is an acronym that stands for: Target the students' needs and the learning outcome; Examine the tech choices, then decide what to use; Create opportunities to integrate technology with other instructional activities; Handle the implementation and monitor the impact on the students' learning (King-Sears & Evmanova, 2007). The authors provide practical guidance on how to guide teachers and practitioners in making informed and individualized

decisions about technology use (Kennedy & Boyle, 2017). The key recommendations are (1) to ensure that when technology is chosen, it solves a specific academic need and is matched to curriculum content; (2) the technology must be age-appropriate and not draw attention to the student's disability, (3) first consider low-tech and low-cost options to meet student's needs.

The second model is the multimedia design framework (MDF) described by Kennedy et al. (2014). This framework builds on the previously described model and also combines the UDL framework with Mayer's Cognitive Theory of Multimedia Learning (CTML) (Kennedy et al., 2014). The five phases of MDF are as follows:

1. Establish a firm purpose for instruction.
2. Ask pre-planning questions about students' individual learning needs and the demands of the content being taught.
3. Consider how the principles of UDL can help design instruction that appropriately interfaces with the demands of the content and the student's learning needs.
4. Consider how Mayer's instructional design principles can help inform the looks and sounds of instruction.
5. Evaluate outcomes.

The last model is the SETT framework that guides educators in the process of considering, providing, and supporting assistive technology to students with disabilities (Zabala, 1995). SETT stands for Student, Environment, Task, and Tools. The SETT framework emphasizes the importance of considering AT in the context of specific tasks that students need to perform in educational settings. It also highlights that assessment and interventions are continuous and ongoing processes (Zabala, 1995).

Implementation of Assistive Technology

Best Practices

Zabala et al. (2000) developed quality indicators for assistive technology in school settings. The indicators were developed for assistive technology services for the following areas: (1) administration, (2) consideration, (3) assessment, (4) IEP development, (5) implementation, and (6) evaluation of effectiveness. Following these quality indicators for assistive technology will ensure students receive quality AT services. Quality indicators for assistive technology (QIAT) services are a set of descriptors of critical elements related to major functions involved in providing assistive technology services (Zabala, 2000). QIAT in administration ensures the development of policies, procedures, and other supports necessary to sustain effective technology implementation. QIAT for consideration of assistive technology safeguards students' right to assistive technology and services. QIAT in the area of assessment for assistive technology needs provides teachers and other members of educational teams with clear and concise processes to identify tools and strategies to address students' specific needs. QIAT for documentation in the IEP helps the team describe the role of assistive technology in the child's educational program. QIAT for implementation involves setting expectations for people working together to support students using assistive technology to accomplish expected tasks necessary for active participation in customer educational environments. Lastly, QIAT in the area of evaluation of effectiveness includes an expectation for data collection and documentation to monitor changes in student performance resulting from the implementation. Further, students' performance is reviewed in order to identify if any modifications or revisions are needed. As students move from elementary to secondary education, their environments, needs, and performance levels drastically change; therefore, the AT and AT services must reflect that.

In the context of various models of matching students and technology and the QIAT, it is essential to acknowledge that AT is not only the assistive devices or equipment but also AT services (Zabala, 2000). Despite the IDEA's (2004) requirement to consider technology devices and services in developing an IEP for a student to gain maximum benefit from free appropriate education, there has not been a description of high-quality assistive technology services (Bowser & Reed, 1995; Carl et al. 1994). In this research, quality AT services are defined as services that align with the recommendations of the QIAT Consortium in all six areas: (1) administration, (2) consideration, (3) assessment, (4) IEP development, (5) implementation, and (6) evaluation of effectiveness.

Barriers to Implementation

Despite the plethora of research on the benefits of using AT, improved teacher training in technology, and setting the quality indicators for ATS, many available resources remain on the "sideline" because teachers do not believe they can successfully implement AT or provide quality ATS (Evmenova et al., 2022). This is especially true for students with high-incidence disabilities. Research has shown that teachers are more likely to persevere in implementing AT when they have higher self-efficacy (Atanga et al., 2020; Harper et al., 2017). Most studies determined that barriers and facilitators of AT implementation are financial restraints, lack of information, and professional development (Fernández-Batanero et al., 2022; Lamond & Cunningham, 2022). However, if these three factors are less of a concern, it still does not guarantee that the teachers will implement the AT (Dillon & Morris, 1996; Evmenova et al., 2022).

Inclusion is presently the main trend in special education. Assistive technology (AT) plays a critical role in including students with disabilities as it provides access and enables

people with disabilities to participate in daily activities, including education (Edyburn, 2005; Fernández-Batanero et al., 2022). Edyburn (2005) started a conversation expressing the need for research demonstrating AT's effectiveness as an inclusion tool. Olakanmi (2020) and Fernández-Batanero et al. (2022) reviewed literature from the past decade and found that AT successfully increased the inclusion and accessibility of students with disabilities; however, they also documented that AT is not homogeneously utilized by students who fall into different categories of disabilities (Bouck & Long, 2021; Quinn, 2009).

The Role of Self-efficacy in AT Implementation

Teachers and Self-Efficacy

Teacher self-efficacy is defined as the belief in the ability to teach effectively (Gibson & Dembo, 1984). Teachers' self-efficacy beliefs are thought to influence not only their motivation, performance, and job satisfaction but also the achievement of the students (La et al., 2019; Ma et al., 2021; Morris et al., 2017). Researchers have been interested in improving teachers' self-efficacy, which can ultimately help improve students' achievement. Special attention was paid to sources of self-efficacy in the research (Morris et al., 2017; Tschanen-Moran & Hoy, 2001).

Research on sources of teachers' self-efficacy has been somewhat limited (Klassen et al., 2011; Morris et al., 2017). Morris et al. (2017) reported that many studies use indirect measures, such as elements of teacher training, instead of directly exploring sources of self-efficacy described by Bandura (1997). However, when direct measures were utilized, they were not always consistent with theoretical propositions. For instance, many studies measure mastery experiences by years of teaching or job satisfaction. Few studies asked teachers directly how specific experiences shaped their confidence and self-efficacy (Klassen et al., 2011; Morris et al., 2017). Many studies focused on mastery experiences and few on other sources. Interestingly, a

recent cross-cultural analysis found that verbal persuasion can have different effects on teachers from various cultures (Yada et al., 2019). Another limitation of current research discovered by Klassen et al. (2011) and confirmed by Morris et al. (2017) is that most studies to determine self-efficacy sources have been done on pre-service teachers and those at the elementary school level.

Teachers at various stages in their teaching careers may have different sources of self-efficacy (Gale et al., 2021). Novice teachers may rely more on social persuasion and vicarious experiences, while for more experienced teachers' mastery experiences are the main sources of self-efficacy. It is important to note that mastery experiences may be not only a positive experiences, as depicted in some studies, but negative experiences may also drastically affect teachers' self-efficacy. Furthermore, physiological and emotional states seem to affect female teachers more, possibly due to higher reported stress levels of societal gender norms (Gale et al., 2021; Klassen & Durksen, 2014).

As evident from research, teachers' self-efficacy has a multifaceted nature. When looking at the sources of self-efficacy, it is important to remember that it is teachers' perception of mastery experiences, social persuasion, vicarious experiences, and physiological response that affects self-efficacy and not the objective experience itself (Bandura, 1997; Gale et al., 202; Gist & Mitchell, 1992; Morris et al., 2017). Therefore, context plays a crucial role in shaping teachers' beliefs.

Self-Efficacy Theory in the Context of Implementation of Assistive Technology by Special Education Teachers

In 2021, in preparation for the 4th International Conference on Special Education, Giek (2021) attempted to systematically review research published from 2016 through 2021 on the influence of teachers' self-efficacy on the use of assistive technology. Overall, his study revealed

a positive correlation between teacher self-efficacy and their use of AT. Giek (2021) also noted that Bandura's self-efficacy theory was the most used framework for studies, followed by Tschannen-Moran and Hoy's (2001) Teacher Self-Efficacy Model. For AT, the most common models were the technological pedagogical content knowledge model by Mishra & Koehler (2006) and Davis's technology acceptance model (1993) (Giek, 2021). Most studies collected data through surveys/online surveys, emphasizing that quantitative measures are more popular in recent research.

Furthermore, Giek (2021) suggested that more studies that focus on qualitative measures are needed to explore and analyze teachers' self-efficacy and use of AT. Understanding teachers' perspectives and factors affecting their self-efficacy when it comes to the implementation of AT is especially important in light of the Active Implementation Framework (AIF), described by Fixsen et al. (2009) and further developed by Metz et al. (2015). AIF emphasizes the importance of collaboration, data-driven decision-making, and ongoing support for successfully implementing technology in educational settings on the organizational level. As discussed earlier, current legislation is setting the trend to increase the use of assistive technology, which makes it imperative to understand how political movements and organizational actions combined affect teachers' self-efficacy in AT.

The Active Implementation Framework is rooted in principles of social cognitive theory, which emphasize the importance of agency, motivation, and social support in promoting change. It consists of four stages (exploration, installation, initial implementation, and full implementation) that describe a nonlinear process requiring trial and error for several years before the innovation finds a sustainable fit (Evmanova et al., 2022). While the organization as a whole is undergoing the stages of accepting and implementing educational technologies to

promote the inclusion of students with disabilities, it is important to understand how this affects teachers' perspectives and confidence in AT selection, acquisition, implementation, and maintenance among students with disabilities.

AT Implementation among Students with High-Incidence Disabilities

High-Incidence Disabilities

According to the National Center for Educational Statistics (2022), the number of students who received special education services in the United States in the 2021-2022 school year was 7.2 million, or 15 percent of all public school students. Every student is guaranteed the right to consider AT in developing or reviewing their Individual Educational Plan (IDEA, 2004). As stated earlier, one of the largest categories of students that is served under IDEA (2004) is specific learning disability (SLD) (33% of all students in special education), followed by speech and language impairment (SLI) (19%) and other health impairment (OHI) (15%). However, studies by Quinn (2009) and Bouck and Long (2021) suggest that AT is not utilized to its full potential for students with SLD, SLI, and OHI. When Quinn (2009) looked closely at the primary users of AT devices and services, he found that 40% of AT users are serviced in self-contained settings. Categories of students such as SLD, SLI, and OHI are rarely, if never, serviced in such a restricted setting.

Furthermore, about 28% of all AT users are students serviced under the category of multiple disabilities, which represent only 2% of all students in special education (National Center for Educational Statistics, 2022; Quinn, 2009). Quinn's (2009) findings are consistent with the previous research on AT users, such as Edyburn (2005), who raised a question about the appropriate use of AT among students with high-incidence disabilities. The low rates of assistive

technology use among students with learning disabilities despite the known benefits are rather concerning (Bouck & Long, 2021).

Needs of students with high-incidence disabilities

The students in special education who are often classified as high-incidence disability students qualify for special education services under categories such as emotional and/or behavior disorders, learning disabilities, mild intellectual disability, and, in some cases, high-functioning autism, attention-deficit hyperactivity disorder and speech and language impairment (Gage et al., 2012). The research indicated that the students from the above categories share some commonalities in their cognitive abilities, academic performance, and behavioral performance (Gage et al., 2012; Sabornie et al., 2005). Students with high-incidence disabilities have poor academic performance, such as reading/writing difficulties and difficulties with mathematics (Gage et al., 2012; Graham et al., 2017).

In reading, students with high-incidence disabilities often struggle with reading at an appropriate rate (fluency) when compared with peers without disabilities, learning sight words and vocabulary (Cain & Oakhill, 1999; Jenkins et al., 2003; Wagner et al., 1997; Wolf & Bowers, 1999). Students with high-incidence disabilities also have problems on all levels of the writing process (Wong, 1997). Specifically, these problems include low productivity levels, weak mechanical skills, and difficulty in planning, generating, organizing, revising, and editing (Graham et al., 1991; Lewis et al., 1998; Mayes et al., 2005). Data from numerous assessments indicated that students with high-incidence disabilities do not perform well in rigorous mathematics courses and struggle with basic arithmetic (Loveless, 2008).

In addition, they may exhibit behavior problems and social-emotional deficits (Sabornie et al., 2005). High-incidence disabilities are often not obvious until a child is placed in school,

illuminating the child's weaknesses (O'Brien et al., 2019). In this context, Hunt (2021) argues that if AT is an enabler of learning, then the identification process of AT users should start as early as possible to ensure adequate and equitable access and participation of all children with disabilities in inclusive education.

Benefits of AT for students with high-incidence disabilities

Various technologies and software exist to assist students with high-incidence disabilities in word recognition, speech recognition, and math computations and representations (The Assistive Technology Industry Association, 2023). The various Ats for students with high-incidence disabilities could be divided into sub-categories:

1. Text-to-speech (TTS) recognition (e.g., Kurzweil 3000, Natural Reader; Snap and Read),
2. Speech-to-text (STT) (e.g., Dragon Naturally Speaking, MacSpeech),
3. Word prediction (Co:Writer),
4. Mathematics assistive technology (e.g., Equatio),
5. Behavioral interventions (e.g., software and tools that assist with executive functioning, graphic organizer software) (Bouck, 2017).

Technology in literacy assists students in various ways. TTS allows students to access print materials, and while TTS reads the text aloud, it also highlights words as they are read, which assists students with tracking. Meyer and Bouck (2014) examined the role of TTS and found that students who participated in the study did not improve over baseline phases on fluency, comprehension, or task completion time; however, students felt good about independently accessing print without the instructor's assistance. In another study, TTS was successfully integrated with repeated reading interventions and was found to increase students'

reading fluency, accuracy, and comprehension (Coleman & Heller, 2010). More recent studies found that as technology becomes more advanced and incorporates many features that assist with executive functioning skills, it can support students with reading difficulties better and improve reading comprehension (Silvestri et al., 2022; Sulaimon & Schaefer, 2022; Wood et al., 2018). The most recent study by Keelor et al. (2023) compared students with reading and language difficulties ages 8-12 years old reading under various conditions: silent reading, reading aloud, listening only, TTS with no highlighting, and TTS with highlighting. Researchers discovered that TTS with and without highlighting may be a helpful tool for supporting the reading comprehension of students with reading and language difficulties, particularly for students with dyslexia (Keelor et al., 2023)

In writing, one of the most commonly recommended Ats is speech-to-text technology. STT or speech recognition, sometimes called voice recognition, enables individuals to convert speech to text. Unlike a voice recorder, STT allows students to see the text as they dictate. In addition, unlike dictation to an adult scribe, it is not dependent upon available human resources. For students who struggle with spelling and children who cannot physically write or access a keyboard, STT provides a way to write independently.

In recent years, STT technology has become more accurate and readily available (Kambouri et al., 2023). STT technology is offered as separate software (e.g., Dragon Professional) and is also built-in as a basic feature in Microsoft 360 or any Android or iOS device. There is a growing body of research on the benefits of speech-to-text assistive technology (Kambouri et al., 2023; Ok et al., 2022; Perelmutter et al., 2017). The usage of speech recognition technology with students with high-incidence disabilities that is incorporated into writing instruction and appropriately taught can increase students' confidence in writing and

motivation to write, which, in turn, improves writing intervention outcomes (Kambouri et al., 2023; Ok et al., 2022).

Another AT in writing is word prediction applications. These applications predict the word you intend to type based on frequency, syntax, and the first letters typed. Initially, this technology was used to help individuals with physical disabilities to help increase their typing speed and decrease the number of keystrokes needed to complete a word (Mirenda et al., 2006). However, it was found that this technology can also assist individuals with spelling and reading difficulties (Bouck, 2017). Today, word prediction applications have algorithms to make suggestions based on phonetic and inventive spellings. Most word prediction programs use synthesized speech to help students with reading difficulties recognize words from a list of suggested words. Most word prediction programs can create personalized word banks for each user to learn the words students frequently write. In addition, the software predicts using a topic-specific vocabulary (DonJohnston, n.d.) several studies examined the effectiveness of word prediction software and found it to have positive effects on the performance of students with writing disabilities and students with physical disabilities (Evmenova et al., 2010; Evmenova & Regal., 2019; Handley-More et al., 2003; Mirenda et al., 2006).

Struggling writers typically have difficulties planning and organizing ideas when writing (Gage et al., 2012). Students with learning disabilities struggle with higher-order writing processes to establish purposes for writing, activate background knowledge, and generate topic-specific information (Graham & Harris, 1993). Furthermore, they lack an understanding of text structure, which prevents them from logically arranging ideas (Englert et al., 2007). Computer-generated graphic organizers have been used to help students during the planning stage of writing. Such programs effectively improve students' writing with high-incidence disabilities

(Sturm & Rankin-Erickson, 2002; Gonzalez-Ledo et al., 2015; Dexter & Hughes, 2011; Englert et al., 2007).

Assistive technology in mathematics focuses on three main areas: (a) anchoring instruction, (b) computer-assisted instruction, and (c) calculators (Bouck, 2017). In the 2009 literature review, Bouck and Flanagan (2009) note that AT in mathematics is generally helpful and has positive results for students with high-incidence disabilities. Later, Bouck et al. (2020) corroborated the use of virtual manipulatives by students with disabilities and demonstrated positive outcomes of such AT.

Lastly, widespread mobile technology could support various evidence-based practices (Cheng & Lai, 2021; Qahmash, 2018). While technology that is part of instructional interventions would not be considered a traditional AT, it has great potential to support students with challenging behavior (Emerling et al., 2021) and Attention Deficit/ Hyperactivity Disorder ADHD (Moraiti et al., 2022). For example, teachers have used technology as part of self-monitoring, video modeling, and behavior-specific praise to support student behavior.

Summary

AT has the potential to enhance the lives of people with disabilities. In educational settings, AT significantly impacts academic engagement, academic performance, development of autonomy, and participation. Furthermore, the research found that AT can increase the acquisition of social skills, promote motivation, and increase students' attention. Even with the widespread adoption of technology in recent years, there are still different obstacles that teachers and schools must overcome to apply the tools with the students: (1) the need for teacher training and (2) difficulty in accessing AT. Additionally, despite the plethora of varieties of AT, it is underutilized

among students with high-incidence disabilities. AT for students with high-incidence disabilities is often viewed as a “crutch” preventing them from learning necessary skills. However, recent studies indicated that students with reading, writing, or mathematics disabilities improved their academic performance and access to the curriculum when using text-to-speech and speech-to-text tools. One factor described in the literature that contributes to the special educators’ use of technology is teachers’ beliefs in their ability to use technology. A gap exists in the literature on the deeper understanding of special educators' attitudes and perceptions that contribute to AT implementation among students with high-incidence disabilities in settings where financial restraints and lack of professional development are less of a concern. By examining teachers’ attitudes and perspectives toward AT, practitioners can better understand and promote the factors that increase the adoption of AT among students with high-incidence disabilities.

CHAPTER THREE: METHODS

Overview

The purpose of this hermeneutical phenomenological study was to describe the experiences of special education teachers when implementing assistive technology with students with high-incidence disabilities for special education teachers at the large school district that provides teachers and students access to AT. The problem is that despite the available resources, special education teachers who work with students with high-incidence disabilities underutilize them. This chapter describes in detail the research design, procedures, and analysis for the present research study. The hermeneutic phenomenology research design incorporated interviews with special education teachers, focus groups with special educators, and an analysis of documents. An interpretive framework guided the fundamental ethical assumptions while contributing to a deeper exploration of the lived experiences of individuals with disabilities and promoting social change and inclusion by challenging existing norms and narratives. This research aimed to describe mastery experience, vicarious learning experiences, social persuasion, and emotional and physiological states of special education teachers with AT for students with high-incidence disabilities.

Research Design

A hermeneutic phenomenological design was chosen for this study. The current study aimed to describe the experience of implementing AT with students with high-incidence disabilities by special educators. Unlike quantitative research, which relies on numbers and statistical analysis, qualitative research explores special educators' experiences, motivations, and decision-making processes in-depth, focusing on the factors that constitute teachers' self-efficacy

beliefs. Furthermore, the reality of special education teachers is constructed through interactions with colleagues, parents, students, and administrators. Qualitative methods such as interviews and content analysis uncovered different viewpoints, interpretations, and subjective experiences (Creswell & Poth, 2018).

It is well-documented that self-efficacy improves teachers' AT implementation (Atanga et al., 2020; Harper et al., 2017). The four factors that are believed to be the main influences on one's level of self-efficacy are mastery experiences, vicarious experiences, verbal persuasion, and somatic and emotional states (Bandura, 1993, 1999). These factors must be considered in the context of individual beliefs and perceptions of teachers and in the context of the whole organization's implementation (Fixsen et al., 2009; Rogers, 2003).

In 2021, in preparation for the 4th International Conference on Special Education, Giek (2021) attempted to systematically review research from 2016 through 2021 on the influence of teachers' self-efficacy on the use of assistive technology. Overall, his study revealed a positive correlation between teacher self-efficacy and their use of AT. Giek also noted that Bandura's self-efficacy theory was the most used framework for studies, followed by Tschannen-Moran and Hoy's (2001) Teacher Self-Efficacy Model. The most common models for AT were the Technological Pedagogical Content Knowledge Model by Mishra & Koehler (2006) and Davis' Technology Acceptance Model (1989). Most studies collected data through surveys/online surveys emphasizing that quantitative measures are more popular in contemporary research, further stressing the need for a qualitative study that would investigate the factors affecting the self-efficacy of special educators.

Utilizing hermeneutic phenomenological study design allowed for an in-depth exploration of individual experiences within the same school district to portray a more in-depth

representation of the phenomena (van Manen, 2014). Furthermore, the phenomenological methodology helped illuminate detailed descriptions and personal meanings of lived experiences related to AT implementation with students with high-incidence disabilities. All participants in the study were from the same district; they were in special education and worked with high-incidence disabilities students – therefore, they all have shared experiences of a phenomenon. Moreover, they had access to the same assistive technology for high-incidence disabilities students, and all teachers had access to professional development (PD) opportunities. However, variations exist in school climates, school administration, teachers' backgrounds, beliefs, and perceptions. The level of assistive technology implementation also varies from teacher to teacher, given that they have equal access to technology and PD.

This study employed hermeneutical phenomenology as a research method. Phenomenology is a description of the lived-through quality of lived experience and, simultaneously, an explanation of the meaning of the expressions of lived experience (van Manen, 2014). The two descriptions might sound confusing, but they should not be: since all the experiences are mediated through some form of symbolic representation, they have an interpreting nature. Gadamer (1986) best outlined the heart of the hermeneutic phenomenological approach – when one interprets the meaning of something, they actually interpret an interpretation. The current study is not a pure description of teachers' lived experiences but rather interpretations of teachers' words and actions to find commonalities in the experience and describe them as a phenomenon that enables researchers to see which factors contribute to teachers' decision-making process to implement assistive technology with their students. Therefore, hermeneutic phenomenology was the best-suiting approach for the study. A case study approach that allows the development of detailed portrayal and case analysis was

considered; however, it did not fully meet the requirements of focusing only on experiences as lived.

Various sources were used to collected data: interviews, focus groups, and documentation. The data were analyzed using a holistic approach to derive the themes that potentially explain why some special educators implement assistive technology while others do not. Various data sources aided in triangulating the results.

Research Questions

Central Research Question

What are the lived experiences of special education teachers who implement AT with students who have high-incidence disabilities?

Sub-Question One

How do special education teachers describe mastery experiences when implementing assistive technology with students with high-incidence disabilities?

Sub-Question Two

How do special education teachers describe vicarious experiences when implementing AT with students with high-incidence disabilities?

Sub-Question Three

How do special education teachers describe verbal persuasion when implementing AT with students with high-incidence disabilities?

Sub-Question Four

How do special education teachers describe physiological feedback when implementing assistive technology with students with high-incidence disabilities?

Setting and Participants

Participant and sampling designs were purposefully and strategically selected as needed to explore the problem of underutilization of AT among students with high-incidence disabilities. This section of the chapter aims to describe the setting and participants. In the context of phenomenological studies, the most suitable strategy was criterion sampling (Creswell & Poth, 2018). This section also explicitly outlines the specific criteria used to include participants.

The district has assistive technology specialists supporting special education teachers and students. The AT specialists provide support in identifying the needs of students as they pertain to AT, help match students to technology, and provide training for students, teachers, and parents. In addition, AT specialists provide consultation reports that include recommendations, strategies for implantation, and suggestions on how to incorporate information in students' IEPs. AT specialists also provide coaching to teachers on how to integrate AT into their instructional practices. Lastly, the AT department can assist with providing more advanced AT devices and software.

The district has district-wide licenses covering all county students to utilize software that supports students with reading and writing disabilities, such as Snap and Read, Co:Writer Universal, and OrbitNote. All special education teachers have access to professional development offered at least four times a year and can request additional training and coaching on demand. Moreover, the district has a procedure for requesting AT support for individual students, which includes submitting a request through an online portal and sending an email to the AT specialist.

Setting

The study was conducted in a school district in the Southeastern United States serving a large metropolitan area. The school district is in a densely populated area that continues to grow. The district encompasses a significant geographical area, accommodating a range of urban neighborhoods and many suburban communities. Based on the Diversity Index Map of 2020, the diversity index was 64.1% (www.census.gov). The student body comprises individuals from diverse socioeconomic backgrounds, reflecting a broad spectrum of regional income levels. The district's demographic composition encompasses a mix of ethnicities, cultures, and languages, contributing to a vibrant and multicultural learning environment.

Participants

A total of 10 participants from K-12 settings were recruited at the district. Participants in this study were special education teachers with various teaching experiences from one to 25 years, with a minimum of one year of most recent experience in special education. All participants in the study are interrelated resource teachers who work with students with high-incidence disabilities. Furthermore, the participants in the study are familiar with AT for high-incidence disabilities and have experience implementing AT within the last five years.

The students in special education who are often classified as high-incidence disability students qualify for special education services under categories such as emotional and behavior disorders, learning disabilities, mild intellectual disability, and, in some cases, high-functioning autism, attention-deficit hyperactivity disorder and speech and language impairment (Gage et al., 2012). The research indicated that the students from the categories mentioned earlier share some commonalities in their cognitive abilities, academic performance, and behavioral performance (Gage et al., 2012; Sabornie et al., 2005). Students with high-incidence disabilities may have

poor academic performance, such as reading/writing difficulties and difficulties with mathematics (Gage et al., 2012; Graham et al., 2017). In addition, they may exhibit behavior problems and social-emotional deficits (Sabornie et al., 2005).

Researcher Positionality

Hermeneutic phenomenology is a method that helps researchers interpret experiences through text or some other form of symbol to describe phenomena (van Manen, 2014). Since it has the interpretive element, it is important to explicitly state the researcher's positionality (Creswell & Poth, 2018). This section of the chapter provides the author's interpretive framework, philosophical assumptions, and the researcher's role.

Interpretive Framework

For most of my life, I worked, lived, or cared for persons with disabilities or neurodiverse persons. As a result, I witnessed firsthand and experienced how the realities of persons with disabilities are constructed differently from the majority. In my research, I unconsciously make a point of bringing awareness of the position of persons with disabilities. I strongly believe disability is "a dimension of human difference and not ... a defect" (Creswell & Poth, 2018, p.32). Therefore, I think that we are all more alike than different. The interpretive framework of disability theories resonates with me a lot. However, my first degree is in Finance, and this field of study is mostly quantitative. A scientific approach to research is where my epistemological beliefs are grounded.

Furthermore, I seek logical explanations and empirical data to establish cause-and-effect relationships. I see a tremendous gap in research in special education that utilizes the postpositivist framework. Mostly, this issue stems from a lack of empirical data, ethical issues,

and the extreme diversity of the researched field. However, this kind of research is most convincing for policymakers, school administrators, and the general population, leading to greater changes. Therefore, I identify my interpretative framework as postpositivist through the lens of disability theories.

Philosophical Assumptions

A researcher's philosophical assumptions shape the direction of the research goal and outcomes, determine the scope of training and research experience, and serve as a basis of evaluative criteria for research-related decisions (Huff, 2009). This section will discuss my ontological, epistemological, and axiological assumptions. These assumptions make the reader aware of the researcher's views of reality (ontology), how the researchers know the reality (epistemology), and the value stance taken by the inquirer (axiology) (Creswell & Poth, 2018).

Ontological Assumption

Having lived in various cultures, I believe reality is socially constructed. Knowledge is subjective, contingent, and relational. My ontological assumption is that reality is not fixed or objective but rather shaped by individuals' circumstances and experiences. My perceptions are aligned with the views of feminist and critical theorists who argue that our understanding of reality is shaped by the social, cultural, and political context in which it is produced. Harding (1987) states that knowledge is not discovered but rather created and is always located within particular historical, cultural, and political contexts. For example, the construct of disability only exists in a person's interaction with the environment. According to the International Classification of Functioning, Disability, and Health (ICF) by the World Health Organization (WHO), a person's functioning and disability result from the dynamic interaction between health conditions and contextual factors, including personal and environmental factors. Thus, I

recognize the need for a critical examination of how disability is constructed and experienced, particularly by disabled individuals themselves.

Epistemological Assumption

My epistemological position as a researcher is that knowledge is constructed through negotiation between the researcher and the research participants. This view aligns with the post-positivist belief that knowledge is subjective, dynamic, and co-constructed through interaction between the researcher and the researched. I recognize the importance of including the perspectives and experiences of disabled individuals in my research, as their experiences provide a unique insight into the social and political construction of a disability.

Disability theory postulates that a disability results from societal barriers, not personal or individual problems (Siebers, 2008). I believe that it is necessary to challenge the dominant medical and deficit-based views of disability and to consider the social, cultural, and political factors that contribute to the experience of a disability. Albrecht and Devlieger (1999) discovered that 54.3 % of the persons with severe disabilities in the study, despite their physical limitations, believed that they had an excellent or good quality of life. Researchers attributed it to their ability to re-create their social worlds and noted that knowledge is not simply a reflection of the world but is created through inquiry, communication, and interaction.

Axiological Assumption

As a postpositivist researcher, I believe values and beliefs shape knowledge production and are integral to the research process. My axiological assumption is that research should be guided by a commitment to social justice, particularly concerning the experiences of disabled individuals. Disability theorists argue that social, cultural, and political factors shape the experience of disability and that a commitment to addressing these issues must guide research. I

believe my research should contribute to creating a more inclusive and equitable society for disabled individuals.

Researcher's Role

When considering the researcher's role, it is crucial to acknowledge the connection between the researcher and the participants (Creswell & Poth, 2018). In conducting this phenomenological inquiry, I recognize my role as a human instrument of the study, bringing forth my perceptions, interpretations, and experiences. In my case, I have been involved with the participating school district for seven years, initially as a special education teacher and later as an assistive technology specialist. As an assistive technology specialist, I collaborated with some of the teachers in the study sample. It is important to recognize that such pre-existing relationships could potentially influence the study results. To address this concern, as an employee of the district, I deliberately excluded myself as a data contributor. Furthermore, throughout the research process, I continuously engaged in reflexive practices to identify and bracket my presuppositions and biases, striving to maintain the integrity, authenticity, and richness of the participants' lived experiences (Creswell & Poth, 2018; Tufford & Newman, 2012).

I assumed responsibility for collecting, analyzing, and interpreting all data, including documentation and interview data. Additionally, I transcribed all audio recordings of the interview sessions. I took proactive measures to ensure impartiality due to my previous role as a special education teacher and my current position as an AT specialist within the school district. Despite having a peer-like relationship with the participants, I maintained a strong rapport that fostered the open sharing of information from the sample (Creswell & Baez, 2021). This strong rapport aided in cultivating a neutral and nonjudgmental approach toward the study participants (Patton, 1999).

In this study, as the researcher, I hold a central position in designing and executing the research. My role involved making informed decisions regarding the study's methodology, data collection tools, and analytical approaches, all of which directly influence the outcomes and validity of the research. As the primary contact for this study, my responsibility included acquiring consent from the participants (see Appendix A), obtaining Institutional Review Board (see Appendix D) approval, and initiating communication by writing a letter to the school district administrators where the study will take place, seeking their permission to conduct the research.

Procedures

After all approvals were received, I sought information about potential candidates for the study. To ensure the generalizability of findings, I aimed for a diverse population of various demographics, ethnic backgrounds, and educational backgrounds. Participants had at least one year of experience working with students in special education with high-incidence disabilities students and had experience implementing assistive technology within the last five years.

An email with an invitation and explanations was sent to prospective participants with a detailed description of their rights as participants and a portrayal of the goals and objectives of the research (see Appendix B). Each invitation was followed up with a phone call or visit within a week to clarify the study further.

The interviews were conducted first. The interview questions were recorded with two digital devices. I also took descriptive notes during the interview to capture its non-verbal aspects. A digital device was transcribing all interviews, and I proofread them. Electronic copies of the transcription were distributed to the interviewees for member checking, allowing the participants to review the interview documentation, extend feedback, and offer correction of any

noted error (Patton, 1999). This facilitated the assurance of data accuracy and validity of the interviews. At the interview, I obtained five consecutive day lesson plans.

Focus group interviews and document analysis were warranted as the next step of the research process. This was a necessary step to ensure the triangulation of data sources. By incorporating multiple data sources, the study aimed to establish a convergence of evidence, reinforcing the researcher's findings (Creswell & Poth, 2018). Focus group interview was scheduled via Microsoft Teams.

The study utilized phenomenological data analysis steps described by Moustakas (1994). The procedures included horizonalizing the data regarding every horizon or statement relevant to the topic. The meaning units were listed from the horizonalized statements. Then, they were clustered into common categories or themes, removing overlapping or repetitive statements. Last but not least, clustered themes and meanings were used to develop the textural descriptions of the experience. Then, textural descriptions are merged with structures into the meaning to define the phenomenon's essence.

Additionally, I used the causation coding method. This method assists researchers in labeling the mental models participants use to uncover the causes of the events (Saldaña, 2021). The identified codes were chronologically organized to establish attribution, such as the cause, the outcome, and the link between the cause and the outcome.

Permissions

The researcher first obtained IRB approval. After the IRB approval, the proposed study was submitted to the participating school district for approval. The district reviewed proposals for compliance with federal regulations concerning student records, privacy, and participation in research studies to ensure that the research studies and surveys do not interfere with instruction

or require excessive student or staff time. Furthermore, the district ensured that the study aligned with its current strategic plan. After the district approved the study, teachers' consent was obtained.

Recruitment Plan

To ensure a purposeful sampling approach, I employed a criterion-based and convenience sampling strategy for my research, as recommended by Creswell and Baez (2021). These strategies enabled me to include teachers implementing assistive technology with students with high-incidence disabilities. In this process, I sought input and referrals from my colleagues, who were also assistive technology specialists, as valuable reference sources. I sent teachers an invitation to participate in the research (See Appendix B). I followed up the email within one week. After an agreement was obtained and consent signed, I interviewed each participant. In addition, immediately following the interview, I asked participants to share their lesson plans and other artifacts that they utilized to guide their instructions. Four weeks later, I asked participating teachers to participate in focus group interviews via Microsoft Teams.

Data Collection Plan

In this hermeneutical phenomenological study, the researcher utilized various sources of evidence, including interviews and documentation. By employing multiple sources of evidence, I conducted an in-depth examination of a phenomenon within a real-world context, facilitating the development of converging lines of inquiry (Creswell & Poth, 2018). The primary objective of data collection was to identify rich descriptions of the lived experiences that align with the theoretical propositions established earlier, enabling the exploration of the central research question (van Manen, 2014). The data collection and analysis adhere to a hermeneutical

phenomenological study, wherein the data emerge and change, focusing on the whole (Moustakas, 1994; van Manen, 2014).

Individual Interviews Data Collection Approach

Interviews play a crucial role in phenomenological studies (Moustakas, 1994; van Manen, 2014), serving as a key driver for data analysis by offering initial explanations for teachers' decisions to use assistive technology with students with high-incidence disabilities. Semi-structured interviews with predetermined, open-ended questions generated the data needed for a comprehensive analysis while still allowing flexibility for unexpected turns in the conversation (Denzin & Lincoln, 2000). Based on the literature on teachers' self-efficacy, the following questions were designed to explore special education teachers' experiences implementing AT.

Table 1

Individual Interview Questions

1. Describe your experience and background in special education, particularly in working with students with high-incidence disabilities. CRQ
2. Share a specific instance when you successfully integrated assistive technology into your teaching practices to support a student's learning. SQ1
3. How did witnessing a colleague effectively implementing assistive technology success impact your beliefs in your capabilities to use technology similarly? SQ2
4. Describe when you received positive feedback or encouragement from colleagues, administrators, parents, or students regarding using assistive technology. SQ3
5. Describe a situation where you felt a sense of empathy or emotional connection with a student's challenges while implementing assistive technology. SQ4

6. Tell me about an experience where you learned about an innovative assistive technology approach through professional development or discussions with other educators. SQ2
7. Share a specific example of a situation where you collaborated with parents, caregivers, or specialists to implement assistive technology for a student with special needs. SQ3
8. Describe an instance when you faced challenges while implementing assistive technology. SQ1
9. How did you manage your emotional reactions and used your past successes to overcome these challenges and maintain your belief in your capabilities? SQ1
10. Tell me about a time when you felt excited or curious about exploring new assistive technology tools or strategies. SQ4
11. Share an example of when a student's progress or achievement through assistive technology had a positive physiological impact, such as increased engagement or improved behavior. SQ4
12. What else would you like to share about your experience implementing assistive technology? CQ

The initial question served as an icebreaker to establish a friendly and conducive atmosphere for participants to feel comfortable and willing to share their experiences (Creswell & Poth, 2018). The research sub-questions were designed to explore participants' experiences with the four major sources of self-efficacy described by Bandura (1993, 1997). Questions two, eight, and seven were intended to deepen understanding of teachers' mastery experiences when implementing AT, which pertained to the first sub-question. Questions three and six explored teachers' vicarious experiences and helped answer the second sub-question. Questions four and seven explored how verbal persuasion affected teachers' decision to implement AT with the

students. Questions five, ten, and eleven were designed to investigate teachers' physiological feedback when implementing AT, addressed in sub-question four. Finally, question twelve aimed to further explore teachers' experiences with AT and capture any additional sources of self-efficacy.

Individual Interview Data Analysis Plan

The data from the interview was analyzed based on the theoretical propositions of Bandura (1993, 1999). Several factors influence teachers' self-efficacy. These include mastery experiences (personal achievements and successes), vicarious learning experiences (observing others), social persuasion (verbal encouragement and feedback), and emotional and physiological states (emotional reactions and physical sensations) (Bandura, 1999). Therefore, interview data will be organized according to theoretical propositions (Moustakas, 1994). All interviews were recorded and transcribed by the researcher.

The initial themes were identified and later organized into clusters to generate textural descriptions. The second round of analysis included identifying the underlying patterns of how and why teachers integrate AT. First, the researcher created codes and derived themes using manual coding. Then, the study findings were compared with theoretical propositions focusing on processes and outcomes. Next, the researcher assessed each theoretical condition using quantitative and qualitative measures. Finally, the researcher drew conclusions based on textural and structural descriptions to fully understand participants' experiences (Moustakas 1994).

Focus Group Interview Data Collection Approach

I conducted focus group interviews to get a sense of the voice of people in the group (Katz-Buonincontro, 2022). Groups can have a powerful effect on their members by bringing to the surface new perspectives that might otherwise be latent in one-on-one interviews. During

group discussions, participants had an opportunity to construct their responses and reflect on their experiences (Katz-Buonincontro, 2022). The key principle of a high-quality focus group is to have homogeneity of common group characteristics (the group of educators who implement AT with students with high-incidence disabilities) and heterogeneity of thought (educators have various work conditions, backgrounds, and experiences).

After the one-on-one interviews, participants were invited to participate in a focus group discussion about implementing AT among students with high-incidence disabilities. I explored the themes that have emerged from the initial analysis of interview data to deepen the understanding of growing themes and to triangulate the findings (Saldaña, 2021). Furthermore, I compared the results to determine the differences between the interview and the focus group data (Katz-Buonincontro, 2022). I used the bracketing technique. I was the moderator of the focus group. The guide for the focus group followed these steps: introductions, basic guidelines, question-guided discussion, and conclusion.

Table 2

Focus Group Questions

1. Why is AT important for students with high-incidence disabilities? SQ3
2. How confident do you feel in effectively integrating assistive technology into your teaching practices? SQ1
3. What challenges have you faced when incorporating assistive technology into your teaching, and how have you overcome them? SQ2, SQ3
4. How do you typically go about learning to use new assistive technology tools? SQ2, SQ3

5. What resources or support systems do you find most helpful? SQ2, SQ3
6. What made you consider AT for a student? SQ2
7. What factors do you believe were the most important for your successful implementation of AT? SQ1
8. Describe when you faced resistance or hesitation from a student, parent, or colleague about using assistive technology. How did you handle it, and did it affect your confidence? SQ4
9. What do you wish you knew about AT and AT implementation before you started using it in your classroom? SQ1, SQ 2, SQ3,
10. How would you suggest improving training and support for special education teachers when using assistive technology with high-incidence disabilities? SQ1, SQ2, SQ3, SQ4

Focus Group Data Analysis Plan

The focus group interview was recorded and transcribed by Microsoft Teams. The analysis from the focus group interview was similar to that from the one-on-one interviews. First, I coded the data according to the themes that were identified in the one-on-one interviews. I looked for any new themes that emerged during the focus group. I also examined the differences and similarities between the themes that developed during the interviews and how they were portrayed during the focus group discussion.

The data from the focus group interview had two purposes: (a) corroborate and augment the information from the one-on-one interview and (b) identify additional themes based on the new data. Therefore, when analyzing records from focus the group interview, I used the newly identified codes with the previously identified themes to confirm them (Saldaña, 2021). All data

from the focus group and the one-on-one interviews were analyzed to identify codes that are consistent with the theoretical propositions.

Documents Analysis Data Collection Approach

Documentation is an important source of information that allowed me to corroborate and augment the interview findings (Creswell & Poth, 2018; van Manen, 2014). For my study, I mainly examined teachers' lesson plans.

Please note that, the utilization of these sources of information may have potentially negative consequences. First, analyzing documents may result in bias sample (Creswell & Poth, 2018; van Manen, 2014). Second, asking special education teachers about their lesson plans has a negative connotation of distrust, evaluation, and judgment that some participants may experience, which may, in turn, lead to negative attitudes toward the researcher. Additionally, not all special education teachers write detailed lesson plans, which may lead to an incomplete picture. Despite the potential risk associated with this data collection method, using primary sources plays a prominent role in confirming teachers' intentions, perceptions, and actions. The benefit of analyzing documents was not only in documents' relative subjectivity (as they were not created for the study) but also in providing additional cues to answer the research question and explore the phenomenon as a whole (van Manen, 2014).

Document Analysis Plan

For phenomenological research, documentation corroborates and augments other evidence sources (Moustakas, 1994). Analysis of lesson plans primarily aimed to validate teachers' perceptions and intentions regarding integrating AT with their students. Lesson planning is at the core of teachers' experiences and reflects their instructional decisions and intentions. I examined each document to capture teachers' experiences incorporating AT into

their instructions. The first step was to identify codes and compare them to those previously identified in interviews and the focus group (van Manen, 2014). The findings were analyzed to confirm previously identified themes (Moustakas, 1994). I looked for new themes and compared how the themes emerged across multiple data sources.

Data Synthesis

This study's data collection and analysis followed an explication process of phenomenological studies, emphasizing the need for corroborating, confirming, and extending codes and themes from individual interviews from one transcript to another through additional texts, the focus group interview, and document analysis (Moustakas, 1994; van Manen, 2014). As a result, each data source contributed to a phenomenon, collectively synthesizing meanings about the essence of the experience.

After the individual interviews, focus group data, and document analysis data were transcribed, the transcriptions were reviewed and coded to determine the themes of participant data (Saldaña, 2021). Using coding and categorization, reoccurring themes and patterns were uncovered and compared to each other and the current literature (Patton, 2003; Saldaña, 2021). Organizing codes in a table allowed me to determine themes for a more in-depth exploration of participant data (Saldaña, 2021). Further, coding allowed for key phrases, ideas, and words to be uncovered and systematically organized (Moustakas, 2014). The next step was to corroborate the result by analyzing the individual interview, focus group interview, and document analysis data to extend the list of themes. Lastly, the identified themes were triangulated using all three data sources (Saldaña, 2021).

Trustworthiness

Qualitative research is “interpretive” in nature, which means that the inquirer makes personal interpretations of information (Creswell & Baez, 2021). Due to the nature of this type of research, the authors must address the validity of their research. Validity in qualitative research means that the findings are accurate, and this accuracy could be assessed from various perspectives: researcher, participants, and readers (Creswell & Baez, 2021). Over the years, multiple lenses of qualitative validity have been developed. Lincoln and Guba (1985) were the first to discuss qualitative validity through evaluative criteria of credibility, transferability, dependability, and confirmability.

Credibility

Credibility pertains to the degree to which the outcomes of a study effectively depict reality, as perceived by participants, as an approximation of the truth regarding the phenomenon under investigation (Lincoln & Guba, 1985). I established credibility through three means: (a) triangulation, (b) peer debriefing, (c) member-checking, and (d) bracketing.

Triangulation

In this study, the credibility of the findings was further enhanced through the implementation of data collection methods triangulation. Individual interviews provided initial codes, which were further corroborated by the focus group discussion. Document analysis confirmed the finding as the lesson plans were not created independently of this research and therefore included unbiased information.

Peer debriefing

Throughout this study, I frequently utilized peer debriefing (Creswell & Baez, 2021) as a valuable technique. It enabled me to discuss with colleagues, ensuring my analyses remain

firmly grounded in the data. While it would have been ideal to involve assistive technology scholars in triangulating the results through peer debriefing, I did not have immediate access to such peers. Nonetheless, I found supporting evidence in the literature, albeit limited, which offers corroboration for my findings. Additionally, experts within my academic program who were well acquainted with my research provided valuable perspectives that helped clarify my study's outcomes.

Member Checking

My personal experiences as a special education teacher, who incorporate AT with students with high-incidence disabilities helped me establish a unique connection with the study participants (Rossman & Rallis, 2016). This insider's perspective, also known as an emic perspective, as Rossman and Rallis (2016) suggested, proved advantageous for my research. It allowed me to accurately reflect the participants' words during interviews, employing immediate member checking (Creswell & Baez, 2021; Lincoln & Guba, 1985). This process was crucial in confirming concepts by approaching them from various angles, ensuring I captured their experiences' true essence.

To guarantee the fidelity of the data, I engaged in further member checking after transcription. I sought clarification on specific data elements with the participants, ensuring an accurate reflection of their success stories, which also served as member checking, according to Lincoln and Guba (1985). However, I remained cautious not to assume an automatic understanding of participants' intended meanings. I challenged myself to explain concepts using their own words, even when I 'elieved I had already grasped their intentions.

For additional member checking, I provided willing participants with a copy of their transcript, which they reviewed for accuracy. Furthermore, I shared a summary of the main points from each participant's interview, inviting them to verify its accuracy.

Bracketing

In this study, I rigorously employed the process of bracketing, or epoché, to mitigate the potential impact of my assumptions, biases, and expectations on the exploration and understanding of the participants' lived experiences. From the early stages of my research, I engaged in reflective exercises, documenting my beliefs, experiences, and assumptions related to the phenomenon (Tufford & Newman, 2012). This ongoing practice helped me ensure the emergence of themes grounded in participants' experiences and not limited by my own interpretive lens. I employed various methods, such as bracketing interviews with outside sources to reveal my emotional response to data and participants, reflexive journaling, and writing memos throughout data collection (Tufford & Newman, 2012). However, complete bracketing is a complex process, and while every effort was made to maintain objectivity, the potential influence of my background and perspectives on the interpretation of the themes is acknowledged (Tufford & Newman, 2012).

Transferability

Transferability pertains to the ability to generalize the research findings across other settings (Lincoln & Guba, 1985). The technique I utilized to allow readers to make the decision regarding the transferability of the research findings is generating a rich, thick description (Creswell & Poth, 2018). In my study, I employed vivid descriptions to illustrate the experiences of special education teachers working with students with high-incidence disabilities within a specific public school district. These descriptions provided a comprehensive and detailed

portrayal of the factors that either facilitate or impede educators' choices regarding implementing assistive technology with their students.

Furthermore, it is important to note that teachers interviewed in the study all worked for the same district and had equal access to resources and training regarding assistive technology; however, significant variations exist between the schools from organizational, administrative, cultural, and socio-economic standpoints. The consistent feedback of participants across various schools suggests that while access to assistive technology and professional development for teachers is important, there are other factors that significantly alter teachers' decisions to implement assistive technology in their classrooms. While findings from one district may not facilitate the transferability of results across all school districts, considering the limited information from the literature, it provides first exploratory steps toward an improved understanding of the factors that increase the implementation of assistive technology among students with high-incidence disabilities.

Dependability

Dependability refers to the consistency and replicability of the findings (Lincoln & Guba, 1985). In my study, I ensured dependability by providing detailed descriptions of my procedures: research design, methodology, data collection procedures, and data analysis techniques. The descriptions of the method I devised for this study are clear, aligned with existing literature, and sufficiently simple to be replicated with special education teachers who work with high-incidence disabilities students or any other population. My committee thoroughly reviewed these procedures and deemed them sufficient to demonstrate mastery of the method as I designed it.

Confirmability

According to Lincoln and Guba (1985), confirmability refers to the degree to which the findings and interpretations of the research are grounded in the data and can be verified by others. Confirmability ensures that the researcher's biases, preferences, or preconceived notions do not influence the results. I strived for objectivity and transparency in my research process to enhance confirmability. I achieved it through strategies such as reflexivity, audit trail, peer review, and triangulation of the data sources.

Researcher reflexivity is the process by which the researcher discloses her personal beliefs, values, and biases that may shape the inquiry (Creswell & Miller, 2000). I included reflective commentary throughout my study to bracket my predispositions that may interfere with interpreting findings. In addition, I have secured an audit trail by keeping a detailed record of my research process, including data collection instruments, interview transcripts, field notes, coding schemes, and analytical decisions. The audit trail allows others to trace and verify my research steps and increases the transparency and the dependability of the study. Lastly, I used peer review and various aspects of triangulation described earlier to enhance the objectivity of my study findings (Shenton, 2004).

Ethical Considerations

To address any ethical concerns arising at any point in this study, approval from Liberty University's Institutional Review Board (IRB) and informed consent forms from the site and the participants were obtained before collecting any data. In order to enable potential participants to make an informed choice when considering participation in this study, the purpose and objective of the study was disclosed to all participants (Schaffer, 2009).

All physical data are under lock and key in a file cabinet in my home, and any digital data are kept on a password-protected computer and phone for three years as required by Liberty University's IRB to ensure the privacy of the participant's responses. The use of pseudonyms was offered to all participants. Participants were assured they could decline participation or withdraw from the study at any time (Creswell, 2013).

Summary

This study employs a comprehensive approach by utilizing one-on-one and focus group interviews and documentation to explore the experiences of special educators in considering and implementing assistive technology for students with high-incidence disabilities. By gathering insights from participants, corroborating findings through focus group interview, and obtaining unbiased information from documentation, this research aimed to contribute to a deeper understanding of the role of special educators in facilitating the effective use of assistive technology, ultimately promoting inclusive educational practices for students with disabilities (Creswell & Poth, 2018).

CHAPTER FOUR: FINDINGS

Overview

The purpose of this hermeneutical phenomenological study is to describe the experiences of special education teachers when implementing assistive technology with students who have high-incidence disabilities at the large school district that provides teachers and students access to AT. The study involved individual interviews, focus group discussion, and analysis of lesson plans. Participants were special education teachers working with students with high-incidence disabilities who successfully implemented assistive technology in the last five years. This chapter presents themes and sub-themes identified through the analysis of data for each participant. Furthermore, this chapter discusses the research question related to the themed data.

Participants

The participants were carefully chosen based on specific eligibility requirements. The participants were special education teachers with various teaching experiences in K-12 settings with a minimum of one year of most recent experience in special education, familiar with AT for high-incidence disabilities, and expertise in implementing AT within the last five years. The participants for the study were recruited through the referrals from assistive technology specialists. Each candidate received an IRB-approved letter via email with an invitation to participate in the study and a consent form. Once participants agreed to join the study and signed the consent, an individual interview was scheduled. During interview participants were asked to share their lesson plans for five consecutive days. After each interview, participants were expected to participate in a focus group. Nine participants provided their lesson plans; all 10

were part of the focus group discussion. Demographic information for the participants is presented in Table 3.

Table 3

Participants

Participants	Years Taught in Special Education	Highest Degree Earned	Grade Level
Sarah	17	Education Specialist	Middle School (6th – 7th grade)
Meredith	17	Masters	Elementary School (5th grade)
Simone	3	Doctorate	Middle School (6-8th grades)
Rachel	13	Bachelors	Elementary School (K-3 grade)
Janet	17	Masters	Elementary School (4th grade)
Caitlin	6	Masters	Elementary School (K-5th grade)
Natalie	12	Masters	Elementary School (3rd grade)
Amber	4	Bachelors	Middle School (6th grade)
Tasha	10	Masters	High School
Jasmine	26	Bachelors	Middle School (9th grade)

The following is a detailed description of each participant and a short narrative of how they persisted in AT implementation.

Sarah

Sarah has been working in the particular School district for 17 years. She is an English language arts and reading teacher for students with high-incidence disabilities in 6th through 8th grades. Most of her students are struggling with print disabilities and are more than two years behind in reading and writing. Her first exposure to AT for students with high-incidence disabilities was years ago when the district had just started implementing Don Johnston's products, such as Co:Writer (STT) and Snap&Read (TTS). While Sarah was one of the first people in the county to receive official professional development training, she did not implement it consistently until an AT specialist coached her. The AT specialist came to each of her classrooms over several days to work with individual students. Sarah describes that after she consistently implemented AT, she realized how "it levels the playing field for kids," especially when it comes to writing and accessing grade-level text.

Meredith

Meredith has been working in special education for 17 years. Over the course of 17 years, she has taught in all grades at the elementary school level from Pre-K through 5th grade. While Meredith has a master's degree in special education, her first encounter with AT was while working in the special education program Pre-K class, where she taught several non-verbal students using AAC devices. Meredith stated that she first experienced the powerful effect of AT when she saw a drastic decrease in aggression in the younger students when they could use AAC devices to communicate and express themselves. Later, it encouraged her to explore AT with

older students who struggled with writing and exhibited aggressive behaviors triggered by the demand to write.

Simone

While Simone has been working in primary education only for three years, she has more than 20 years of experience in higher education. Simone teaches English language arts and reading in middle school and is also the literacy department chair at her school. She has always been intrigued by technology. She believes technology helps present information in multiple ways. In special education settings, what helped her become comfortable with AT was a partnership with a general education teacher who had years of experience in special education. During one of the first years of teaching middle school, Simone had experience with a student who exhibited aggressive behavior when asked to write. With the guidance of her co-teacher, Simone introduced the student to STT software, which allowed the student to dictate her responses. After seeing a drastic change in her behavior, Simone became an advocate of AT for her students.

Rachel

Rachel has 13 years of experience in special education. She worked most of her career in a self-contained school for students with aggressive behaviors. She is currently teaching students with high-incidence disabilities in a K-3 settings for students who are academically significantly below their peers. Rachel is also working toward her master's degree in special education. Rachel believes that AT is very important for her students, and she has witnessed positive outcomes of AT implementation by observing her colleagues and her own child, who is using TTS and STT. However, Rachel has encountered difficulties implementing AT with younger students, K-2.

Janet

Janet has 17 years of experience in special education. She has been working with various categories of students, including intellectual disabilities and profound emotional and behavioral disabilities. Janet currently teaches co-taught classes in elementary school for students with high-incidence disabilities. Janet described that for most of her career, she was very skeptical about AT until an AT specialist worked with one of her students, and she was able to observe the great benefits of AT for students with high-incidence disabilities. She believes that AT "gives…students confidence".

Caitlin

Caitlin is a young teacher with six years of experience in special education at the elementary school level. Caitlin has participated in various professional development training programs offered by the county; however, her confidence in AT implementation grew after she had coaching sessions with one of the AT specialists who demonstrated how AT could be beneficial and effective with one of her students who had significant aggressive behavior triggered by writing tasks. Caitlin believes AT allows her students "to access the general education curriculum in their least restrictive environment."

Natalie

Natalie has been teaching special education for 12 years. She spent most of her career working with younger students (Pre-K through second grade). For the last two years, Natalie taught third grade. When sharing her experience with AT in younger grades, she said she did not feel successful. Some of her students in younger grades were recommended to use AAC devices, but they did not use them to their full potential due to teachers not "pushing enough." However, working in third grade and collaborating and observing her colleagues who successfully

implemented AT with a student who was disengaged and very resistant to any writing activity made her seek more education from AT specialists. Through coaching from an AT specialist, Natalie became confident in implementing AT in her classroom.

Amber

Amber has been teaching students with high-incidence disabilities at the middle school level for four years. Prior to that, she was a teacher assistant in the program class for students with intellectual disabilities, where she observed her teacher implement various Ats. Amber shared that she believed that AT is important because she saw it's effectiveness, but in order to use it in her own classroom, she needed a one-on-one coaching session with an AT specialist. During the coaching session, she was able to observe how her students successfully used AT and were able to provide written responses using STT. This experience made her believe that AT should be part of her instructional strategies because it allows students to actively participate not just in her classes but in other courses, also.

Tasha

Tasha is currently working at a high school level, teaching students with high-incidence disabilities. Most of her students are significantly behind in reading and writing. Prior to high school, Tasha taught in elementary school, where she had experience with communication devices. Working with communication devices made her aware of AT; however, when she started teaching high-school students, she was unaware of AT for students with high-incidence disabilities. She participated in professional development offered by the county, but then she sought additional coaching from an AT specialist. Through coaching, Tasha observed how her students could be successful with AT and started implementing it herself. She shared that even

though she knows how to use the software, she often seeks help and support from an AT specialist.

Jasmine

Jasmine is a middle school teacher. She is teaching English language arts and reading for students with high-incidence disabilities. Jasmine did not participate in professional development training but worked with an AT specialist who provided her with one-on-one training and coaching sessions. Jasmine has a disability herself and often uses AT, such as TTS and STT. Jasmine shared that she felt relieved when she watched her students use AT, which made it easier for her to check their work.

Results

The purpose of this phenomenological study was to understand the lived experience of special education teachers who work with students with high-incidence disabilities when implementing assistive technology. Particularly, this research aims to describe the mastery experience, vicarious learning experience, social persuasion, and emotional and physiological status of special education teachers who successfully implemented assistive technology with students with high-incidence disabilities. Participant demographics were collected and placed in Table 1. The data were organized by participants' years of experience in special education, education level, and the grade that the respondents is presently teaching. Participant data included transcripts of individual one-on-one interviews, a collaborative focus group discussion, and lesson plans. Transcripts were reviewed, and all participant statements relevant to the research were coded using open coding. Further, the data were analyzed using the causation coding method to identify elements of a successful AT implementation among students with

high-incidence disabilities: the cause, the outcome, and the link between the cause and the outcome (Saldaña, 2021). As three data collection methods were used, data triangulation was possible according to Moustakas' (1994) methodology. The themes are grouped based on sub-questions and presented in Table 4.

Table 4

Themes

SQ1: Mastery Experiences	SQ2: Vicarious Experiences	SQ3: Verbal Persuasion	SQ4: Somatic and emotional states
Differences in AT implementation depending on students' age Technical difficulties Conflicting demands in special education Students' technology-related operational skills	Coaching	Feedback	Fear Work-life balance

Difference in AT Implementation Depending on Students' Age

Technology continues to become more accessible, reflecting rapid technological developments. Most children from birth to four years old are exposed to television, tablets, or smartphones (Auxier et al., 2020). Tablets, computers, and smartphones are often the same technologies that carry solutions for students with high-incidence disabilities. Consequently, various age groups may have different perspectives and expectations of technology. Furthermore, depending on a student's developmental stage, the technology can be viewed

differently, thus changing the experience of a teacher implementing AT interventions. The results of the study indicated that teachers' experiences implementing AT significantly differed based on what age group they taught.

AT Implementation K-2 Grades

Teachers of younger grades felt they did not implement AT enough; however, they recognized its importance in the K-2 settings. Teachers expressed that students with high-incidence disabilities are often held back from progressing in academic subjects by their disability, and they presumed that assistive technology could boost students' confidence. However, teachers were contemplating if using assistive technology would take away from working on developing other skills. For example, Rachel and Caitlin shared their doubts about whether they should teach an alternative to handwriting to a student in kindergarten who struggles with handwriting. After all, it is age-appropriate for students in K-2 grades to develop handwriting skills. Teachers communicated that it is very hard to determine how much struggle is too much and when the attention should be shifted to using assistive technology. The teacher expressed similar doubts about decoding skills and students' struggle with reading.

Additionally, when it comes to software that provides text-to-speech support, teachers of younger students find that their students are too young to focus and sustain attention on computer-generated voice. Rachel shared, "I find myself reading to them because they can't focus." Natalie shared that students from lower grades see technology as a reward and struggle to stay focused and see it as a tool that helps them read and write. Lastly, when younger students have print disabilities and struggle with encoding, it is challenging to introduce them to word prediction and speech-to-text because they do not have executive functioning skills to operate the

software. Furthermore, Natalie pointed out that "younger students' speech is not fully developed; therefore, speech-to-text software was not picking up what they were saying."

AT Implementation 3-12 Grades

Teachers of students in third through twelfth grades found AT the most beneficial. They noted the drastic positive behavior change and were most excited about AT. Before students started using AT, academic tasks triggered aggressive behaviors. Teachers described the AT in these grades as a "game changer," "blessing," and "going from hating school to loving school." Teachers had the most success implementing AT with students with social-emotional and behavioral difficulties who, during writing, would "put their head down and refuse to work" or would have "aggressive outbursts." After being introduced to assistive technology, these students would be excited about writing and sharing amazing ideas with the parents, the teachers, and the peers. Sarah shared that it gives students the "ability to open the doors."

Technical Difficulties

Technical difficulties can significantly hinder the use and the effectiveness of assistive technology. Individuals with disabilities highly depend on assistive technology to perform tasks. The effects of technical difficulties on the use of assistive technology can broadly impact students, teachers, and caregivers in general attitudes towards assistive technology. Participants mentioned that technical difficulties directly affect their students' experiences with assistive technology. Many teachers shared how technical challenges make the AT tools unreliable. During the focus group interview, one of the teachers shared:

> It is hard enough to teach students using assistive technology tools because it takes longer for students to open the assignments. But also, when they can't sign in, I have to sign in

> each student individually, which takes the whole class period. The worst part is that you never know when it is going to happen.

Amber also added:

> You know, our kids have behavior problems, and when tools don't work it triggers the behavior. Kids know that devices should work fast, and when they don't, they lose it. My students also often struggle when their work is not saved because we lost internet connection. Nothing was saved, and they need to start over.

Technical difficulties may include a plethora of issues. However, participants repeatedly mentioned two problems: lack of a stable Wi-Fi connectivity and students' devices working "too slow." Two sub-themes were noted in the theme of Technical Difficulties: Wi-Fi Connectivity and Too Slow.

Wi-Fi Connectivity

Many AT solutions are dependent on Internet connectivity. The AT software is inaccessible when there are issues with wireless networking technology that allows electronic devices to exchange data or connect to the Internet using radio waves. Amber shared that her school encountered problems with the Wi-Fi system this year, and "it was extremely frustrating for her and the students to implement AT." Caitlin also said that her school's building had issues with the Wi-Fi system, and it made it "impossible to use AT," especially in younger grades where students "do not have patience to wait" and "don't know how to refresh the network and reconnect." Simone said, "If there is no internet connection – it is not a very successful day with assistive technology." Rachel expressed her frustration that so many assistive technology tools rely on Wi-Fi connectivity, "we have become completely dependent on the Internet; I wish some of the tools would work old-school without Wi-Fi, just as a calculator."

Too Slow

All teachers in the study expressed annoyance and aggravation with the issue of students' devices being "too slow and needing to be restarted." Various issues were listed among the reasons for slow computer performance. Examples are limited random access memory (RAM), aging or failing hardware, failure of an operating system, missing operating system and software updates, overheating, and hardware and software conflicts. Jasmine shared:

> I never understood what those IT people think when they give students an old, slow device and expect children to be successful. It takes students forever to handwrite their answers, but it sometimes takes them longer to start their devices. At least when they try to write – they are doing something not just sitting and waiting.

Janet and Simone shared that when a student's device takes too long to implement AT, they "share it" on their devices. Sarah also said, "Many of the devices should be retired because of how slow they are."

Conflicting Demands in Special Education

Teachers in special education reported feeling overwhelmed by the number of conflicting demands and lack of time. Special education teachers are expected to provide access to the general education curriculum while providing high-quality, specially designed instructions that are proven effective in closing the educational gap for students enrolled in special education. Sara articulated, "It is very hard to find time to learn new technologies and AT solutions because, as a special education teacher, you have to do so much more than a general education teacher." In addition to teaching, special educators collect data for each student on various goals and objectives, write individualized educational plans (IEP), provide updates and progress reports on the IEP goals and objectives, and collaborate with speech, occupational, and physical therapists,

behavioral specialists, medical personnel, and general education teachers. Learning new assistive technology felt overwhelming despite teachers believing AT is important for their students. Jasmine shared:

> There is so much… so much. I want to do it [implement AT], but it's so much. You have so many meetings you have to go to. You don't really have time to plan. We do not have time to read plans. Listen, you have to cover so much that to cover. This [AT] is too much, so we just put it on the back burner because it is not the main focus. Nobody wants to do it because, unfortunately, teachers feel it's one more thing added to the plate.

Janet conveyed that "she never had time for AT until one year during summer school"; she was "forced to figure out because the kid had it all over his IEP." Janet stated, "A big deal was that it was during summer, and I actually had time because I did not have to do many other things."

Not Enough Time

Meredith shared, "there is just not enough time for me to learn about new cool technologies." Natalie stated, "Time is a big factor" when it comes to learning AT or implementing it. Janet, Simone, and Rachel believe that AT training should be mandatory a week before school starts so they have enough time to practice and learn the operational and functional skills needed for AT implementation. Simone stated, "This should be required training during pre-planning that supports all teachers, not just SEC teachers, because there needs to be an alignment to support teachers, and everybody needs time to learn it before they can implement it in the classroom." Janet shared, "the AT training must be mandatory before school starts because teachers must be ready and know what they are doing before they teach students." Lastly, Rachel

believed that “AT training should be mandatory”. She also shared, “We all want more training, but we never have time. It is never enough.”

The participants also confirmed the feeling of “never having enough time” during the focus group discussion. Jasmine shared that it was easier for her to start learning AT because she needed to use it for herself, and she had to allocate time to learn how to use it to fulfill her responsibilities as a teacher. However, learning additional programs and software is challenging due to “not having enough time.”

Too Many Directives

Another sub-theme that emerged from Conflicting Demands in Special Education was Too Many Directives. This sub-theme manifested in a number of ways. Teachers are required to use specific methodologies for reading and math interventions with students that require additional support. At the same time, teachers are expected to complete mandatory literacy training that is directed at all educators in the county. The compulsory training requirements do not incorporate AT, which makes special educators feel “confused” about the administration’s expectations. Meredith is relatively new to the county and had to complete multiple trainings quickly. She felt very overwhelmed and thought that some of the trainings, while good and important, were not compatible with each other. She expressed how she felt confused about which strategy to implement and prioritize. Natalie had similar experiences. They both noted that while it is great that the county offers so many resources, it is easy to feel overwhelmed because it is hard to prioritize and hard to differentiate when it would be appropriate to choose to teach students AT.

In addition, the district may require certain educational technologies for students to use; however, these technologies often do not align with AT or are highly “cumbersome” to

incorporate. One example, Caitlin mentioned, is that the district uses Microsoft products for teachers and students; however, the AT products work better with Google and should be accessed through Google Chrome. As a result, the instructional technologies department provides recommendations based on Microsoft products, while the AT department recommends using Google-based products.

Students Technology-Related Operational Skills

In order to be successful with AT, students need prerequisite skills in operating a personal laptop and inputting information, whether dictating or typing. Furthermore, students need to know how to navigate a device and be able to troubleshoot minor issues with the technology. It is imperative to teach students those skills explicitly. All participating teachers recognized this fact and ensured that they allocated time to teach technology-related operational skills. Teachers often referred to these skills as "basic computer skills," but when further asked to define those skills, two sub-themes emerged: Importance of Basic Computer Skills for AT Effectiveness and Typing Skills.

Meredith believed that students' proficiency in basic operational skills is the deal breaker in AT implementation. Sarah and Jasmine also believed that students are not able to master assistive technologies for high-incidence disabilities if they are unable to navigate devices and be proficient with typing. Sarah noted that it is not about how fast students can type but whether they can "produce a piece of writing in one sitting."

Importance of Basic Computer Skills for AT Effectiveness

Sarah spends the first month of school teaching students basic computer operational skills. While she sometimes felt overwhelmed by how challenging these skills may be for someone with executive functioning deficits, she often reminded herself that "these are real-life

skills they [students] will use them the rest of their lives." Without basic computer operational skills, students cannot access AT and, therefore, cannot access the general education curriculum.

Another issue teachers encounter is that without basic technology operational skills, students are "unable to show what they know" because they "have erased their work." Sara and Simone discussed how file management knowledge and skills are important for students because, without this knowledge, they may struggle to save or share their work, which has happened multiple times in their practice. Tasha also added that understanding "cloud-based and locally stored files is important for students. She shared that her students often believe that all files are cloud-based, and they do not realize the difference, leading to loss of their work.

While all participants acknowledged the importance of teaching students computer skills, middle and high school teachers were surprised to discover that many students did not have these skills. One teacher shared, "You just want to take the computer and do it for them because of the amount of time it takes them to do it independently." In contrast, elementary school teachers feel they should be teaching computer skills but do not have sufficient time to do it. Rachel shared, "My writing block is only 30 minutes long, and by the time I show them how to open a document, we only have a few minutes left to do the writing."

Typing Skills

When students are unable to transcribe their ideas using handwriting, all teachers agree that typing should be introduced. However, teachers felt there was no sufficient time or instructions to teach students keyboarding. Elementary school teachers and students have access to keyboarding software, but there is no support for older students. Jasmine passionately shared that her middle school students feel frustrated when asked to type. "If we gonna put assistive technology, you're gonna have to teach the children how to type."

Rachel also shared that typing skills may become a barrier in younger grades, even for kids who are not struggling in writing:

> So in second grade, when this week they have like a test or a writing test that they have to do and where they have to type, right? And so a lot of these kids have never been introduced to typing, so for two of my kids that I pull for reading, I had to introduce typing to them on Thursday for this week, and the struggle to even type or figure out how to use text to speech or all of that was disheartening, especially since they have a test on it this week. And we were given less than a week to prepare them for it. So that was hard because it's like they get about 70 or 90 minutes to do this test, and they can't even type a sentence, and they don't even know what text-to-speech is. So even if they know how to write sentences, if they can't type, they are not able to show it.

Coaching

The district's model of AT support for special education teachers is that AT specialists offer training to all teachers on tools available to all students with the hope that teachers will implement them in their classrooms. While the tools are available to all students, they are essential for students with high-incidence disabilities and designed to support reading, writing, and math. Additionally, teachers have a process for submitting a request for AT consultation for a specific student to assist with AT selection and implementation.

The participants viewed training as an essential part of the AT implementation process. Natalie shared, "We all could use more training with it cause it's the way of the future." Meredith also confirmed, "The PD [Professional Development] was very helpful to us to have a new age information." However, it was not a turning point when teachers decided to implement AT with students. Janet said,

> I had an AT training, but it was so much. And when I actually got a student during summer school who had AT for writing, I thought I needed to give this box back, and someone else needed to take this kid because I don't know how to help him.

All participants expressed similar experiences. While the training "helped realize the potential" of AT, it was "not enough" to successfully implement it.

Eight participants described their first experience with AT, and they mentioned having "that one student" who struggled with reading or writing and exhibited behaviors that disrupted her learning or the learning of others. Teachers described as feeling "helpless," "frustrated," and "concerned" for the student. They further described reaching out for help and narrated the experience with an AT specialist working with "that one student" and demonstrating the tools and their effectiveness with the student. Two other teachers described their first encounter with AT through a co-teacher who effectively implemented it in their class. All participants reported feeling amazed after seeing peers successfully implement AT with "that one student". One teacher said, "it actually worked", "the behavior changed so much", and "he [the student] could actually do it."

The sequence of events described by participants was coded and organized chronologically. The sub-codes in a sequence were Struggle with a Challenging Student, Reliance on External Expert for AT Knowledge, and Experienced Benefits of AT. For all participants in the study, a coaching session with an AT specialist or another knowledgeable colleague was a turning point in their decision to implement AT with students. Teachers described their decision-making process as "it hit me," "life-changing," and "eye-opening." Three sub-themes were identified using inVivo coding and analyzed within this theme using

causation coding. The process codes were identified and further examined to establish cause-and-effect relationships.

Struggle with a Challenging Student

Participants described having a student who "was embarrassed of his handwriting," "would not do anything," "just refused to write anything," "would shut down," "put his head down," "would depend on me with his work," "would just sit there." All teachers expressed frustration because they would "try all they know," and a student still was not making progress and was not engaging in the instructional activities. Two participants also noted that students who could not perform academic tasks exhibited disruptive behaviors.

Reliance on External Expert for AT Knowledge

The frustration of having a student who was "hard to reach" triggered teachers to seek help from colleagues and external experts, which was coded as code two in the chronological sequence. For most participants, it was an AT specialists at the county level; for two participants, it was their colleagues with expertise and experience in AT implementation. This vicarious experiences broadened their understanding of AT and shifted the paradigm that "nothing would work" and "they just can't do it." Janet stated, "This stuff is a game-changer; I just could not believe he did it." Simone said, "I opened up to realize that there is more than just one way to teach."

Additionally, working with the AT expert improved teachers' operational skills and built their confidence in AT implementation. For example, Sarah shared:

> OK, so watching her do things. So she came this year and on three separate days and showed like 6th grade, 7th grade, and 8th grade separately at different times… Same time of day that like, so it was smaller groups different. Like snap and read, but like lots of

> different things, and the ability to walk around and help students troubleshoot was game-changing for me because like just showing me how to do it, my computer works like hers. But like their [students'] settings are set up differently, like there are just different pieces of things that don't look the same. So when I was able to like when a kid couldn't log in or when it said this weird thing, and I was able to troubleshoot like in the course of like two weeks like 15 different things that I saw, you know, and go into how to change the language or how to change different things, speed things up, slow things down… I didn't forget it. Like it moved it to my long-term memory so that her repetitiveness really helped me be able to do it, and now I could explain it to others, whereas like before I would have to be like, well, I gotta go in and look at like, I don't really know what I'm doing.

Experienced Benefits of AT

Teachers described watching their colleagues working and introducing AT to students as "eye-opening" and described how it "can level the playfield," "allows to assess what students know," helps students "not look different to their peers," "be successful in the least restrictive environment." Caitlin also felt relieved knowing that the other students in the classroom would benefit because now she does not have to spend so much one-on-one time with struggling students. Caitlin shared:

> I would say that watching the kids be able to become independent learners as they get older instead of having to have someone sit next to them and walk them through step by step was a big confidence booster for them, and it made me want to learn how to use the assistive technology, how to better incorporate it into my lesson plans so that they can become confident learners in the classroom.

Participants described these vicarious experiences as the driving force behind their decision to implement AT, even though some had training in AT and were aware of existing solutions offered by the county. Participants' testimony contrasts the theoretical or formal introduction to AT through training and the impactful, persuasive nature of vicarious experiences. While professional development training provides the necessary knowledge and awareness, witnessing peers' successful AT applications directly influences educators' willingness to adopt assistive technology solutions. Figure 1 demonstrates the chronological sequence of events described by participants. Figure 2 depicts cause-end-effect dynamics within the data.

Figure 1

Chronological Sequence

Figure 2

Causation Codes

Antecedent conditions	Mediating variable	Outcome category
Peer-expert showed how students can be successful with AT.	Resistance to AT	AT implementation

Feedback

Special educators shared that they often feel lonely implementing AT because their colleagues and administrators "just don't get it"; however, their students and parents share great appreciation. The differences in AT perception were noted among the parents of various age groups of students. Janet and Sarah, who teach older students, described parents as "being in tears" because of how much better students performed with AT, and they were surprised to learn that their kids can be successful. Whereas Meredith, Rachel, and Natalie encountered resistance from parents of younger students in AT implementation, seeing it as a "crutch" that would hold their child from learning needed skills.

Regarding colleagues, the feedback was mostly in the form of ignoring. Tasha shared:

> Teachers don't trust the fidelity of a student's work with the use of assistive technology, especially the leverage in that it gives, and why a student would need that amount of leverage versus a student who does not have access to it.

However, when teams collaborated, teachers described it as a great success. Meredith, Natalie, and Caitlin noted they had experienced great success when the team was on board with AT implementation. Caitlin said:

> I would say we have one student who's now a fifth grader here, who's had an assistive technology device for a very long time, and as a team, we're very successful with implementing it with him. We all understand the technology and implement it across all settings.

Natalie also noted:

> I definitely feel like the collaboration is one hundred percent why I am able to implement it the way I am. I mean, AT [assistive technology specialist] coming in and like, sitting

> with me on the computer and showing me the workbook and stuff like that was obviously tremendous help. Also, OT [occupational therapist] has come in and done a few things to kind of monitor and see if there's anything else we need to add in with that particular student, and then at my previous school, when we had the student with the AT device, I was constantly in contact with the speech pathologist about things that we could try.

All participants acknowledged that administrators are aware of AT due to testing requirements but do not have a clear and concise understanding of what it can do for students with high-incidence disabilities. Misinterpretations of AT use are not uncommon.

Feedback greatly impacted teachers, and this theme was discussed several times throughout the interviews. Various stakeholders in education provided different feedback that had a distinct effect on educators. Four sub-themes were discerned: Student Engagement and Feedback, Uncertainty about Administrative Awareness of AT Use, Parents' Feedback, and Colleagues' Feedback.

Student Engagement and Feedback

Teachers felt most motivated by their students' responses to AT implementation. Natalie and Rachel described how younger students exhibited pride and willingness to share their work with teachers and parents. Janet, Rachel, Jasmine, Simone, and Tasha revealed that older students thanked their teachers for allowing them to complete their work independently. Jasmine shared, "When I give them tools, their creativity flows, and they are eager to share." All participants noted their students' excitement about the academic tasks when they could use AT. Simone said, "Now [after she started implementing AT in her class], when my writing block starts, my students are so excited."

Uncertainty about Administrative Awareness of AT Use

The participants agreed that the feedback from the administration about the use of AT was often unclear. Most participants acknowledged that while the administration recognizes AT as testing accommodations, they lack understanding of its impact or, as Meredith put it, "what technology does for these students." Caitlin illustrated how the administration misinterpreted AT use. During an observation, she used AT with a student with exceptional learning needs and received negative feedback, prompting her to explain the necessity of the device over handwriting. Caitlin felt compelled to clarify to the schools' administration, "So I had to go to them [administrators] and explain like he [student] has a disability, he can't write it. That's why he Is putting it on his device."

Similar experiences of uncertainty about the administration's awareness of AT were shared during the interviews. One participant summarized it during a focus group discussion as follows:

> So I would say that the administration as a whole doesn't quite understand because they're not in it every day. They don't observe it every day, but they're aware that we have students that have it and that may need it. But that would really be about it.

Parents' Feedback

According to teachers – they encounter various feedback from parents depending on the level of involvement and the age of the students. Parents of young learners often resist the introduction of AT, perceiving it as more of a "crutch" than a beneficial tool aimed at providing access to the general education curriculum while ensuring meaningful participation. Meredith explained,

> I show the parents because they're not always fully aware of what that actually is and how it's implemented in the classroom. They never want it to be a crutch. So instead, the way that we, or the way I, present it, is how it starts and what the end goal is.

In contrast, parents of older students see the drastic difference in their child's performance and often request AT support. The participant stated, "And so like in IEP meetings, when we go over the data, they [parents] are just blown away by how much their student can really do on their own by using their AT." However, two teachers shared that their students' parents are not involved in their lives, and they do not get much feedback from them.

Colleagues' Feedback

Special educators revealed that they all struggled with colleagues' buy-in regarding AT. Tasha and Jasmine stated, "I am the only one who does AT in my school." Simone passionately encouraged her colleagues, "They have to realize that there's more than just one way and teaching that to our students." Natalie shared, "We do not talk about it enough; we should be sharing our strategies." Sarah felt aggravated, sharing that when she is in a co-taught class, she spends a lot of time ensuring she prepares lessons for a student using AT, but her co-teacher changes plans at the last minute, and all the work she prepared goes to waste. Several teachers disclosed that their colleagues would tell them, "I am not doing it. I am just not." Teachers relayed that, in this case, they feel so "disheartened" because they either "have to do it all by themselves for the kid" or "just give up." Lastly, special education teachers face the argument "that the students can't use the particular AT during the testing."

However, teachers who experienced collaboration between parents, therapists, and general education teachers reported that it was a "fantastic" experience where a child could generalize the use of AT across various settings. Unfortunately, only three teachers had this

experience. When teams collaborate on the use of AT, it helps troubleshoot any difficulties with the device and, therefore, creates a personalized experience for the user.

Fear

When participants were discussing their emotional and physiological state associated with AT utilization, the emotion that kept coming up was fear. However, this fear was not related to the fear of using technology but rather the fear of failing students and the fear associated with not fully understanding students' disabilities. When describing emotional state, participants used words such as "devastated," "fearful," "scared," "dread," "worry," "avoid."

Two teachers also mentioned their fear of technology; however, they clarified that the fear of failing students helped them overcome their fear of technology. The participant confessed, "I gotta get it together [overcome the fear of technology] because I am really missing out on an opportunity to help my kids grow." Similarly, fear of being unable to support students and not fully comprehending students' needs motivated participants to seek AT support. Amber's example demonstrates the common fear of teachers when they unsuccessfully try various strategies but do not fully understand the needs of a student, "I was worried for him. Nothing would work. I have asked my colleagues, but it has not worked. I was scared that he just would not be able to write." As a result, during the data analysis stage, two sub-themes were developed: Fear of Failing Students and Fear of Hidden Disabilities.

Fear of Failing Students

Fear is a multidimensional emotion that, in many cases, can motivate actions. Janet shared that one of her biggest motivators in improving AT implementation is fear of failing the students. She confessed that she had a negative experience when she did not fully understand AT, leading to wasting students' time. She shared that she never wants to experience it ever

again. Seven other participants had similar experiences that led them to seek more information and learn the software. Natalie illustrated, “It was scary to think that I can’t help him because I don’t know how to use software.” Another participant said, “I was dreading the thought that because I am not familiar with AT, the student will lose an opportunity to learn.”

Fear of “Hidden” Disabilities

Another fear that the teachers experienced was related to the fear of the unknown. Many high-incidence disabilities are not seen and can have various manifestations (Morina &Carnerero, 2022). Many teachers shared that fear of failing as a teacher stemmed from not fully understanding what held students back from making progress. One teacher stated, “I think I called for AT because I was not sure how dyslexia affects him and what I can do.” In other cases, teachers expressed hesitancy to accommodate, fearing that making accommodations for students with high-incidence disabilities would require too much effort and would disrupt the flow of the classroom. The participants shared, “I was unsure how we could make it work in a regular class.” Teachers also expressed feeling anxious about their ability to meet students’ needs. Four educators also admitted that it is easy to misinterpret students’ behavior when you do not fully understand how their disabilities manifest. Also, many teachers do not fully understand how AT can help students, leading them to avoid it altogether.

Work-Life Balance

All participants shared that using technology comes with frustration, especially when things do not work how they should. Simone beautifully put it, “teaching AT is like a dance,” “you got to sway.” Working with technology requires mental flexibility and work-life balance to avoid feeling overwhelmed and frustrated. Natalie said that “promptly leaving work and not staying at school longer hours” helps her enjoy her young children and feel happy. This

ultimately led to her calm composure in the classroom when she experienced technical difficulties. Tasha, Rachel, and Amber shared that they use breathing techniques and positive inner dialogue learned during meditation practices that help them stay calm when encountering technology problems. Overall, teachers agreed that work-life balance is key to staying calm in the classroom and implementing AT.

Research Question Responses

This study's goal was to examine a central research question and four sub-questions focused on the experiences of special education teachers who implement AT with students who have high-incidence disabilities. The data presented in the previous section were used to obtain answers to each research question. The findings were also illustrated in the section above in the tabular format in Table 4.

Central Research Question

What are the lived experiences of special education teachers who implement AT with students who have high-incidence disabilities?

One of the big takeaways that emerged from the data is how teachers' experiences differ across various age groups of students. Implementing AT was found to be most challenging for a younger demographic, specifically students from kindergarten through second grade. Teachers acknowledged that AT is highly promising in students of these ages, yet they admitted they "are not using it enough" and not "to its full potential."

One of the reasons teachers of students of younger ages struggled with AT implementation is the concern that it could detract from teaching required skills. For example, there were concerns about teaching typing at the expense of developing handwriting skills.

Caitlyn shared, “I do not want to take handwriting away. It is still very important at this age.” Furthermore, when teachers were trying to implement speech-to-text technology, it was problematic because younger students’ speech was not fully developed, and the software did not recognize their speech accurately.

Another problem was that students at that age often did not have executive functions to focus on text-to-speech. The teacher noted, “I find myself reading it to them…because they just can’t focus.” Another participant said, “They are not engaged with a computer-generated voice.”

Technology in special education, especially at a younger age, is frequently used as a rewarding activity. However, it becomes challenging for younger students to differentiate between using a tablet or any other technology as a reward to play versus a learning tool. The teacher said, “They just see it as a toy.” Additionally, students at this age do not have operational skills with technology. The necessity of teaching these skills to students is obvious; however, it is very challenging due to the high curriculum demands and the limited time students can focus.

On the contrary, participants found utilization of AT in older grades “life-changing” for students. It provided them access to the curriculum, “leveled the playfield,” and allowed “their creativity to flow.” Most importantly, teachers noted drastic positive changes in students’ behavior and were amazed by how students were more engaged and excited about academic activities that they used to dread.

The results yielded some interesting findings about barriers to AT implementation. Most participants noted that technical difficulties were highly discouraging for students. Teachers named Wi-Fi connectivity and slow response of devices to commands as two of the main challenges. Simone shared, “Our kids are so technologically savvy; they know that computers should be fast, and when they are not, they get mad.”

Another barrier identified by the participants is the multiple demands on teachers. In the classroom, time is a finite resource, and every decision a teacher makes about how to use this time comes with the cost of not being able to pursue other educational opportunities or teaching methods. It is easy to feel frustrated when too many demands are placed on teachers with conflicting directives that are poorly orchestrated and do not include AT.

Furthermore, lack of peer support and administrative assistance hinders teachers' self-efficacy to be successful in AT implementation. Teachers feel overwhelmed and discouraged. Simone said, "Getting that buy-in from colleagues is a challenge we must continuously overcome." Participants shared that their co-teachers refused to learn AT, and participants felt that they had to "do it all by themselves for the kid" or "just give up." These findings were corroborated through document analysis. There is a clear pattern that when a co-teacher is not supportive of AT implementation, a special educator is not planning for AT.

The data analysis yielded some facilitators to AT implementation. For example, the testimonies of participants about a change in students' behavior and attitude towards school after they were introduced to AT was very motivating for teachers. One teacher shared, "he went from hating school to loving it."

It may seem counterintuitive, but the Fear of Failing a Student motivated teachers to overcome the fear of technology use. Also, coaching sessions were discovered to be a tipping point for teachers when they have decided to implement AT with their students with high-incidence disabilities. Coaching from an AT specialist or knowledgeable peer helped teachers overcome fears and barriers associated with the Fear of Hidden Disabilities. Lastly, teachers with work-life balance seemed to better handle the frustration related to technology implementation.

Sub-Question One

How do special education teachers describe mastery experiences when implementing assistive technology with students with high-incidence disabilities?

Overall, teachers describe the use of assistive technology as "giving students opportunities to succeed," giving students confidence," "leveling the playfield", allowing students "not to feel different," and "making them excited about learning." However, teachers also described challenges such as technical difficulties, conflicting demands in education, and the struggle of students not having basic operational skills with the computer, especially at middle and high school levels.

Teacher experiences differed based on the grade level they taught. In grades K-2, Rachel shared, "I find myself reading it to them because they can't focus." Natalie shared that "technology is not as readily available" in younger grades, and "kids see tablets and computers as a reward and not an educational tool." In addition, she shared that "younger students' speech is not fully developed; therefore, speech-to-text was not picking up what they were saying."

With older students, third grade through eighth, teachers noted that implementing AT is most impactful. They saw positive changes in engagement, performance, attitudes, and behavior toward particular academic activity and school in general. After the student completed her work using AT, Rachel shared, "The student was ecstatic to share his work with a class." Another teacher shared that speech-to-text and word prediction was "a game changer to her students." Multiple teachers described situations where the "student was refusing to work," "putting his head down," was "just sitting there," being "excited about his work," "eager to share it," and "loving school."

High-school teachers also find AT beneficial. Tasha shared that AT is allowing students to be independent in their work. Furthermore, she shared how AT can be seamlessly integrated

without interrupting a class flow; for example, “students just put headphones on, and they can listen to text at their reading level and comprehend it all without anyone ever knowing they use it.” Meredith stated, “It [AT] is logistically positive because it makes the classroom flow. So, if we would not have certain assistive technology, it would postpone the learning of others and themselves.”

Sub-Question Two

How do special education teachers describe vicarious experiences when implementing AT with students with high-incidence disabilities?

All participants described vicarious experiences, such as observing a more knowledgeable peer implement AT with the student. They described this experience as the most impactful in their decision to implement AT. One participant shared, “I had the AT training, but I had not implemented it much before the AT specialist showed me with my student.” The other teacher said, “The training was great, but when the AT specialist came and worked with the students, that’s when it hit me.”

Other teachers had similar experiences with their colleagues. For example, Meredith shared that she worked with the co-teacher, a Vanguard team member. This teacher was very knowledgeable about different technologies accessible through the county’s portal, and she started implementing it with students with emotional and behavioral disorders. Meredith said, “I have started implementing it too. It made me want to learn more.”

Teachers described observing and learning from peers who successfully implemented AT in a very distinct way. Participants used phrases like “it hit me,” “I finally realized,” “it like a lightbulb went on,” and “it made all the difference in the world.” The common story was that the teacher would struggle with a student and would be unsure of how to help, and after they

observed a peer supporting a student with AT, the student's needs became more apparent. The data revealed that participants felt strong emotions during vicarious experiences.

Sub-Question Three

How do special education teachers describe verbal persuasion when implementing AT with students with high-incidence disabilities?

Participants identified the feedback from students and parents as the most rewarding. Older students often explicitly stated to teachers how much they liked using AT and how it made them "independent" and "like everybody else." Still, the change in students' behavior towards challenging activities frequently provided the most positive feedback. Janet shared,

> So, this particular student has a lot of social-emotional behavior issues that usually arise with a challenge or something that he perceived that he can't do even before he tries it. It just starts, and it becomes a block. Nope, not going to do it. Can't do it. It's too hard, and it's awful. Writing is one of those challenges for him. So, I taught all class how to log in to Co:writer, but I did not say a word to him. The next thing I saw, he was using it! I could hear him talking into a microphone. But I never said a word. So, today, we had his meeting, and I shared his writing with his mother. His mother came to tears. This kid would write five sentences and say that he was done with his essay. He wrote about six paragraphs with dialogue.

On the other hand, participants did not know whether administrative personnel was aware of them implementing AT and were unsure if administrators understood AT's full potential. In one case, the administrator, while performing observation to evaluate the teacher's effectiveness did not fully understand the use of AT and provided the following negative feedback to the teacher – "helping too much to student."

Peers' feedback and verbal persuasion had the most negative impact on teachers' self-efficacy in implementing AT. Sara shared,

> I am just going to say you can leave in a world where the other teachers just…like…I'm just… I'm not going to do it. I'm just not. And so then it's like either you have to do it for the kid, or it doesn't get done. And the other piece of that is if it's like in a co-taught setting, you really are at the mercy of your co-teachers, how well they plan and how organized they are. Because after you spend 30 minutes doing an assignment only for it to not be used, you kind of get to a point where it's like you have to figure it out. You are willing to put your time towards it if that makes sense. But, like if you know it's not going to be used, so, and that's what doesn't make you feel good. That is the worst part for me. Then you feel bad, and it's not even just the irritation with the team or co-teacher it's, in addition you wasted your time, and you have not helped the kid.

Document analysis also confirms these findings; teachers plan differently depending on the co-teacher's acceptance of AT. It is noted in the document analysis that the special education teachers incorporate different levels of technology accommodations in their lesson plans based on who they are co-teaching with. One possible explanation may be that if the co-teacher is willing to implement AT, more AT is incorporated into the lesson. If not, technology may not be integrated because co-teachers are less inclined to use it.

Sub-Question Four

How do special education teachers describe physiological feedback when implementing AT with students with high-incidence disabilities?

Teachers shared that fear is the most commonly associated emotion with AT implementation. Teachers shared that they felt fear of failing students if they did not learn how to

use AT and fear of being unable to help the student because the teacher did not fully understand a student's needs until a knowledgeable other did not show them how AT can help. Simone shared, "I know I had many reservations about technology, but I dread the idea that I failed a student because I did not want to learn." Rachel also mentioned, that the fear to fail a students helped her overcome the fear of technology, "You know, I have many fears. But my fear to fail a student is stronger than my fear of technology." In both scenarios, fear motivated teachers to either implement AT or improve AT implementation. Finally, Caitlin shared, "Technology can be scary, but it is not what we should be worried about. Not giving our students what they need is what we should be worried about."

Another emotion that teachers felt was frustration when technology did not work as it should. One participant said, "It's like a dance; you got to sway." Many shared that having a life-work balance is the key to staying calm and "sway" when things do not go according to their plan. One participant described a common theme of importance of a work-life balance and the emotions associated with it:

> I am very adamant about leaving on time every day to be with my family. So, I think that helps kind of manage my emotions as well. I try to do as much as I can, leave what I can here and get as much done while I'm here. And then go home and be with my family.

Another teacher shared:

> I struggle to have work-life balance. I get so worried about work stuff that it can be hard to let it go by the end of the day, but I do my best to never check my emails on weekends. I don't have it on my phone, and you know, Friday comes, and I don't check my emails until Monday morning.

Amber's comment about emotions associated with AT implementation was, "by the end of the day we have to take care of ourselves so we can come back the next day and deal with it [technical difficulties] again."

Summary

The purpose of this hermeneutical phenomenological study is to describe the experiences of special education teachers when implementing assistive technology with students who have high-incidence disabilities. This chapter presented the following themes: Differences in AT Implementation Depending on Students' Age, Technical Difficulties, Conflicting Demands in Special Education, Students' Technology-Related Operational Skills, Coaching, Feedback, Fear, and Work-Life Balance. Special educators who work with students with high-incidence disabilities and implement AT face many challenges in persevering with AT implementation. Vicarious experiences in the form of coaching from someone knowledgeable about AT or an AT specialist seem to boost teachers' self-efficacy the most. Also, verbal persuasion in the form of feedback from the students and the parents positively affected teachers' desire to implement AT. Lastly, the fear of failing the student that the teachers experienced motivated them to get better at AT implementation.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this hermeneutical phenomenological study was to describe the experiences of special education teachers when implementing assistive technology with students who have high-incidence disabilities at a large school district that provides teachers and students access to AT. A summary of the data presented in chapter four is included in this chapter. It is followed by an interpretation of the findings, implications of the findings for policy and practice, theoretical and methodological implications, limitations and delimitations, and recommendations for future research.

Discussion

This section discusses the study's findings based on the developed themes and sub-themes. It further connects the findings to the literature. The interpretations of the findings summarize the themes developed from the data and include my interpretations.

Summary of Thematic Findings

The eight themes and 17 sub-themes were developed to answer the central question of what are the lived experiences of special education teachers who implement AT with students with high-incidence disabilities and the four sub-questions: (1) How do special education teachers describe mastery experiences when implementing AT with students with high-incidence disabilities? (2) How do special education teachers describe vicarious experiences when implementing AT with students with high-incidence disabilities? (3) how do special education teachers describe verbal persuasion when implementing AT with students with high-

incidence disabilities? (4) How do special education teachers describe physiological feedback when implementing AT with students with high-incidence disabilities?

Eight themes emerged that described special education teacher experiences when implementing AT with students with high-incidence disabilities: (1) Difference in AT Implementation Depending on the Student's Age, (2) Technical Difficulties, (3) Conflicting Demands in Special Education, (4) Students' Technology-Related Operational Skills, (5) Coaching, (6) Feedback, (7) Fear, (8) Work-Life Balance.

Two sub-themes emerged for the Difference in AT Implementation Depending on the Students' Age: At Implementation in K-2, AT Implementation in 3-12 grades. Two sub-themes emerged for the Technical Difficulties: Wi-Fi Connectivity and Too Slow. Two sub-themes emerged for Conflicting Demands in Special Education: Not Enough Time and Too Many Directives. Two sub-themes were identified for Students Technology-Related Operational Skills: the Importance of Basic Computer Skills for AT Effectiveness and Typing Skills. For Coaching, three sub-themes emerged: Struggle with a Challenging Student, Reliance on External Experts for AT Knowledge and Experienced Benefits of AT. For Feedback, four sub-themes emerged: Student Engagement and Feedback, Uncertainty about Administrative Awareness of AT Use, Parents' Feedback, Colleagues Feedback. For Fear, two sub-themes emerged: Fear of "Hidden" Disabilities and Fear to Fail Students. Lastly, for Work-Life Balance, no sub-themes were identified.

Interpretation of Findings

The interpretations of findings begin with a summary of themes identified based on the data collected from ten participants. The data included individual interviews, a focus group interview, and an analysis of documents in the form of lesson plans and instructional notes. The

goal of lesson plans and instructional notes was to confirm AT implementation as the teachers stated. Due to the nature of lesson plans, not all themes were confirmed through the document analysis. The themes related to participants' physiological and emotional states were not corroborated through document analysis, only through the focus group interview. However, the triangulation of data confirmed the identified themes. The data included individual interviews, focus group interviews, and an analysis of lesson plans. The triangulation of data confirmed the identified themes. The thematic findings are the following: (1) Difference in AT Implementation Depending on the Student's age, (2) Technical Difficulties, (3) Conflicting Demands in Special Education, (4) Students' Technology-Related Operational skills, (5) Coaching, (6) Feedback, (7) Fear, (8) Work-Life Balance.

Facilitators of AT implementation

Technology utilization in schools highly depends on teachers' self-efficacy (Compeau & Higgins, 1995; Isikli & Sezer, 2022; Siyam, 2018). Looking at the themes and sub-themes identified in the present study based on the rich descriptions of sources of self-efficacy among the teachers who successfully implement AT with students with high-incidence disabilities, certain facilitators and barriers to AT implementation were identified. Among the facilitators of AT implementation are Student Engagement and Feedback, Parents' Feedback, Coaching, Fear to Fail Students, and Work-Life Balance.

Teachers reported feeling motivated when their students who were unable to complete the task independently could do it with AT. Some teachers experienced positive verbal feedback from older students about the use of AT, and some observed drastic positive changes in behavior, especially among younger students. These findings are consistent with Atkinson's expectancy-value theory of motivation (Schunk, 2020). Based on the verbal persuasion from students,

teachers' attitudes towards the value of AT increased. The same goes for Parents' Feedback; teachers feel motivated when parents recognize the value and support educators in implementing AT with students.

All study participants noted that they had professional development training that brought awareness about AT; however, they started implementing it after individualized coaching sessions with AT specialists or another colleague. What was unique about these coaching sessions is that a coach worked with a particular student with whom the teachers struggled.

When codes were analyzed using causation coding, the attribution sequences in the chronological matrix were identified (Saldaña, 2021). Observing peers' success with the task could have made teachers believe they can also do it. Another potential explanation for the high effectiveness of coaching is that the teacher may not have believed that students could succeed at certain tasks until observing their success. The vicarious experiences mediated the variable of resisting new technology. Coaching has been the best model for teachers to follow TECH principles of AT implementation (King-Sears & Evmenova, 2007). According to TECH model it is important to ensure that when technology is chosen, it solves a specific academic need of a particular student and matches curriculum content, which could be best demonstrated in a coaching environment.

Based on teachers' descriptions and explanations, Fear to Fail Students motivates teachers because they try to avoid the feeling of not being able to help the students and thus are more likely to search for mitigating solutions. However, according to Atkinson's expectancy-value theory, this fear may motivate teachers because they had strong, rewarding experiences of positive behavioral change in students with high-incidence disabilities. People tend to judge the likelihood of attaining a given goal based on the individual's perception of how likely the goal

can be achieved. In other words, if you have experienced success in changing one's behavior, you will have higher motivation despite the fear of failure (Shunk, 2020).

Another facilitator of AT implementation among students with high-incidence disabilities is teachers' Work-Life Balance. The work-life balance and self-efficacy are intricately interconnected. A poor work-life balance can undermine self-efficacy by increasing stress and reducing the time and energy for reflective practices and professional growth (Morris et al., 2017; Tschannen-Moran & Hoy, 2001). Conversely, high self-efficacy can contribute to better work-life balance by enabling more effective classroom management instructional strategies and effectiveness and enhancing overall job satisfaction. According to the data collected as part of the present research, work-life balance can promote AT integration and improve AT implementation because teachers can better handle the frustrations associated with technology.

Barriers to AT implementation

A significant factor in the implementation of AT is the student's grade. Students in kindergarten through second grade struggle to stay engaged when using text-to-speech; they do not have the executive functioning skills to access computers at the same level as their older peers. Speech-to-text often does not pick up younger students' developing speech patterns. These findings revealed that implementing AT in younger grades may be more challenging due to students' developmental levels. Similar struggles were described by Hu et al. (2021) when describing technology integration for young children during the COVID-19 pandemic.

Regardless of students' ages, a lack of basic computer skills makes it harder to implement AT. Basic computer skills are a foundation for further learning and adapting assistive technology. Students require fundamental technology operational skills such as keyboarding use, navigating operating systems, and understanding file management (Edyburn, 2013; Zabala et al.,

2000). While all participants noted a lack of students' operational skills as a barrier to AT implementation, only one out of nine teachers explicitly included teaching these skills as part of their lesson plan.

Another significant factor that negatively affected teachers' beliefs in successful AT implementation is their peers' buy-in and peers' willingness to implement AT across all settings, not just in the special education classrooms. Quality indicators for AT clearly outline the importance of AT implementation across all settings; however, many general education teachers do not see the value of AT and are not ready to change their teaching routines to incorporate it in their classrooms (Zabala, 2000).

Similarly, school administrators lack an understanding of AT and do not always support educators in AT implementation, which generally negatively impacts special educators' self-efficacy. It was most apparent during a special educator's effectiveness evaluation, where AT implementation was misinterpreted and rated poorly. Current teacher evaluation methods do not account for the needs of special education students. Morris-Matthews et al. (2020) investigated whether the most commonly used tool, Danielson's Framework for Teaching (FFT), currently utilized in more than 20 states to evaluate teachers, promotes appropriate instruction for special education students. The findings of this study suggest that the FFT tool rates direct, explicit instructions rooted in behaviorist orientation, which is essential for special education students and AT implementation, as low-quality instructions. As a result, special education teachers evaluated by this tool cannot use received feedback to guide teaching and classroom practices, nor can administrators use the information obtained through FFT to promote effective instructional strategy, including AT implementation (Brobbey & Kmail, 2021; Morris-Matthews et al., 2020).

According to the findings of the present study, another significant factor that negatively affects teachers' self-efficacy in implementing AT is technical difficulties. Current policies encourage and support the integration of technology in education and aim to ensure that students have access to necessary technological resources; however, the quality and the state of the technology matter. Devices that are unable to support assistive technology software due to limited RAM, aging or failing hardware, failure of an operating system, missing operating system and software updates, overheating, and conflicts between hardware and software make assistive technology inaccessible.

Unreliable Wi-Fi connectivity is another issue that makes teachers feel helpless about AT implementation. The AT software is dependent on Internet connectivity. It is inaccessible when there are issues with wireless networking technology that allows electronic devices to exchange data or connect to the Internet.

Sources of self-efficacy

One of the goals of this research is to document what has helped teachers move from a stage of exploration of AT to implementation according to the active implementation framework proposed in Fixsen et al. (2009). In the previous research, Gale et al. (2021) suggested that the most common source of teachers' self-efficacy is mastery experience, followed by social persuasion and less commonly vicarious experiences. However, this study documents vicarious experiences as the most powerful source of self-efficacy. All participants moved from exploration to implementation after they had observed a coach or a peer successfully implementing AT.

Most participants of the present study had prior experiences of professional development training in the area of AT, and some tried implementing AT independently before coaching

sessions, but based on their feedback, they did not feel successful. Professional development ensured teachers' awareness of AT; however, what made them "believers" was observing a colleague successfully implementing AT with a student who, as a result, demonstrated drastic positive behavior change towards challenging academic tasks. This finding implies that vicarious experiences are among the main sources of self-efficacy related to AT implementation.

Age-related experiences

Teachers had drastically different experiences in AT implementation based on the grade of their students. Teachers of younger students had the most difficulties, while teachers of students in third through eighth grade had the most success with AT. Limited data is available about AT implementation in high school since only one out of the nine invited high school teachers agreed to participate, the lowest response rate out of all grade levels.

Hunt (2021) argued that if AT is an enabler of learning, AT utilization should occur as early as possible in the lifecycle. While it seems logical, she also discovered that it is often not the case, and AT is not implemented early enough. Some of the possible explanations as to why this is t the case could be: (1) teachers worry that AT will hinder skill development in early education, (2) young students lack the focus to sustain attention on computer-generated TTS, (3) younger students inability to see technology as a learning tool and not as a reward and playtime, (4) younger students' speech is not fully developed which often makes STT technologies inaccurate.

Students in the third through the eighth grade seem to benefit from AT the most. While teachers reported some challenges in implementation, they also reported the highest success rate. Students within this age group could access the general education curriculum successfully, significantly increasing their independence. AT helps teachers to see, so to speak, "hidden"

disabilities and recognize them. It alleviates fears by providing teachers with a clear understanding and a means to address the learning challenges faced by their students.

The low rate of high school teachers' participation in research on assistive technology could be due to teachers not seeing the value in the study on AT implementation. Rogers (2003) described that an important factor in the diffusion of innovation is compatibility with needs. The compatibility of innovation is the degree to which it meets a felt need. Students in high school are better at hiding their needs to fit in social circles. Therefore, high school teachers may not be aware of the need in the first place and consider AT implementation as unnecessary work.

Integrating technologies could be considered a daunting task that will demand extra time and effort to learn, incorporate, and implement into existing practices (Rogers, 2003). In the age of fast-developing artificial intelligence, experts voiced concern that ensuring students' work fidelity is harder (Gayed et al., 2022; Yeadon et al., 2023). Additionally, some educators can be skeptical about the effectiveness of AT based on the past experiences with tools that failed to meet expectations (Fixsen et al., 2009). Resistance to change could also play a role, as some teachers prefer traditional teaching methods over adopting new technologies (Rogers, 2003).

The only high school participant shared, "High school teachers don't trust the fidelity of a student's work with the use of assistive technology," and they do not see the need for such support for high-school students. This view contradicts findings from Parents' Feedback of older students who note that AT allows their students to participate in meaningful academic activities, and they see a drastic change in students' behavior.

The conflict in the views of various stakeholders in the educational settings can be an additional barrier to AT implementation. According to Paramar et al. (2010) stakeholder theory, differing views and objectives among stakeholders, such as students, teachers, parents,

administrators, and the wider community, can lead to challenges in implementing evidence-based practices or in making progress toward resolving issues.

Implications for Policy and Practice

The implications of the findings of the study are addressed in the following section. The discussion focuses on potential policy and procedural changes that could improve AT implementation among special educators with students with high-incidence disability. Considerations include proposed actions that could help promote the role of AT specialists in AT implementation and help overcome barriers to AT implementation. Recommendations on increasing teachers' self-efficacy related to AT are made.

Implications for Policy

On January 22, 2024, the United States Department of Education released a letter on the provision of assistive technology devices and services for children with disabilities under the IDEA (U.S. Department of Education, 2024). In this letter, the U.S. Department of Education emphasized the critical role of high-quality educational opportunities accessible to all learners. It highlighted the transformative potential of assistive technology and how it reduces inequity and accessibility disparities. The letter provides guidance from the Office of Educational Technology and the Office of Special Education Programs on the provision of assistive technology devices and services for children with disabilities. It aims to dispel misconceptions about AT, providing examples of its use to enhance educational outcomes, develop skills, and prepare children for post-school life while advocating for a more inclusive and equitable educational system. Furthermore, it advocates for UDL.

While this letter is an important step towards the goals of UDL, there are several discrepancies between current educational policies and practices. For example, while IEP

outlines students' right to accommodations, including AT interventions, many instructional accommodations and AT solutions are not allowed during standardized testing. Allowing accommodations for high-incidence students in standardized testing environments may potentially increase teachers' buy-in and administrative awareness, two of the greatest barriers to AT implementation identified in this research. Furthermore, it may help eliminate technical difficulties and Wi-Fi connectivity issues, another two barriers in AT implementation, by promoting guidelines and specifications on which devices are compatible with AT software and what the requirements for Wi-Fi network should be.

Another policy implication that holds significant potential to enhance teachers' engagement with AT and administrators' awareness of its importance is creating and implementing a teacher evaluation system that assesses teachers' provision of AT services. Such modified teacher evaluation system has multiple potential benefits. First, it would incentivize teachers to become proficient in using and integrating AT into their instruction. Secondly, it would highlight the significance of AT within the educational framework, bringing awareness to administrators of the need to support teachers in this area, potentially leading to increased allocation of resources to AT devices and training. An evaluation system can help promote clear classroom standards and expectations for AT use. Lastly, prioritizing AT in teacher evaluations signals to all stakeholders that educational institutions are committed to leveraging technology to meet the needs of all students.

Implications for Practice

The experiences of special education teachers in implementing assistive technology among students with high-incidence disabilities highlights the necessity of support systems that promote such practices. Special education teachers face various challenges while implementing

AT, ranging from a lack of students' operational and typing skills and technical difficulties to a lack of support from the peers and the administration. Despite these challenges, these teachers find support in students' and parents' feedback, coaching sessions, and work-life balance.

School and district leadership should consider promoting the development of basic computer and typing skills to students starting at young ages. For example, providing evidence-based programs aimed at developing digital literacy skills may assist educators and teach students those skills quickly and efficiently. Also, timely acquisition of these skills should be promoted across all settings – special education and general education.

Another critical area in which teachers should be supported is high-quality professional development for all (not just special education) teachers to increase AT buy-in and ensure students' AT skill generalizability across various settings. Special educators, on the other hand, should receive coaching sessions to ensure they reach full implementation. Coaching sessions should include evidence-based practices and incorporate integral parts such as modeling, practice, and feedback (Glover et al., 2023). Coaching should prioritize hands-on training that will allow teachers to practice new skills in a controlled environment, fostering confidence in the implementation in real classroom settings. Furthermore, professional development goals should align with the learning objectives and challenges unique to students of different ages, ensuring that educators are equipped to address these effectively. Based on the drastically different experiences of special educators of various grade levels, professional development should reflect these differences and be geared specifically to the needs of students of specific ages and grades.

Leaders and administrators should strive to create a culture and environment where work-life balance is promoted. Various strategies can be utilized to foster a culture of well-being. School leaders should model work-life balance by managing their time effectively and charging

staff to do the same. Implementing programs focused on mental health, stress management, and physical well-being, such as mindfulness sessions, fitness classes, and wellness workshops, could be good options. Another strategy could be streamlining administrative tasks using digital platforms, which would help reduce the time teachers spend on paperwork. Furthermore, ensuring that meetings are necessary, focused, concise, and are not scheduled during after-hours is critical.

Administrators should encourage teachers to take their allotted vacation and personal days, emphasizing the importance of rest and recovery and recognizing that mental health days are legitimate reasons for absence and an effective strategy to avoid burnout. Regularly acknowledging and rewarding staff's hard work and achievements is very important. Another important aspect is periodically checking in with staff to gather feedback on their work-life balance and adjust policies and practices accordingly.

Theoretical and Empirical Implications

Theoretical and empirical implications have been drawn from this research and are discussed below. Self-efficacy refers to an individual's belief in their capabilities to execute certain tasks and to persevere in their course of actions (Bandura, 1997). Theoretical implications surrounding the sources of self-efficacy play an important role in understanding teachers' decisions in implementing assistive technology for students with high-incidence disabilities. Recognizing and supporting teachers' sources of self-efficacy promotes better implementation of AT and a more inclusive environment. It allows students with high-incidence disabilities to access general education and participate more meaningfully in educational activities.

Theoretical Implications

This study is based on Bandura's social cognitive theory, focusing on self-efficacy (Bandura, 1997). Self-efficacy refers to a person's belief in their ability to succeed in specific tasks. This belief can influence whether they will succeed or fail. Self-efficacy is built from four key sources: mastery experiences (learning from success), vicarious experiences (learning from observing others), verbal persuasion (encouragement from others), and somatic and physiological states (one's physical and emotional condition).

Gale et al. (2021) ranked sources of self-efficacy from highest to lowest in the following order: (1) mastery experiences, (2) verbal persuasion, and lastly (3) vicarious experiences. However, the present study suggests that vicarious experiences are the ones that move teachers from exploration of innovation to implementation. All participants in the study started actively and independently implementing AT only after they had experienced another peer implementing AT with the student that they struggled with.

Furthermore, the idea of "hidden" disabilities manifests itself when teachers see how dramatic changes in student's behavior could be when provided with appropriate AT support (Evans et al., 2015; Moriña, & Carnerero, 2022; Skär, 2010; Wilkins et al., 2016). When students receive appropriate AT services and support for challenging academic tasks, teachers realize the cause of the struggle and can see how, at least in part, AT resolves and mitigates students' challenges. Natalie said, "I like to figure out the reason the student is putting his head down… And once the AT specialist gave him the right AT support, I could finally see what was wrong".

While it makes sense that mastery experiences should be the main driving force for innovation implementation and acceptance of new strategies as described in previous research, the concept of self-efficacy is more intricate for teachers who work with students with "hidden" disabilities. Vicarious experiences could allow teachers to learn from a peer and better

understand the disability they could not fully comprehend. Vicarious experiences enable teachers to recognize the potential of a specific student, and it seems to encourage teachers. This understanding could be the driving force behind the move from exploring AT to actively implementing it.

Empirical Implications

The main trend in special education is inclusion, which strives to integrate students into the general education classes while providing them with needed support to compensate for their disability. Assistive technology is a powerful tool to do it; however, teachers' perspectives on high-incidence disabilities differ from those disabilities that can be seen. This study shows that general education teachers have difficulty adopting AT with high-incidence disabilities students. Also, special education teachers are adopting AT only after they have witnessed its benefits through vicarious experiences. The study has empirical implications that differentiate the unique nuances of AT implementation among students with high-incidence disabilities.

Furthermore, AT implementation in different grades looks different. Teachers of students in kindergarten through second grade have unique challenges: (1) teachers worry that AT will hinder skill development in early education, (2) young students lack the focus to sustain attention on computer-generated TTS, (3) younger students are unable to see technology as a learning tool and not as a reward and playtime, (4) younger students' speech is not fully developed which makes STT technologies highly inaccurate. Teachers and students in grades three through eight report the most benefit from AT for students with high-incidence disabilities. Students can independently access the curriculum and complete the work "like other students." Teachers observe drastic positive changes in students' behavior in response to academic demands in these grades. They also get positive feedback from students and parents about AT effectiveness. Future

research should further examine the differences in AT implementation, focusing on various grade levels.

This study identified facilitators and barriers in AT implementation among students with high-incidence disabilities. It further expanded on the understanding of Bandura's self-efficacy theory in the context of the implementation of assistive technology by special education teachers. Giek (2021) suggested that most studies examining teachers' self-efficacy in the context of technology implementation collected data through surveys/online surveys. However, the current study brings detailed qualitative descriptions of teachers' experiences and perceptions of AT implementations among students with high-incidence disabilities.

Limitations and Delimitations

While this study provides valuable insights into the experience of special education teachers who implement AT with students who have high-incidence disabilities, it has its limitations and delimitations. The experiences detailed were those of a limited number of teachers, which limited the comprehensive representation of the broader population of teachers who work with students with high-incidence disabilities. Additionally, the study scope was confined to a specific school district, limiting the generalizability of the findings. Furthermore, the study predominantly relied on qualitative, self-reported data. While this approach provided in-depth insights into the participants' personal experiences, it also introduced potential bias as the data were subject to their perceptions, memory recall, and willingness to share personal information.

Another limitation is that the study captured the participants' experiences over a short time period. A longitude study, tracking teachers through training and coaching sessions to the implementation of assistive technology, would reveal additional insights that were not captured

in this study. While the study had five elementary school teachers and four middle school teachers, it only had one teacher from a high school. The low representation of the high school level may not a generalization of the findings to high school. Additionally, the study contained only female participants. Including the voices of all gender identities could alter the findings and reveal new perceptions.

While the qualitative nature of the study offered rich, detailed personal experiences, it also introduced subjectivity in the data interpretation. The findings were interpreted through my lens, and despite efforts to maintain objectivity, personal biases and perspectives could influence the analysis. In recognizing these limitations and delimitations, the study highlights the need for further research. Future studies could benefit from a more extensive and a more diverse sample. Also, replicating a study in another school district to outline additional factors that affect teachers' self-efficacy when implementing AT with students with high-incidence disabilities could benefit the literature on AT implementation.

Recommendations for Future Research

The experiences of special education teachers implementing assistive technology with students who have high-incidence disabilities, as detailed in the study, provided a rich foundation for future research in this area. Several potential avenues for further research have been identified. Further exploration could significantly contribute to the literature on AT implementation and the practical guidelines for all stakeholders on improving AT services among students with high-incidence disabilities.

One of the study's main findings was that the driving force of AT implementation was the vicarious experiences of teachers through coaching sessions. However, it remains unclear whether, through these coaching sessions, teachers were able to observe peers succeed, and

therefore, it made them believe that they can do it too, or that they observed the success of a student with another teacher and believed in students' capabilities. In the case of the latter scenario, the teacher's perception of a student and her abilities in light of her learning challenges plays a critical role in the decision to implement AT.

As discussed earlier, teachers are less aware and knowledgeable about "hidden" disabilities (Evans et al., 2015; Moriña & Carnerero, 2022; Skär, 2010; Wilkins et al., 2016). In this instance, vicarious experiences alter the teacher's perception of learning challenges and the disability. Future research should explore in greater detail the comparison of teachers' perceptions of AT depending on students' disability. This inside may reveal a complex layer of factors that educators consider when integrating AT into their teaching practices.

Future research should explore this perception more thoroughly by comparing how teachers view the use of AT for students with different types of disabilities – such as physical impairments, learning disabilities, sensory impairments, and cognitive disorders. In-depth analysis can reveal insights into the biases, challenges, and opportunities that educators associate with various disabilities in the context of AT implementation.

Another direction that the researchers should explore is effectiveness of coaching sessions implementing AT. A qualitative and quantitative analysis can shed light on the approach by which goal-driven guidance in AT implementation, observations, and feedback create the conditions necessary to transfer newly learned evidence-based practices and procedures into classroom implementation (Glover et al., 2023). The uniqueness of coaching teachers on implementing AT with students is that you coach teachers on how to be coaches for students, while the teachers often lack firsthand experiences relying on AT. While AT can simplify tasks,

for students with disabilities – AT enables possibilities for those who have high-incidence disabilities.

The study identified clear variations in the implementation of AT across student age groups, suggesting that age plays a crucial role in how AT tools are adopted and utilized in educational settings. These findings open up several avenues for further exploration, specifically regarding educators' pedagogical strategies and practices at different educational levels.

Future research should look into the experiences of teachers working across various grade levels to understand the factors contributing to AT's successful integration in the classroom. Examining educators' perspectives from elementary, middle, and high school can help identify grade-specific challenges and opportunities in AT implementation. More specifically, how teachers at various grade levels adapt AT to their instructional methods; what is an effective way to prepare teachers for AT implementation; how educators select and customize AT solutions to meet the needs of students of different ages; how AT impacts students' engagement, independence, and academic performance of students at various ages?

The current study laid an important groundwork by identifying facilitators and barriers to AT implementation as perceived by teachers. However, an in-depth quantitative analysis is recommended to deepen the understanding of these factors and to develop more actionable strategies for supporting AT implementation. The quantitative approach could provide empirical evidence to pinpoint critical factors determining AT implementation among students with high-incidence disabilities. The primary objective of transitioning to a quantitative analysis would be to statistically validate the facilitators and barriers identified in the qualitative study. This would involve measuring the extent to which each factor influences AT implementation, thereby determining their relative importance and impact.

Conclusion

This hermeneutical phenomenological study examined the experiences of special education teachers who successfully implemented assistive technology among students with high-incidence disabilities. The problem is that despite the available resources and professional development training, AT is underutilized among students with high-incidence disabilities. The study shed light on facilitators and barriers that special educators experience when implementing AT in their instructional practices. Furthermore, the study documented variations in teachers' experiences with AT implementations across various grade levels.

The study is rooted in Bandura's self-efficacy theory, which postulates that our perceptions of our abilities can influence our success or lack thereof. Previous research established that teacher's self-efficacy is a determining factor in AT implementation; however, little is known about which factors constitute self-efficacy. Previous studies determined mastery experiences and verbal persuasion have the highest effect on teachers' self-efficacy. Nevertheless, when it comes to AT implementation among students with high-incidence disabilities, vicarious experiences had the greatest impact. They were a determining factor in moving teachers from the AT exploration stage to the AT implementation stage. In practical terms, when teachers participated in professional development training, they became aware of AT for high-incidence disabilities but were not implementing it. However, all participants in the study experienced observing peers successfully implementing AT with their students, and this experience served as a moving factor in activating AT implementation in their own instructional practices.

Based on the study's findings, there are some policy and practical implications and suggestions for future research. For example, most states do not allow AT for high-incidence

disabilities as standard accommodations during state standardized testing. The inability of students to access tools that enable them to access the general education curriculum and mitigate the negative effects of their disability may lead to poor performance of students with high-incidence disabilities. AT for these students should be consistently offered during standardized testing.

Additionally, the teacher evaluation system that is designed to promote and maintain the highest standards of teaching quality should reflect the need for teachers' knowledge about AT implementation. The understanding of AT is critical as it reflects the evolving needs of a diverse population, including those with high-incidence disabilities. Knowledge about AT implementation ensures that the educational environment becomes more inclusive and provides students with access to general education.

The study identifies several proposed strategies to promote AT implementation: ensuring instructions in basic computer skills and typing, offering AT coaching for teachers and students, and encouraging strategies for work-life balance among teachers. Future research should carefully look at teachers' perceptions of the role of AT for high-incidence disabilities and compare educators' views of the use of AT for students with different types of disabilities and different grade levels.

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APPENDIX A

Consent for Participants

Title of the Project: Special education teacher perspective on implementation of assistive technology among students with high-incidence disabilities.
Principal Investigator: Olga Volkov, M.A., Doctoral Candidate, School of Education, Liberty University

Invitation to be Part of a Research Study

You are invited to participate in a research study. To participate, you must be an IRR teacher for at least one academic year. You must be familiar with assistive technology for students with high-incidence disabilities and have experience implementing it for at least nine weeks. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research.

What is the study about and why is it being done?

The purpose of the study is to describe the experiences of implementing assistive technology with students who have high-incidence disabilities for special education teachers.

What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following:

1. Participate in an in-person, audio-recorded interview that will take no more than 2 hours.
2. Review interview transcripts for accuracy and clarifications. The time commitment for this activity should not exceed 30-40 minutes.
3. Participate in a focus group interview lasting 45 minutes.
4. Lastly, you will be asked to share your five-day lesson plans or any other documents that you believe would contribute to me gaining a deeper understanding of your successes and challenges in implementing assistive technology with your students.

How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include providing insights into effective strategies and practices successful special education teachers use. This knowledge can be disseminated to educators and institutions, leading to improved teaching methodologies that better accommodate diverse learning needs. Ultimately, this can contribute to a more inclusive educational environment where students with high-incidence disabilities can thrive alongside their peers. Furthermore, the study's insights can be incorporated into professional development programs for educators, empowering them with practical strategies for integrating assistive technology. This, in turn, enhances teacher effectiveness and confidence in addressing the diverse needs of students with disabilities, ultimately benefiting the entire educational community.

What risks might you experience from being in this study?

The expected risks from participating in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

I am a mandatory reporter. During this study, if I receive information about child abuse, child neglect, elder abuse, or intent to harm self or others, I will be required to report it to the appropriate authorities.

How will personal information be protected?

The records of this study will be kept private. Published reports will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be kept confidential by replacing names with pseudonyms.
- Interviews will be conducted in a location where others will not easily overhear the conversation.
- Confidentiality cannot be guaranteed in focus group settings. While discouraged, other members of the focus group may share what was discussed with persons outside of the group.
- Data will be stored on a password-locked computer. After five years, all electronic records will be deleted.
- Audio recordings will be stored on a password-locked computer until participants have reviewed and confirmed the accuracy of the transcripts and then deleted. The researcher and members of her doctoral committee will have access to these recordings.

How will you be compensated for being part of the study?

Participants will be compensated for participating in this study. You will receive a $50 Amazon gift card as a token of appreciation for participating in the study. The gift card will be disbursed

at the beginning of our in-person meeting at your location for the purpose of obtaining lesson plans and conducting the interview.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with Liberty University or [redacted]. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you, apart from focus group data, will be destroyed immediately and will not be included in this study. Focus group data will not be destroyed, but your contributions to the focus group will not be included in the study if you choose to withdraw.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Olga Volkov. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at [redacted] or [redacted]

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the IRB. Our physical address is Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA, 24515; our phone number is 434-592-5530, and our email address is irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

☐ The researcher has my permission to audio-record me as part of my participation in this study.

_____
Printed Subject Name

_____
Signature & Date

APPENDIX B

Recruitment letter/email

Dear Potential Participant,

As a doctoral candidate in the School of Education at Liberty University, I am conducting research as part of the requirements for a doctoral degree. The purpose of my research is to describe the experiences of implementing assistive technology with students who have high-incidence disabilities for special education teachers., and I am writing to invite you to join my study.

Participants must be an IRR teacher for at least one academic year. You must be familiar with assistive technology for students with high-incidence disabilities and have experience implementing it in the last five years. Participants will be asked to take part in a one-on-one, audio-recorded, in-person or via MS Teams interview, review interview transcripts for accuracy and clarifications, take part in a video-recorded focus group, and provide lesson plans for five consecutive days. It should take approximately two hours to complete the procedures listed. Names and other identifying information will be requested as part of this study, but participant identities will not be disclosed.

To participate, contact me at [redacted] or [redacted]. If you meet my participant criteria, I will work with you to schedule a time for an interview.

A consent document is attached to this email. The consent document contains additional information about my research.

If you choose to participate, you will need to sign the consent document and return it to me at the time of the interview.

Participants will be compensated for participating in this study. You will receive a $50 Amazon gift card as a token of appreciation for participating in the study. The gift card will be disbursed at the beginning of our in-person meeting at your location for the purpose of obtaining lesson plans and conducting the interview.

Sincerely,

Olga Volkov,
AT Teacher-Diagnostician

[redacted]

APPENDIX C

Follow-up letter/email

Dear Potential Participant,

As a doctoral candidate in the School of Education at Liberty University, I am conducting research as part of the requirements for a doctoral degree. Last week, an email was sent to you inviting you to participate in a research study. This follow-up email is being sent to remind you to sign and return the attached consent document if you would like to participate and have not already done so. The deadline for participation is [Date].

Participants must be an IRR teacher for at least one academic year. You must be familiar with assistive technology for students with high-incidence disabilities and have experience implementing it in the past five years. Participants will be asked to take part in a one-on-one, audio-recorded, in-person or via MS Teams interview, review interview transcripts for accuracy and clarifications, take part in a video-recorded focus group, and provide lesson plans for five consecutive days. It should take approximately two hours to complete the procedures listed. Names and other identifying information will be requested as part of this study, but participant identities will not be disclosed.

To participate, contact me at [redacted] or [redacted]. If you meet my participant criteria, I will work with you to schedule a time for an interview.

A consent document is attached to this email. The consent document contains additional information about my research.

If you choose to participate, you will need to sign the consent document and return it to me at the time of the interview.

Participants will be compensated for participating in this study. You will receive a $50 Amazon gift card as a token of appreciation for participating in the study. The gift card will be disbursed at the beginning of our in-person meeting at your location for the purpose of obtaining lesson plans and conducting the interview.

Sincerely,

Olga Volkov
AT Teacher-Diagnostician

[redacted]

APPENDIX D

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

December 27, 2023

Olga Volkov
Alexandra Barnett

Re: IRB Exemption - IRB-FY23-24-773 Special Education Teacher Perspective on Implementation of Assistive Technology (AT) among Students with High-Incidence Disabilities

Dear Olga Volkov, Alexandra Barnett,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:104(d):

Category 2.(iii). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:
The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

For a PDF of your exemption letter, click on your study number in the My Studies card on your Cayuse dashboard. Next, click the Submissions bar beside the Study Details bar on the Study details page. Finally, click Initial under Submission Type and choose the Letters tab toward the bottom of the Submission Details page. Your information sheet and final versions of your study documents can also be found on the same page under the Attachments tab.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at [redacted]

Sincerely,

[redacted]
Administrative Chair
Research Ethics Office

APPENDIX E

Table 1

Individual Interview Questions

1. Describe your experience and background in special education, particularly in working with students with high-incidence disabilities. CRQ
2. Share a specific instance when you successfully integrated assistive technology into your teaching practices to support a student's learning. SQ1
3. How did witnessing a colleague effectively implementing assistive technology success impact your beliefs in your capabilities to use technology similarly? SQ2
4. Describe when you received positive feedback or encouragement from colleagues, administrators, parents, or students regarding using assistive technology. SQ3
5. Describe a situation where you felt a sense of empathy or emotional connection with a student's challenges while implementing assistive technology. SQ1, SQ4
6. Tell me about an experience where you learned about an innovative assistive technology approach through professional development or discussions with other educators. SQ5
7. Share a specific example of a situation where you collaborated with parents, caregivers, or specialists to implement assistive technology for a student with special needs. SQ3
8. Describe an instance when you faced challenges while implementing assistive technology. SQ1
9. How did you manage your emotional reactions and used your past successes to overcome these challenges and maintain your belief in your capabilities? SQ1
10. Tell me about a time when you felt excited or curious about exploring new assistive technology tools or strategies. SQ4

11. Share an example of when a student's progress or achievement through assistive technology had a positive physiological impact, such as increased engagement or improved behavior. SQ4
12. What else would you like to share about your experience implementing assistive technology? CQ

APPENDIX F

Table 2

Focus Group Interview Questions

1. Why is AT important for students with high-incidence disabilities? SQ3
2. How confident do you feel in effectively integrating assistive technology into your teaching practices? SQ1
3. What challenges have you faced when incorporating assistive technology into your teaching, and how have you overcome them? SQ2, SQ3
4. How do you typically go about learning to use new assistive technology tools? SQ2, SQ3
5. What resources or support systems do you find most helpful? SQ2, SQ3
6. What made you consider AT for a student? SQ2
7. What factors do you believe were the most important for your successful implementation of AT? SQ1
8. Describe when you faced resistance or hesitation from a student, parent, or colleague about using assistive technology. How did you handle it, and did it affect your confidence? SQ4
9. What do you wish you knew about AT and AT implementation before you started using it in your classroom? SQ1, SQ 2, SQ3,
10. How would you suggest improving training and support for special education teachers when using assistive technology with high-incidence disabilities? SQ1, SQ2, SQ3, SQ4