ABSTRACT

BLUE, GWENDOLYN CHARLENE. Teachers of students with visual impairments in five North Carolina rural school districts and barriers to assistive technology implementation: An examination of their experiences and perceptions. (Under the direction of Aaron Clark and Cameron Denson).

Visually impaired students, despite access to technology resources, experience difficulties in succeeding in higher education due to ineffective technology resource implementation and a lack of adequate assistive technology instruction. The purpose of this qualitative interview-based study was to determine barriers to assistive technology implementation by examining the experiences and perceptions of a diverse sample of teachers of visually impaired students in rural school districts in selected North Carolina Counties. Technological pedagogical content knowledge (TPACK) was the theoretical structure of this study, which is comprised of content, pedagogical, and technological knowledge in a technologically enhanced learning environment. The sample consisted of five TVIs from five North Carolina Rural County School Districts, whom the researcher interviewed using a semi-structured interview guide. The researcher performed the modified van Kaam methods of phenomenological analysis using NVivo 11 software. The major themes that resulted were building relationships with parents, need for full commitment from stakeholders, and the need for continuous training and improvement. Concerning the technology itself, participants voiced the importance of a classroom environment that facilitates technological use. These findings support the current study’s justification for proposing a TPACK theory for understanding the interrelated domains of technological pedagogical content knowledge and to address diverse teacher needs, student needs, and technology resource conditions.
Teachers of students with visual impairments in five North Carolina rural school districts and barriers to assistive technology implementation: An examination of their experiences and perceptions

by
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Gwendolyn received an Associate of Applied Science degree from Rutledge College in Fayetteville, North Carolina, a Bachelor of Science degree and a Master of Information Science degree from North Carolina Central University in Durham, North Carolina. Her associate degree is in Business Administration, her undergraduate degree is in Business Administration and her master’s degree is in Information Systems. She also earned her Doctor of Education degree at North Carolina State University in Technology Education with a minor concentration in Adult and Community College Education.

Outside of her academic activities Gwendolyn is involved in her church and enjoys spending time with friends and family. She is grateful to her parents and grandparents for instilling in her the importance of family and education.

Finally, the researcher thanks her sister Jennifer Jenkins and special friends Lysaundria Allison, Mae Burks, Dian Davis and Charletta Parker who encouraged and supported her throughout this venture.
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CHAPTER 1: INTRODUCTION TO THE STUDY

Introduction

Technological applications in education provided an abundance of innovative tools and methods used to assist in instruction and teaching. The use of assistive technology (AT) in special education classrooms was especially integral to improving the academic success of students with disabilities (Dalton, 2015). Despite the benefits of assistive technology integration in the classroom, only six states have implemented assistive technology standards and methods for competency reporting (Dalton, 2015). For many students with disabilities, such as visual impairments, the use of assistive technology is a necessary requirement, but a lack of school resources, service accessibility, support, and collaboration networks frequently impacts the accessibility of assistive technology in the classroom (DePountis, Poglund, Griffin-Shirley, & Lan, 2015).

The purpose of this qualitative interview-based study was to examine the perceptions and experiences of teachers of visually impaired students (TVIs) using assistive technology (AT). The participants in the study included TVIs in rural school districts in North Carolina. To ensure the heterogeneity of the sample, the demographics of the participants included teachers from different racial and ethnic backgrounds, ages, genders, and professional experience. In this chapter, the researcher will address the background of the study, problem statement, purpose of the study, research questions, methods for advancing scientific knowledge, research significance, methodology, research design and methods, key terms, and study limitations.
Background of the Study

Researchers on assistive technology competency have frequently focused on quantitative analyses of skill capabilities, but few researchers have addressed perceptions and experiences of assistive technology implementation using technological pedagogical content knowledge (TPACK) theory frameworks (Kaplon-Schilis & Lyublinskaya, 2015). Researchers have suggested that TPACK theory offers unique insight in methodological approaches to assistive technology by incorporating multiple domains of knowledge, personalization in learning environments, skill enhancement, and innovative approaches to teaching a diverse student population (Kaplon-Schilis & Lyublinskaya, 2015).

The theory guiding this study was technological pedagogical content knowledge (TPACK) theory, created by Koehler and Mishra (2009). The TPACK framework stems from Shulman’s (1986) pedagogical content knowledge (PCK) theory that focuses on how teachers develop knowledge through the creation of an understanding of the relationship between content and pedagogy (Kennedy & Deshler, 2010; Koehler, Mishra, & Yahya, 2007; Pamuk, 2012). TPACK theory redefines PCK theory by incorporating a multidimensional process of understanding the embedded integration of technology in pedagogical content knowledge bases. TPACK theory contends that effective technology integration in technologically enhanced learning environments demands that teachers comprehend the relationships between the components of technology, content, and pedagogy (Kennedy & Deshler, 2010; Koehler et al., 2007; Pamuk, 2012). TPACK theory consists of seven multidimensional domains of knowledge: content knowledge, pedagogical knowledge, technology knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and
technological pedagogical content knowledge (Kennedy & Deshler, 2010; Koehler et al., 2007; Pamuk, 2012).

Content knowledge refers to one’s knowledge base informed by theoretical and conceptual understandings of information. Pedagogical knowledge is defined as the basic knowledge associated with teaching and learning methodologies. Technology knowledge centers on one’s comprehension of how technologies are used in relation to a range of specific content domains. Pedagogical content knowledge involves perceptions on how one can combine content and pedagogy to effectively instruct students. Technological content knowledge refers to perceptions on how technology can be incorporated to improve content learning. Technological pedagogical knowledge is defined as the capabilities of technology in enabling instructional approaches. Finally, technological pedagogical content knowledge involves an understanding of the dynamic relationships and learning adaptations enabled by the use of content knowledge, pedagogical knowledge, and technology knowledge in instruction (Kennedy & Deshler, 2010; Koehler et al., 2007; Pamuk, 2012).

TPACK theory has been frequently used to examine the interactions between teachers and students in redefining technology-based knowledge. TPACK is particularly useful when examining assistive technology instruction of students with disabilities due to the ability of the theory to emphasize the significance of several contexts on learning outcomes. In this theoretical framework, teaching is not viewed as an action, but an entire methodology that incorporates an understanding of the reciprocal, dynamic relationships incorporated within practice (Mishra, & Yahya, 2007).
Problem Statement

Visually impaired students, despite access to technology resources, experience difficulties in succeeding in higher education due to ineffective technology resource implementation and a lack of adequate assistive technology instruction (Abner & Lahm, 2002; Kamei-Hannan, Howe, Herrera, & Erin, 2012; Mulloy, Gevarter, Hopkins, Sutherland, & Ramdoss, 2014; Seale, Georgeson, Mamas, & Swain, 2015; Smith, Kelley, Maushak, Griffin-Shirley, & Lan, 2009; Yue-Ting & Morash, 2014; Zhou et al., 2012). Furthermore, teachers of visually impaired students (TVIs) frequently lack proper training and confidence in their abilities to effectively use AT (Abner & Lahm, 2002; Kamei-Hannan et al., 2012; Mulloy et al., 2014; Smith et al., 2009; Yue-Ting & Morash, 2014; Zhou et al., 2012). Researchers have suggested that this lack of training and AT competency is further amplified in rural school districts, but few scholars have qualitatively analyzed the self-efficacy and competence perceptions of TVIs in rural schools (Ault, Bausch, & McLaren, 2013; Wood, 2015). Additionally, of the studies that have addressed technology self-efficacy and implementation in learning environments, few have considered the impacts of ethnicity and gender on perceptions (Teo, Fan, & Du, 2015). The problem of the current study centered on the need to examine the barriers to assistive technology (AT) implementation by examining the experiences and perceptions of a diverse sample of teachers of visually impaired students (TVIs) from sociocultural and gender perspectives. This study incorporated technological pedagogical content knowledge (TPACK) theory frameworks, as this model is frequently used to analyze how teachers adapt to learning new knowledge in technology enhanced learning environments (Kennedy & Deshler, 2010; Koehler et al., 2007; Pamuk, 2012). The intent of this study
was to determine barriers to AT implementation by examining the experiences and perceptions of a diverse sample of TVIs in rural school districts.

**Purpose of the Study**

The purpose of this qualitative interview-based study was to determine barriers to assistive technology (AT) implementation by examining the experiences and perceptions of a diverse sample of teachers of visually impaired students (TVIs) in rural school districts in selected North Carolina Counties. The researcher examined perceptions and experiences by conducting semi-structured interviews with five TVIs from five North Carolina Rural County School Districts. The participants in the study included TVIs in rural school districts in North Carolina. To ensure the heterogeneity of the sample, the demographics of the participants included teachers from different racial and ethnic backgrounds, ages, genders, and professional experience. Of the potential candidates, the researcher recruited English-speaking participants that have been teaching visually impaired students for at least 2 years. The researcher recruited participants by coordinating with key administrators from the five school districts as follows. The researcher asked the administrative office of each of the chosen North Carolina counties to provide a list of all the teachers of visually impaired students in their county. The researcher then purposefully chose one or more TVIs from each county to send an electronic invitation letter to participate in the study. Upon response from potential TVIs, the researcher purposefully chose one TVI from each county to participate in the study.

**Research Questions**

In order to examine the perceptions and experiences of TVIs implementing AT in special education classrooms, the researcher developed several research questions to
assess barriers, skill capabilities, and support services. In this qualitative interview-based study, the researcher posed the following research questions:

**RQ1.** What are the shared, lived experiences of TVIs implementing AT in teaching visually impaired students in rural school districts in North Carolina?

**RQ2.** What are the perceptions of TVIs pertaining to their personal, technological knowledge/skills, and capabilities of utilizing AT in teaching visually impaired students in rural school districts in North Carolina?

**RQ3.** Within their work environments, what are the perceptions of TVIs regarding the use of current teacher preparation programs and in-service support available for their classrooms in rural school districts in North Carolina?

**Advancing Scientific Knowledge**

The current study contributed to data on assistive technology competency and integration. Currently, there is a dearth of literature that qualitatively analyzes the perceptions and experiences of assistive technology integration. Furthermore, the majority of research does not consider the implications of assistive technology integration in rural school districts. The current researcher addressed these issues by examining the shared, lived experiences of teachers of visually impaired students using an interview-based research design (Wojnar & Swanson, 2007).

**Significance of the Study**

Assistive technology is crucial to the academic outcomes, self-efficacy, autonomy, and quality of life of students with disabilities (DePountis et al., 2015). However, several studies have contended that the lack of standards and teacher preparation programs impacts the competency of special education teachers (Abner &
Lahm, 2002; Kamei-Hannan et al., 2012; Mulloy et al., 2014; Seale et al., 2015; Smith et al., 2009; Yue-Ting & Morash, 2014; Zhou et al., 2012). As a result, students with disabilities are negatively impacted. Wong and Cohen (2012) have suggested that 60% of students in a study conducted on assistive technology integration did not benefit from assistive technology due to inadequate training, inconsistency, and unpredictability.

The researcher sought to address the gap in technological competency experienced by special education teachers. This will be useful for K-12 schools, universities researching assistive technology and teacher preparation programs, stakeholders impacted by assistive technology use in the classroom, and policymakers. By researching experiences and perceptions of assistive technology integration, the use of standards for assistive technology integration can be addressed, and implications for further research may be more holistically examined when combined with quantitative data (DePountis et al., 2015).

**Methodology**

In the current qualitative interview-based study, the researcher focused on determining the barriers to assistive technology (AT) implementation by examining the experiences and perceptions of a diverse sample of teachers of visually impaired students (TVIs) in rural school districts. The researcher interviewed five TVIs from five North Carolina Rural County School Districts using semi-structured interviews. These counties were chosen in order to generate a sample of participants with TVI experience from rural school districts in North Carolina. In this section, an overview of the study’s research methodology and design, sampling strategies, ethical considerations, data collection and analysis procedures, and limitations will be provided.
This study utilized a qualitative research paradigm. Quantitative methods generally focus on using scientific and positivist protocols to quantify behaviors of a group of individuals. However, experiences and perceptions cannot be quantitatively measured; therefore, a qualitative approach was chosen. Qualitative methods are generally used to capture the narrative experiences of a group of people while incorporating researcher thoughts, biases, and interpretations (Lincoln & Guba, 1985). Although quantitative studies have been used to assess AT practices of TVIs in urban settings, few investigators have qualitatively analyzed the perceptions and experiences of TVIs in rural settings.

The current researcher used an interview-based study design to examine the shared, lived experiences of TVIs implementing AT within classrooms. Interview-based inquiries are qualitative research approaches that seek to understand and describe particular phenomena. Phenomenology was chosen as it allows for direct, nuanced examinations of experience while incorporating generalizability in interpretation (Moustakas, 1994). An interview-based study design was specifically chosen, as the goal of the current study is to determine the perceptions of AT implementation in TVIs applicable to broad populations in modern society. Little is known about perceptions of AT implementation, therefore an interview-based study approach will allow for detailed descriptions of the phenomenon while still emphasizing shared consciousness between individuals (Moustakas, 1994).

The researcher chose an interview-based study design to describe universal experiences, shared consciousness, and experiences as representative to the broader population of TVIs. This study used qualitative interviews and TPACK theoretical
frameworks to assess experiences and perceptions of TVIs in utilizing AT in rural school districts. The rationale for the selection of qualitative interview-based study was based on previous studies on assistive technology (Clark & Boyer, 2016; Greenhalgh et al., 2013). Clark and Boyer (2016) used interviews to explore how teachers perceived the integration of 21st technology in the development of staff. Greenhalgh et al. (2013) used interviews to explore the experiences of older people regarding the use of telehealth and telecare.

The researcher chose an interview-based study approach over an interpretive approach for several reasons. First, in interpretive phenomenological approaches, individual accounts of experience are emphasized rather than descriptive accounts of shared experiences (Wojnar & Swanson, 2007). Descriptive phenomenological approaches, on the other hand, focus on shared consciousness and common experiences that can be generalizable to the broader population (Wojnar & Swanson, 2007). The purpose of this study was to determine generalizable perceptions of AT implementation experiences that can be applicable to TVIs in a variety of locales, contexts, and experience levels. A modified van Kaam approach to phenomenological analysis by Moustakas (1994) was appropriate in order to generate themes based on the analysis of the individual textual and structural descriptions of each participant regarding the influence of the phenomenon examined in the study.

**Nature of the Research Design for the Study**

The researcher used purposive sampling to identify TVIs in rural school districts. This allowed the researcher to generate a sample based off of particular participant experiences (Lincoln & Guba, 1985). The sample consisted of five TVIs from five North Carolina Rural County School Districts. TVIs that have an adequate amount of
experience working with visually impaired students will be recruited to participate in this study. The researcher recruited participants by coordinating with the key administrators from the school districts, and secured permission to use the school districts as recruitment sites for the study. After the site permission was secured, the researcher recruited participants by coordinating with key administrators from the five school districts. Participants were selected purposefully from those who expressed interest in joining the study. Sampling criteria focused on generating a sample consisting of participants within the five selected school districts in North Carolina, able to speak English, and have been teaching visually impaired students for at least 2 years. Possible candidates were asked to provide information about their language speaking ability and amount of experience with teaching visually impaired students. The researcher created a list of ideal candidates from the respondents, after determining eligibility from possible candidates. The researcher attempted to recruit participants from the list, and scheduled interview meetings with the participants included in the study.

In order to obtain validity and credibility in the study, a sample size of five participants was appropriate to provide in-depth, detailed examination of perceptions and experiences (Lincoln & Guba, 1985). In addition, there may have been variation in cultural backgrounds and experiences of the participants, so an adequate sample size was needed to provide more complex interpretations of the data. In this study, the use of five participants allowed the researcher to collect enough information to adequately determine the common, shared experiences of participants in the study.

**Data collection and ethical considerations.** The researcher used semi-structured interviews to determine the essence of shared experiences in TVIs in rural areas. The
researcher obtained IRB approval prior to data collection and maintained all IRB protocols throughout the research process. Ethical considerations that the researcher addressed with participants included discussing voluntary participation, informed consent, full disclosure of the study’s purpose and possible risks and benefits, restriction to access of data, and participant confidentiality. Participants received coded numbers, and all research data were restricted to ensure privacy and security concerns are met. Paper data were stored in locked file cabinets and electronic data were stored on a secure database. Only the researcher had access to the locked file cabinet and secure database. After 7 years, all participant data will be shredded and deleted from the secure database. Interviews lasted approximately 30 to 60 minutes and were scheduled and conducted in a private location. Participants were required to sign consent forms before data collection begins. Participants were briefed about the study’s purpose, possible risks and benefits, and confidentiality assurance, and they were informed of their ability to end participation at any time (Spradley, 1979).

During interviews, the participants elaborated on their experiences and responded to pre-determined semi-structured questions. The researcher created the interview questions using literature and theoretical information; the interview guide contained open-ended questions that allowed the participants to comfortably answer questions while maintain structure and order throughout the interview (Spradley, 1979). Data were recorded and transcribed with participant consent in order to prepare data for coding and analysis (Schutt, 2011).

**Data analysis procedures.** During data analysis, the researcher organized and coded the data using NVivo 11 coding software. The researcher formulated expected
themes and patterns from literature findings, and compared these with the empirical findings. The researcher used the modified van Kaam method by Moustakas (1994) to analyze data with perceptions on AT implementation as the central phenomena. The following steps indicate how the researcher analyzed the data in this study (Moustakas, 1994):

1. Listing and preliminary grouping of the experiences from the interviews
2. Reduction and elimination of codes or invariant constituents
3. Clustering and thematizing of the invariant constituents
4. Final identification of the invariant constituents and themes
5. Construction of the individual textural descriptions
6. Construction of the individual structural descriptions
7. Integration of both the invariant constituents or the other imperative perceptions and experiences of the participants and final themes

The use of an exhaustive description in the modified van Kaam method of phenomenological analysis by Moustakas (1994) allowed for interpretations of data to be reduced to common themes and patterns experienced by the participant. After data were coded, analyzed, and interpreted, the researcher constructed a final report.

**Definition of Terms**

In the present study, a clear understanding of key definitions associated with assistive technology is needed. The researcher used the following terms throughout this dissertation.
Assistive technology (AT). Assistive technology is defined as tools used to enhance information access and communication abilities of students with disabilities or physical impairments (Wong & Cohen, 2012).

Teachers of visually impaired students (TVIs). Teachers of visually impaired students are professionals that have expertise in teaching students with visual impairments and recognizing how visual impairments affect learning (Wong & Cohen, 2012).

Technology. In TPACK theory, technology is defined as a collection of tools or methods used to assist in information delivery and processing (Pamuk, 2012).

Content. In TPACK theory, content refers to information and knowledge acquired (Pamuk, 2012).

Pedagogy. In TPACK theory, pedagogy consists of information acquired about the ways in which students learn (Pamuk, 2012).

Assumptions and Limitations

Assumptions, limitations, and delimitations must be addressed within the study’s research design. Researcher perceptions and biases about the study may influence study results. For instance, the researcher may begin interviewing participants with assumptions about the type of responses that would be uncovered during interviews. In order to keep biases from affecting how information is interpreted, the researcher utilized field note journaling to document personal assumptions and beliefs, concerns, and comments throughout the research.

The researcher addressed this limitation by incorporating field note journaling to document researcher biases, concerns, and comments that occur throughout research. In
addition, participants may experience changes in opinion about their experiences over time. TVIs may currently experience problems due to issues such as a lack of funding or proper training, but these problems may not be as relevant as other concerns as time goes on. To address this limitation, the researcher asked the participants to describe their perceptions about their particular circumstances and determine whether they foresee any changes in perception in the future. Finally, concerns with privacy and perceived job vulnerabilities associated with criticizing school policies may also have influenced participant responses. Participants may have worried that expressing negative perceptions might affect their performance and functioning within their job roles. However, participants were informed that all information would remain confidential and would not have an impact on their jobs. The use of IRB approval, discretion measures, and confidentiality assurances ensured that the data remained confidential and anonymous.

Summary and Organization of the Remainder of the Study

The purpose of this interview-based study was to explore the perceptions and experiences of teachers of visually impaired students using TPACK theory frameworks. The sample consisted of five participants from five North Carolina Rural County School Districts. The researcher performed semi-structured interviews to gather data on the perceptions and experiences of teachers using assistive technology in rural school districts. The researcher used the modified van Kaam method by Moustakas (1994) to collect and analyze data in order to identify themes that reflect the shared, lived experiences of teachers of visually impaired students.

In this chapter, the researcher discussed the background of the study, problem statement, purpose of the study, research questions, methods for advancing scientific
knowledge, research significance, methodology, research design and methods, key terms, and study limitations. In Chapter 2, the researcher will provide a review of the literature and key findings on assistive technology implementation and competency. In Chapter 3, the researcher will discuss the current study’s research methodology and design considerations, and will provide a flow chart of the methodology. In Chapter 4, the researcher will provide a discussion of the study’s results. Finally, in Chapter 5, the researcher will provide an analysis of the study’s implications, limitations, and recommendations.
CHAPTER 2: REVIEW OF RELATED LITERATURE

Introduction

Assistive technology has shown great promise for improving the in-class lessons for visually impaired students; however, more research is required to determine what methods can create effective technology resource implementation. Mainly, teachers lack the proper training and have a tendency for low self-efficacy (Ervin-Kassab, 2014). Often this is caused by the lack of competent assistive technology training programs. Another factor to consider is the demographic information and background of the teachers, which include their gender and ethnicity (Koh, Chai, & Tsai, 2014). In rural school districts, this problem is multiplied and further complicated by a literature gap that concerns how well assistive technology performs among visually impaired students (VIS; Quintana & Zambrano, 2014). More research is necessary to understand how assistive technology can be better incorporated into rural schools, due to the lack of investigative research in rural teacher technological pedagogical content knowledge.

The current researcher intended to provide information to help resolve some of the barriers assistive technology has when being integrated into the classroom environment by investigating the perceptions and experiences of teachers that work with visually impaired students in rural schools. This will aid in supplying more information on how TVIs regard assistive technology (AT) while utilizing technology in their classrooms as they interact with visually impaired students. Assessing their technological abilities and knowledge will also be considered. Another focus is to include a diverse sample of rural TVIs within the context of gender and social-cultural constructs. This study was performed as a systematic review which identified the impacts of AT on TVIs,
obstacles in implementing the technology in rural school districts, AT competencies, as well as the theory and framework of technological pedagogical content knowledge (TPACK).

In this literature review, the researcher will provide an analysis of current literature that offers data that can further advance the subject matter of TVIs interacting with visually impaired students through assistive technology, within the framework of TPACK. The first section reviews the literature search strategy and key terms. The second section covers the TPACK theory, and analyzing the data within its framework. The third section discusses the efficacy of AT in visually impaired classrooms in diverse settings. The fourth section will review how confident TVIs are working with AT. The fifth section will provide data on how much of an impact AT has on VIS. Lastly, the final section of the literature review will relate any significant findings in the context of the TPACK theory. The researcher ends the chapter with a summary and conclusion of the literature review.

**Literature Search Strategy**

For this literature review, only two databases were used to search terms: Science Direct and Google Scholar. The main key terms used in the search were in this order: assistive technology visual, assistive technology teachers, assistive technology barriers, assistive technology rural visual, TPACK theory, TPACK assistive technology. These key terms pulled relevant articles, which the researcher chose based on how closely they provided data on the topics of TVIs working with AT, AT’s impact on AT, and TPACK theory benefits and obstacles.
The more historically classic studies were identified as being the most cited peer reviewed papers. The original theorists are identified as Koehler and Mishra (2009). However, only recently published peer reviewed articles (from 2012-2016) are discussed in this literature review.

**Theoretical Framework**

Technological pedagogical content knowledge (TPACK) is the theoretical structure of this study, which is comprised of content, pedagogical, and technological knowledge in a technologically enhanced learning environment. These combined principles can create the groundwork for helping teachers become competent in teaching visually impaired utilizing technology through the application of these concepts. This means that teachers require skill or experience in teaching employing classroom technology in order to have a significant impact on students (DePountis et al., 2015).

Figure 1 shows a visual representation of the TPACK

![Figure 1. Visual Map of TPACK](image-url)
Although assistive technology may have many benefits, several difficulties arise due to teacher competencies and whether instructional methods are effective enough for students with visual impairment (Ajuwon, Meeks, Griffin-Shirley, & Okungu, 2016; Borg & Östergren, 2015; Cohen & Perling, 2015; Hechter & Vermette, 2013). The main problems include how well teachers of visually impaired students are trained, and how well they are able to integrate it into classrooms. This issue makes it most difficult for students to catch on to the new equipment, because of this instructional flaw. At times, teachers are not able to use the full potential of the technology due to their own limitations.

Obstacles in creating policies that educators and scholars plan to adopt in schools play a huge part. Identifying what legal requirements and justifications for creating a general guideline among teachers is necessary; however, defining this is difficult due to the ambiguity and lack of research on what the universal needs of visually impaired students may be (Ajuwon et al., 2016; Hechter & Vermette, 2013). The TPACK theory allows for a unique approach that can be tailored to each individual student, and teacher, for diverse needs.

The accessibility of assistive technology is narrow, due to the lack of qualified teachers of visually impaired students, the availability of time for technological instruction and adjustment within the school curriculum, as well as the purchase of assistive technology equipment due to the cost (Flanagan, Bouck, & Richardson, 2013). For a more integrative approach, TPACK can expedite the process of allowing teachers to get up to speed with improved training practices, as well as help aid in the selection of
proper computer systems that are cost effective and best tailored to each classroom environment.

With the TPACK theory in use for special education teachers of the visually impaired, there are several learning designs which can help benefit student performance (Ajuwon et al., 2016). Utilizing TPACK also shows that teachers using technology who belong to professional-education organizations have higher levels of confidence in both assessment and technology” (Ervin-Kassab, 2014). Improving the confidence of teachers in programs, as well as improving their self-efficacy, is part of the theory’s strategy.

The TPACK theory is often not incorporated into rural settings, nor is it mentioned much in literature due to the lack of resources available to rural communities. Among the barriers currently preventing proper implementation, it would seem rural communities forego technology due to it being more of an extra complication, rather than a beneficial practice. For this reason, this study addressed what TPACK can do for teachers of visually impaired students in order to aid students in their academic progress.

**Obstacles for Visually Impaired Teachers**

Significant barriers prevent teachers of visually impaired students from properly employing integrating assistive technologies in the classroom environment due to the lack of skill training and assistive technology proficiency. In a study for technology integration in K-12 classes, 80% of all teachers expressed that technology was available, but it was found that a quarter of respondents expressed frustration after experiencing barriers that handicap effective technology integration in their classrooms (Hechter & Vermette, 2013). Teachers reported obstacles such as cost, usability, lack of training and little experience (Flanagan et al., 2013). When observing middle school special education
teacher’s perception in a study, Flanagan et al. found that teachers perceive assistive technology to be effective but rarely used. Although, previous successful experiences that involved assistive technology in the support of student learning has helped to encourage its use, and was received as beneficial and advantageous by teachers. The overarching theme of teachers' reports indicated that they generally needed more experience and knowledge in assistive technology to use it to its full capacity. Studies showed that stigmatization, cost, access, and knowledge/training for teachers and students were the main issues at hand (Flanagan et al., 2013).

In a quantitative descriptive experiment by Hetcher and Vermette (2013), it was shown that the dominant barriers teachers observed in class while working with assistive technologies were time, support, budget, training, and resources. This is similar to some of the issues Flanagan et al. (2013) observed—specifically, training and budget. In combination with the limitations in resources, there were also inadequacies in pre-service training and professional development (Wong & Cohen, 2012).

According to Borg and Ostergren (2015), a scarcity in affordability was the prime reason for not possessing assistive technology. Their study on the perspectives of the users of this technology demonstrated that the types of providers and costs paid differed between users of different types of assistive technology, which can signify three things: assistive technology tends to be inaccessible due to price range, there is no government support for the technology to be used in schools, and there are no statewide protocols or programs for schools to administer the assistive technology. It is on an individual basis for each school.
Using technology requires that TVIs “engage in the arduous process of sifting through a growing number of continuously evolving products” (Zhou, Parker, Smith, & Griffin-Shirley, as cited in DePountis et al., 2015, p. 2). This suggests that not only do teachers have to adjust to applying educational technology, but also continuously train in order to be congruous with new emerging technologies. This can be a major concern for teachers who already feel burdened by other classroom duties. The disunion in AT knowledge and skill among teachers is another significant problem (Wong & Cohen, 2012). Teachers unequivocally acknowledged the benefits of AT but there were still some significant gaps and disconnections in AT knowledge and skills amongst the teachers (Wong & Cohen, 2012). The variance in the teacher’s skill set make it harder to match a training program to a group of teachers, as each individual teacher has a distinct level by which they need to improve upon. Because of this the student’s experience “was limited as inconsistencies in use of and access to AT were dependent on teachers' skills and the availability of equipment” (Wong & Cohen, 2012, p. 1).

A teacher’s emotional state when working with AT can have a primary influence on how the instructor applies AT to educational material. In a study that surveyed 127 participants, Alkahtani (2013) found that there is a major concern with not having a positive attitude, which becomes a primary barrier to using assistive technology. This researcher further noted that 84 teachers required more professional development, and suggested that training these teachers could enhance the use of AT in the classroom. What was also conspicuous is that when integrating ET into schools, attention must be paid to teachers perceptions of the usability of ET in order for integration to be a success (Hart & Laher, 2015). Hart and Laher posited that access to educational technology was
not enough for adequate use, and for successful implementation more would have to be applied to help the teachers use ET. This points to the need for bolstering the self-confidence of teachers, possibly with the help of mentorship and training (Hart & Laher, 2015).

**Assistive Technology Requires Support and Training**

Special education teachers in rural school districts are substantially impacted by ineffective assistive technology practices resulting from a lack of resources and services, geographic isolation, and a lack of support and collaboration networks. The discrepancy in common vision, limited training, insufficient funding, little teacher time, and access to support services are some of the many known problems when attempting to implement assistive technology (Flanagan et al., 2013). Many times, the devices and training were not at all available due to how expensive it is, and school districts cannot stay up to date with latest devices (Zhou et al., as cited in DePountis et al., 2015). DePountis et al. (2015) pointed out that a solution to help with integrating both high and low tech devices into schools is by developing a tool kit. Though not always up to date, the kit and manual would help provide a single source of information on a conservative number of tools, as well as how to use them for each subject (DePountis et al., 2015).

Alkahtani (2013) believed that AT might affect students’ development in a negative way because of the time required to comprehend the technology, which can slow the learning speed for students with disability, as well as the rest of class. Teachers in general who do not have an adequate level of skills and knowledge could utilize pre-service and in-service training to expand their knowledge of implementing assistive technology while using a universal design for learning for students with disabilities.
Alkahtani posited that the lack of knowledge and skills of using assistive technology is a critical issue, with over 93 of the respondents reporting they were hardly prepared to provide assistive technology services for the disabled students in their schools. The author concluded that most of the teachers were not confident in using assistive technology, which is clearly due to the deficit in knowledge and training in the technology. The author further commented that this was crucial for both general education and special education teachers in order to create a successful classroom environment (Alkahtani, 2013).

The underlying theme of lack of knowledge and training was also followed by the inadequacy of knowledge about specific types of technology devices (Bausch, Ault, & Hasselbring, 2015), both being major contenders for barriers to proper AT classroom implementation. Other shortfalls for teacher preparedness utilizing AT implied that they were uncertain about how to choose technology for specific students, and also had a massive unfamiliarity with resources for AT, as well as a lack of clarity on how to teach lessons with AT to students. This perpetuated a lack of confidence in teachers, which can prevent teachers of visually impaired students from using AT to its full capability (Bausch et al., 2015).

Such a situation was presented in a study where teachers responded to low-tech devices positively, but electronic assistive technology devices negatively (DePountis et al., 2015). DePountis et al. found that students were more efficient with their traditional calculation technique, however over time their performance with the VISO was equivalent. The voice input/speech output (VISO) calculator was a device newly introduced to students and teachers, the participants indicated that the new technology
had great benefits, since it provided them with increased autonomy for solving difficult mathematics problems (Ajuwon et al., 2016). However, because of the leap required to learn the new technology, there was a delay in where the classic learning methods prevailed. Data showed that the students did not excel more with the new technology, but only that it performed just as adequately as the usual learning methods. Perhaps it is the lack of student comprehension when handling the technology, in addition to no pre-service training for teachers, which prevented the technology from improving student performance.

**Potential Impact of Gender, Demographics, and Socioeconomic Status**

Researchers have shown that teachers’ perceptions of TPACK can directly impact their ability to apply assistive technology in classrooms, but more specifically, the impact of gender perceptions, socioeconomic status, and demographic influences are not entirely understood. In addition to the lack of qualitative research on assistive technology competence perceptions, few scholars have considered the impacts of ethnicity and gender on assistive technology integration in teachers of visually impaired students (Teo et al., 2015).

Borg and Ostergren (2015) felt that age, gender, type of impairment, and socioeconomic status need to be considered when planning and implementing equitable provision of assistive technologies. In contrast, Teo et al. (2015) found that gender groups showed no statistical difference on perceived usefulness, attitudes toward technology, or intention to use technology in a study that investigated gender differences in pre-service teachers. However, Teo et al. also observed that female pre-service teachers had lower scores when they commented on the perceived ease of use. This implies that
female pre-service teachers found technology more difficult to adjust to than their male peers.

In general, Koh et al. (2014) found that teachers’ age and gender were not significantly relayed to their TPACK for Meaningful Learning. Gender differences were reported for TK, TCK, and TPACK in a study done on TPACK for Meaningful Learning on a group of practicing teachers (Chai, Koh, & Tsai, 2013). Male teachers had rated themselves significantly higher than their female peers on the survey. However, a stepwise regression analysis revealed that teaching level and teaching experience have significant influence on the development of TPACK, but not age and gender (Koh, Chai, & Tsai, 2013).

In a similar study on using TPCK for Meaningful Learning Survey, it was found that teachers’ perceptions of technological pedagogical knowledge, technological content knowledge, and technological knowledge had the largest positive relationships when in the process of implementing constructivist instruction using technology (Koh et al., 2014). Rather than gender or age making a big impact, Koh et al. found that primary school teachers and those with more teaching experience tend to be less confident in their pedagogical content knowledge. This demographic of primary school teachers and older teachers carry no further explanation, and would need to be further researched for a better understanding of how teaching status impacts confidence level.

In the same study done by Koh et al. (2013), the researchers revealed that when teachers develop intermediate forms of technological pedagogical content knowledge, it aids in contributing to their confidence for constructivist-oriented technology integration. Previous experience, and even elementary comprehensive knowledge on the use of AT,
had more of an impact than the demographic background of any teacher. The strongest factor for teachers’ success in establishing AT in classrooms is that they are strictly confined to pre-service teacher education (Herring, Koehler, Mishra, Rosenberg, & Teske, 2016).

The absence of research on the impact of social-economic of the ability of visually impaired students to adapt to classroom technology prevents scholars and educators from fully identifying all of the potential barriers. There is a large gap in research that doesn’t clarify how socioeconomic status can influence teacher’s TPACK performance. In order to ensure the equitable provision of assistive technology, services should also consider the age, gender, and socioeconomic status of their target groups (Borg & Ostergren, 2015).

**Assistive Technologies in Rural Schools**

Currently in rural schools, there are vast shortages of fully credentialed teachers and this significantly impacts rural school districts (Ault et al., 2013; Berry & Gravelle, 2013; Gallo & Beckman, 2016). Researchers have found that the challenge of training existing teachers is worse than that of recruiting and training new teachers (UNESCO, as cited in Gallo & Beckman, 2016). Bausch et al. (2015) stated that if educators are going to implement AT in schools as implied by law, AT training should be rigorous as well as inclusive of all areas of AT in pursuance of preparing professionals who are knowledgeable and can serve as qualified members of teams making AT decisions (Edyburn, Higgins, & Boone, 2005).

The shortages of qualified teachers has led to an increase in accepting teachers that are not highly qualified; in addition to this, teachers also have to take on extra
responsibilities to compensate for the deficit. In a survey conducted on special education teachers in 55 rural districts, half of the teachers reported that they shared the responsibility or took a team approach to performing special education services (Berry & Gravelle, 2013). Many teachers may have been satisfied with being an instructor, but were dissatisfied when it came to other responsibilities. Other challenges teachers faced in their positions also included role confusion and a lack of resources (Berry & Gravelle, 2013). In addition to this, other concerns such as overcrowding, high pupil-to-teacher ratios, and decreased educational quality were results of the lack of qualified teachers. Attempts to remedy the situation, such as hiring teachers that are not trained in national standards, only can lead to a decline in educational quality. With other complications occurring in rural schools, a new educational technology for classroom use would not be properly attended to or fully implemented to its best use.

“The UNESCO Strategy on Teachers 2012-2015 emphasized the importance of teacher preparation and building a high-quality teaching force in countries hampered by the lack of teachers” (UNESCO Strategy on Teachers, as cited in Gallo & Beckman, 2016, p. 1). The amount of unqualified teachers that are growing in rural schools could further prevent visually impaired students due to the lack of attentiveness to their unique, and already difficult, situation. It is common when unqualified teachers in rural schools often lack the knowledge and skills required to use technological instructional techniques and intervention practices (Gallo & Beckman, 2016).

Students with disabilities are negatively impacted by a lack of teacher preparation and poor quality of assistive technology services. Less than 20% of special education teacher time is allotted to instruction across programs nationwide, and 17% on general
and special education paperwork (Vannest, Hagan-Burke, Parker, & Soares, 2011). Gallo and Beckman (2016) also reported that issues related to teacher preparation, recruitment, and retention is the most widely acknowledged difficulties when solving the quality challenge.

Special education teachers in rural school districts face particular barriers to effective assistive technology integration (Ault et al., 2013; Berry & Gravelle, 2013; Gallo & Beckman, 2016). The major external barriers are access to technology, time, training of technology use, and support (Hechter & Vermette, 2013). In general, rural special education teachers end up teaching a wider range of students who come from a motley of locations, which gives instructors a much wider range of responsibilities with an increased lack of resources.

Another barrier concerns the huge divide in the income and lifestyles of urban and rural dwellers (Narsey, as cited in Herring et al., 2016). In rural schools, one of the core issues is that some of the teachers have hardly used computers and more than 50% of the teachers are not computer literate (Herring et al., 2016). This meant that rural schools simply did not have the financial capacity to purchase new or used computers and other educational accessories.

Sundeen and Sundeen (2013) also reported that access to technology is not universally available to all districts or schools. In general, rural special education teachers had little to no support networks, lower wages, and very little professional development. Their career opportunities were also limited, which could be highly discouraging. The authors found that decreased funding and budgetary constraints have a direct impact on technology acquisition in many rural school districts (Sundeen & Sundeen, 2013). Large
school districts had funding allocations readily available for computers and other educational needs. Rural districts have unique needs, and may have to rely on alternate funding—perhaps grants or fundraising—for instructional technology needs (Sundeen & Sundeen, 2013).

Even though the number of visually-impaired students are not significantly huge in public schools in rural North Carolina, many students need specialized education. From pre-kindergarten to Grade 12, a total of 667 students are visually impaired in public schools in North Carolina. Table 1 shows the statistical information for visually impaired students in public school from prekindergarten to Grade 12 from the 2016 census in North Carolina.

Table 1

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prekindergarten</td>
<td>74</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>38</td>
</tr>
<tr>
<td>Grade 1</td>
<td>43</td>
</tr>
<tr>
<td>Grade 2</td>
<td>44</td>
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<tr>
<td>Grade 3</td>
<td>46</td>
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<tr>
<td>Grade 4</td>
<td>47</td>
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<tr>
<td>Grade 5</td>
<td>35</td>
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<tr>
<td>Grade 6</td>
<td>42</td>
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<tr>
<td>Grade 7</td>
<td>44</td>
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<tr>
<td>Grade 8</td>
<td>50</td>
</tr>
<tr>
<td>Grade 9</td>
<td>68</td>
</tr>
<tr>
<td>Grade 10</td>
<td>44</td>
</tr>
<tr>
<td>Grade 11</td>
<td>45</td>
</tr>
<tr>
<td>Grade 12</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>667</strong></td>
</tr>
</tbody>
</table>
Rural Schools Have Little Support

The lack of resources and help available to rural schools make it increasingly difficult for visually impaired students, and their instructors, to benefit from AT. Limited resources, which include human, financial, material, and time, in these schools can influence their use of IT and contribute to the rural digital divide (Kurbanoğlu et al., 2014). Rural schools also have less access to universities, as well as collaborative research networks, which can aid in preparing teachers for utilizing new technology programs.

Special education teacher preparation systems in rural areas must incorporate methods to improve assistive technology competency in teachers (Ault et al., 2013; Berry & Gravelle, 2013; Gallo & Beckman, 2016). The need to improve upon the current deficit in resources is necessary for rural schools in order to prevent them from falling behind their urban counterparts. Support systems and mentoring networks to address special education and assistive technology needs must be developed (Quintana & Zambrano, 2014).

Other findings implied that it was necessary to provide more pre-service and in-service preparation in order for teachers to most effectively engage students with significant disabilities as well as more preparation for special education teachers and para-educators in both collaboration and specific assistive technology expertise (Cramer, Coleman, Park, Bell, & Coles, 2015). Because of the various difficulties already faced by rural teachers, having a supportive system that can encourage their pedagogical performance will better benefit rural students in their learning capacity. Additionally, in order to provide more insight into how rural teachers of VIS can best apply technology,
more technology integration techniques are necessary. Special education teachers need to base their lessons off of evidence-based practices in order to properly provide education (Cramer et al., 2015).

Learning models can be created for rural teachers, in order to create a more standardized approach. Ingersoll and Strong (2011) found that transforming teachers' attitudes is as important as improving their skills. Teachers also preferred personalized training and face-to-face collaboration when learning new skills. Other research shows that teacher mentoring has a positive effect on pre-service teachers’ experience in education (Ingersoll & Strong, 2011). These types of support modules could be implemented in rural schools to encourage teachers to surpass their inability to adapt to new technology, despite their isolated circumstances.

Other ways to help instructors would be to introduce to them previous lecturers and mentor teachers who can explain “authentic cases of teachers utilizing various technology resources in their classrooms” (Peled & Oster-Levinz, 2015, p. 187). Additionally, Peled and Oster-Levinz suggested providing further opportunities for rural teachers to explore new and innovative technologies, which would further help when providing pre-service teachers with opportunities to implement activities that effectively utilize technology in authentic classroom settings. This would accommodate the teachers and build up the validity of the use of technology in classrooms, such that teachers can feel more confident in the process through a genuine approach.

**Systems are Necessary for Teacher Evaluation**

It is apparent that teacher evaluation in the United States needs an “overhaul” (Darling-Hammond, Jaquith, & Hamilton, 2012). Darling-Hammond et al. felt that
Teacher evaluation should be solely on professional teaching standards; it should be sophisticated enough to weigh teaching quality across the continuum of development from beginner to advanced teacher. In their study, Darling-Hammond et al. also explained that evaluations should also provide evidence of teacher practice and student learning, as well as professional contributions. Collaboration was another part of the evaluation process that they valued. Darling-Hammond et al. also felt that teachers and administrators should be the ones overseeing evaluation strategies.

Holdheide (2013) stated that districts and states can collaborate with teachers of students with disabilities to design educator evaluation systems that promote the inclusion, collaboration, integration and shared understanding of teacher practice measures, which include measures of student growth for personnel working with disabled students. Holdheide felt that this can be applied to the unique challenges of educators for students with disabilities, as well as positively impact teacher performance.

**Assistive technology competence.** In a study that spotlighted the capabilities of assistive technology in improving scholastic achievement of visually impaired students, a digital game encouraged visually impaired students to interact with their lessons by supporting them to use computer applications that were straightforward and entertaining to use (Argyropoulos et al., 2014). The researchers proposed that utilizing assistive technology devices would be useful. The findings of the study indicated that the digital educational game constructed a collaborative way for teachers to combine their knowledge in assistive technology, and enhance collusion with their students. The study showed that assistive technology devices encouraged visually impaired students to
interact with their lessons by supporting them to use computer applications that were straight forward and entertaining to use (Argyropoulos et al., 2014).

Other goals for the instructors of visually impaired students include obtaining Braille literacy for students. This is an important goal was examined by a study on the accuracy of Braille spelling among visually impaired students, with results that revealed that students with total blindness gave more correct answers, and felt that technology would aid in improving Braille accuracy in spelling (Argyropoulos, 2015). Batorowicz, Missiuna, and Pollock (2012) also stated that assistive technology can improve the writing skills of students with learning disabilities.

Types of useful assistive technology include screen magnifiers, closed-circuit televisions, screen readers, electronic magnifiers, portable and refreshable Braille displays, scanners and optical readers, accessible cell phones, digital and electronic data, and digital readers (Wong & Cohen, 2012). However, the competency of each device requires further research in order to be confident that it is capable of being integrated into a classroom, as well as allowing students to improve their learning.

On a quantitative analytics report that questioned whether assistive technology would effectively meet the unique needs of their students, Ajuwon et al. (2016) found that present literature varies on what assistive technology can provide due to the unique preferences and learning habits of individual students; however, generally speaking, most assistive technology provides positive results when properly incorporated into classrooms. Some of the reviewed researchers agreed that technology is a major bonus to helping students. Kamei-Hannan and Lawson (2012) observed how students were more engaged in writing tasks, displaying higher quality of work when using a Braille note
taker that differed from the standard Perkins Braille brand. Lusk (2012) reported that preferences and performances varied depending upon what optimal magnification devices were selected for the unique needs of students.

For visually impaired graduate students who used assistive technology in a study that examined learning outcomes, results showed that the participants improved in the use of devices introduced during the class, with a greater increase in devices specific to visual impairment across three university programs (Kamei-Hannan et al., 2012). These researchers discovered a relationship between the frequency of the use, the skills of the participant, and the perceived importance of the devices. All three of these factors played a major role in these graduate students performing well, as their perception of the technology, as well as their ability to use it and how frequently it was used, largely impacted their success rate.

In a study in that investigated the impact of assistive technology on teachers in public primary colleges in Kenya, the results were that natural teaching methods worked better for partially blind students, while totally blind students had a slight increase in performance, but the majority of the partially blind students had high increase in performance (Francis et al., 2010). Natural teaching methods, as opposed to using assistive technology, worked best for the partially blind students. The main significant find of the study did show that AT device intervention, such as use of digital recorder in teaching, can help to improve students’ academic performance.

In another study where interactive boards and tablet computers were distributed to teachers and students, the researchers found that even though both teachers and students were in favor of interactive boards, they were also skeptical about tablet computers
(Schelly, Anzalone, Wijnen, & Pearce, 2015). The results varied, as some teachers and students utilized the tablet computers and interactive boards, however in some cases there was no use of tablet computers at all. If the researchers had proposed a method of implementing the new technology, and tying it in to education in a beneficial manner rather than as an option, it is possible the outcome would have been different and there would be more engagement with electronic devices.

In some instances, assistive technology had the potential to either enhance learning environments or exacerbate student disabilities and difficulties. In one study that introduced digital textbooks it schools, the researchers suggested that if there is a general resistance to using new technology, schools should cautiously adopt digital textbooks, due to the lack of adjustment (Bouck, Pei-Lin, & Satsangi, 2016). In many environments, assistive technology is underutilized due to lack of awareness, inadequate support, lack of training, and a lack of collaboration, and limitations in integration and education of teachers. If the assistive technology is badly perceived, it can have a negative impact on the way teachers are exercising it in classrooms. Such could be seen in the case of Bouck et al., where students were maladaptive to the new technology and worked better with textbooks, as opposed to the new digital textbooks.

Brayda, Serino, Wilhelm, and Macé (2015) stated that many assistive devices that initially look promising at a superficial level do not go beyond original curiosity. They pointed out that the most repeated failures were at the design stage, including the lack of serious clinical tests proving the effectiveness of the stimulation methods (Brayda et al., 2015). At the end user level, failure comes from the interference of this new signal with the residual sensory channels and/or the negative impact in the social life of the person.
For these reasons, the joint effort of researchers and experts in the rehabilitation field is a mandatory step to design well-targeted, useful, socially acceptable novel devices.

In a study that explored how well assistive technology performed for middle school special education teachers, results implied that the teachers' perceived assistive technology as an effective tool for literacy, but they rarely used it (Flanagan et al., 2013). This was mainly due to barriers such as lack of training and experience, the cost, and usability, as opposed to the technology itself. Were those barriers not preventing engagement, it is highly possible the technology would be better put to use.

Nees and Berry (2013) reported that it is certain that there are potential benefits of audio assistive technology and accommodations, however barriers remain when incorporating audio in education for people with disabilities (Nees & Berry, 2013). Some examples of problems with technology include stigma associated with assistive technology, delivery of audio, technical difficulties, and validity in audio tests. Some of these problems are simply a part of working with technology, and can only be removed by proper care and training, as well as a support system. All of these resources need better organization as they are already incredibly scarce in rural educational settings.

Rosenblum and Herzberg (as cited in Lancioni & Singh, 2014) performed a research on visually impaired students using tactile graphics, finding that 65% of teachers of students with VI reported they need more training in creating and teaching with tactile graphics (Rosenblum & Herzberg, as cited in Lancioni & Singh, 2014). Because of this lack of training with such equipment for learning, it could be that something this complex, though with great potential, could be entirely impractical for teachers who do not have the time or the confidence to learn tactile graphic technology. Lancioni and
Singh commented by stating that the infrequent use may be the cause of little preparation among teachers to employ tactile graphics in their lesson plan. In order to avoid the failure of an assistant technology in class, it is suggested that as a best practice for students to take advantage of the variety of choices available to efficiently complete school tasks, it is necessary that they are proficient in multiple methods and tools for learning (D'Andrea, 2012). However, that also means that teachers should be ready to employ different methods and instructional techniques in order to help prevent assistive technology from hampering student’s scholastic achievement.

**Student environment can impact assistive technology implementation.** It is possible that the learning environment for visually impaired students may create vulnerabilities in technology competencies. Although assistive technology has been relatively successful in the United States, in Singapore knowledge of AT is inadequate and its use by teachers of students with visual impairments is inconsistent (Wong & Cohen, 2012). Wong and Cohen suggested that assistive technology needs to be seen as a complementary tool to teaching rather than a main one, without it competing with Braille. If the educational facilities had better training, there would be better professional development courses available to allow teachers to be able to fully implement assistive technology.

In another study on students in secondary education with total blindness in Greece, there was no significant correlation found between Braille spelling accuracy and educational setting (Tsiakali & Argyropoulos, 2015). Students were enrolled in a few different educational settings such as “mainstream” educational settings and special schools. Regardless of the location, the results between schools did not change. This
implied that the teachers were all trained to the same capacity, or simply that there was less stigma associated with assistive technology between students.

Some students still face difficulties in using assistive technology due to inadequate curriculum and instruction and the inconsistency and unpredictability of assistive technology information. Teachers indicated they needed more training on available technology for their students in a review on assistive technologies for diverse abilities (Lancioni & Singh, 2014). Disconnections in assistive technology knowledge and skill are still very prevalent in teachers of visually impaired students. Many teachers expressed a sense of isolation from their students, their career work, and their peers as a result of limited interactions due to significant institutional barriers (Hawkins, Barbour, & Graham, 2012). Burgstahler (as cited in Alkahtani, 2013) stated that a universal design would be the best approach, which is the design of products and environments that can be understood and used by all people, to the maximum ability. This could help standardize all the vast technologies that are available on the market today, and simplify products for teachers in an effort to make them more comfortable with educational technology.

Some educational facilities simply have a lack of standards and training impacts assistive technology competency. Argyropoulos (2015) reported that more evidence-based research on Braille literacy programs is needed to guide teachers who teach students with visual impairment, which includes strategies to help develop a more positive academic predisposition. Often, integration of assistive technology is decided by teachers and is frequently overlooked. Zhou et al. (2012) proposed that all university programs develop a course on assistive technology, as well as incorporate assistive technology competencies in their training curriculum. These authors felt that professional
organizations should provide in-service training in order to have teachers acquaint
themselves with assistive technology, to prepare them for use with students. Because
resources are often limited for special education teachers, this would aid in preventing
teachers from feeling isolated or disconnected. Additionally, this can cut down on
wasting time being unable to properly handle the technology. Teachers believe that
learning and applying the technology impacts the amount of time they have available,
however with assisted training and support, it can expedite and simplify the process for
teachers.

**TPACK Theory Techniques**

Researchers have shown that assistive technologies provided significant and
beneficial results for the betterment of student performance (Sterian & Mocanu, 2015).
However, without in-service professional development opportunities and pre-service
education, teachers are not able to properly implement assistive technology. Placing
technology in a classroom environment does not ensure success, as the meaningful
incorporation of technology requires pedagogy and content to give it direction.
Pedagogical knowledge has a direct impact on TPACK learning even at the beginning of
a course, since the lack of pedagogical experience limits development of appropriate
technology integration approaches (Pamuk, 2012).

Koehler and Mishra (2009) stated that the framework of TPACK represents a
formulation of concepts, knowledge of what makes concepts easy or hard to learn,
epistemology theories, knowledge of students’ prior knowledge, and pedagogical
techniques (Quinn, 2012). This involves the knowledge of teaching strategies, their
significance for student learning, as well as how the student contributes to the learning
process. This can also be seen as the “understanding of the manner in which technology and content influence and constrain one another” (Herring et al., 2016, p. 16). An involved understanding of how the curriculum can be changed by the application of technology, as well as identifying which technologies can be used specifically to promote learning, are also an integral part of the theory. TPACK will become increasingly critical, because although teachers need to acquire the ability to use tools that are currently available, they will continue to learn new techniques and skills when technologies become obsolete over time. Teachers had a more stable educational environment prior to the increased use of technology.

Currently, there are many contradictions and confusion about TPACK epistemology (Cavanagh & Koehler, 2013). TPACK is generally understood within university-based teacher education communities as the knowledge needed to incorporate technologies, and especially digital tools, effectively in teaching and learning (Harris & Hofer, 2014). This is due to the disparity in what exactly is the purpose of TPACK measurement, in order to properly gauge how well the TPACK learning system is performing, as well as knowing what appropriate choice or techniques and measurement models (Cavanagh & Koehler, 2013). With the lack of guidance in TPACK theories, various educational facilities utilize TPACK in an entirely personalized way. TPACK as a technique is appropriated to reconnect curriculum and pedagogy with educational technology use after prior technology based professional development was found to be in need of improvement, and re-focused more upon practice than knowledge (Harris & Hofer, 2014). This focus on practice could possibly create gaps in knowledge, with
knowledge being the main driving force behind a successful implementation of assistive technology.

The context in which TPACK is utilized is a key component of its success. However, efforts to measure the success of TPACK have been limited due to the lack of sufficient validity and reliability criteria of educational research and the technological pedagogical content knowledge (TPACK) framework. This tends to be lacking from TPACK research, as well as not completely clarified (Rosenberg & Koehler, 2015).

Cavanagh and Koehler (2013) proposed a seven-criterion lens in order to help researchers outline measurement techniques and principles in order to secure validity and reliability in TPACK research. Harris and Hofer (2014) stated that the primary themes that deal with the appropriateness of the TPACK theme are made up of three components. Harris and Hofer viewed TPACK as a way to connect isolated professional development initiatives, and with the increased collaboration teachers can have a better support network. They also saw TPACK as way to solve professional development problems. Additionally, TPACK has become an organizational learning process, one that can be possibly replicated and bring guidance in order to implement a functioning standardized program. Not every school reflected the themes by which Harris and Hofer developed, but they saw this trend emerge around these three major themes.

According to Harris and Hofer (2014), “Culture trumps everything you do” (p. 4). Connecting and interpreting TPACK along with current and past curriculum and professional development initiatives had a major impact on how TPACK constructs are implemented into the school (Harris & Hofer, 2014). Their studies on surveying teachers from seven school districts presented a new phenomenon, wherein participants described
a shift in their perception and professional development away from a “tool-centric”
approach to a more holistic, TPACK-based approach (Harris & Hofer, 2014). The
approach was to limit the focus on practicing technology, and increase the other areas of
TPACK development.

TPACK is also a great connector. Commentators on the subject matter felt that the
graphical depiction of TPACK’s interrelated components helped them to establish and
strengthen connections among new and existing initiatives in their schools and districts
(Harris & Hofer, 2014). They mainly paid attention to the technology integration
practice, as opposed to TPACK knowledge development. Rather than measuring self-
reported TPACK development, this was more a measure of demonstration in the
classroom itself (Harris & Hofer, 2014).

In a study by Graham, Borup, and Smith (2012), TPACK framework was used as
a lens for comprehending teacher candidate decision making skills in the use of
information and communication technology for classroom teaching. “The research
showed significant student growth in the use of rationales grounded in content-specific
knowledge and general pedagogical knowledge” (Graham et al., 2012, p. 1). This
supports the idea that focusing not on technology alone, but on pedagogical and content-
specific knowledge, increasingly works to the benefit of student academic achievement.
It was also found that rationales in relation to general technological knowledge did not
change, but remained constant in influencing student growth.

Impact of TPACK. TPACK theory helps allow for a skill enhancement, a more
tailored instruction for each individual, as well as the ability to create diverse methods in
order to teach an equally diverse class of students. On a study done on 354 practicing
teachers to examine their constructivist-oriented technological pedagogical content knowledge perceptions, Koh et al. (2014) found “that teachers’ perceptions of technological pedagogical knowledge, technological content knowledge, and technological knowledge had the largest positive relationships with their constructivist-oriented technological pedagogical content knowledge” (p. 1). Other interesting things to note were that teachers with more professional experience were less confident of their pedagogical content knowledge, as compared to teachers with less experience. The findings also were not related to the teachers’ age or gender. “When teachers develop intermediate forms of technological pedagogical content knowledge, it contributes to their confidence for constructivist-oriented technology integration” (Koh et al., 2014, p. 1).

In a study on interactive whiteboards (IWB) utilizing TPACK as a vehicle in an elementary school context, there were significant differences in the teachers’ TPACK with the IWB use (Jang & Tsai, 2012). Jang and Tsai found that science teachers had a higher level of TPACK implementation than mathematic teachers, however there were no significant gender differences. TPACK differed on the basis of teachers’ varying amounts of teaching experience, similar to Koh et al. (2013) study which came to the same conclusion. In this case, however, those who had more years of teaching experience demonstrated significantly higher TPACK than did teachers who had fewer years of teaching experience, which is in contrast to Koh et al. (2013) findings where teachers with more experience had less confidence.

Jang and Tsai (2012) also found that experienced science teachers tended to rate their content knowledge and pedagogical content knowledge in context (PCKCx)
significantly higher than did novice science teachers. The science teachers with less professional experience rated their pedagogical content knowledge in context even higher than teachers with more experience. Additionally, in this study gender and teaching experience became influential factors as well.

Koh and Chai (2014) found that in-service teachers who were more confident in their pre-course TPACK were able to deepen the connections between content knowledge and TPACK after ICT lesson design. However, those who were less confident perceived deeper connections between pedagogical content knowledge and TPACK (Koh & Chai, 2014). Researchers have pointed to information communication technology lesson designs as being an effective conduit for their TPACK development as it supported them to make connections among knowledge sources (Koh & Chai, 2014). These results did not indicate if the teachers’ unique perceptions influenced their TPACK development, or their engagement in information communication technology design activities.

Mouza and Karchmer-Klein (2013) investigated the insights from pre-service teachers’ perceptions on TPACK framework. Their expectations indicated that key components of the course were favorable in creating a greater appreciation of technology in the context of content and pedagogy (Angeli & Valanides, 2013). Unfortunately, their explanations did not provide detailed information on how they would do so concerning content and pedagogy” (Mouza & Karchmer-Klein, as cited in Angeli & Valanides, 2013).

A study on an integrative pedagogical approach analyzed survey responses of pre-service teachers, with findings that revealed that participants had experienced benefits in all the TPACK constructs. Teachers applied their knowledge in practice even though
there was inconstancy in the ways in which knowledge domains were represented in participants’ narratives (Mouza, Karchmer-Klein, Nandakumar, Ozden, & Hu, 2014). TPACK constructs were successfully despite how dissimilar they were in application, with major benefits stemming from the flexible knowledge provided by TPACK methodology and theory.

Technology can be used as a tool to help the academic staff to deliver more effective inside and outside the classroom setting (Lye, 2013). Institutions can use a combination of pedagogical knowledge, technology knowledge, and content knowledge to enhance students’ learning capability” (Lye, 2013). Lye’s study was based on improving student’s learning capabilities in private higher education levels, but the flexibility of TPACK implies that it is capable of being used in a variety of learning environments.

Barriers in TPACK implementation. TPACK differs when applied to university classrooms, as opposed to primary and secondary schools. Though TPACK has been widely embraced in university teacher educators’ lesson plans, its dispersion in primary and secondary schools and districts has been far more reluctant. The results of this study showed that K-12 conceptualizations and functions are different from how the construct has been understood and used in higher educational facilities (Brantley-Dias & Ertmer, 2013). The gradual increase of TPACK implementation in secondary and primary schools makes it difficult to fully apply assistive technology in schools, leaving visually impaired students without the early learning experiences they need.

Technology integration is challenging for teachers when technology is viewed as a separate entity rather than an already embedded practice. The majority of participants
struggled with developing new knowledge. The lack of pedagogical experience constrained the development of appropriate technology integration approaches (Pamuk, 2012). The TPACK theory is known to be effective in special education, as special education relies on the use of innovative teaching methods and effective technology integration methods to address diverse needs of students. However, it also requires the instructor to be flexible, with the need for multiple skill sets. Special education has to incorporate several domains of knowledge and practice, which can limit time allocation availabilities for technological instruction.

In a study by Hechter and Vermette (2013), results analyzed according to the TPACK framework indicated that the leading barriers experienced by all teachers are inadequate access, training, budget, resources, time, and support. The availability of assistive technology greatly depends on the factors of accessibility, cost, and strategic competency when educating with the technology. Teachers that demonstrate TPACK can effectively integrate their knowledge of ICT, as well as their pedagogical and content knowledge, to promote student learning; however, teachers are often considered limited due to their superficial understanding of technology rather than embedded technology integration designs (Graham et al., 2012). According to Pamuk (2012), when creating knowledge bases based on different teaching components, it can be more difficult for pre-service teachers because it requires a “deeper understanding of core knowledge and interpretation of the teaching context and its dynamics” (para. 1).

This relates to the concern about directions and progress in the measurement of the TPACK framework for effective technology integration (Cavanagh & Koehler, 2013). Without the proper oversight to lead TPACK measurement, teachers may feel
unconfident in the application of this framework. Without understanding how to really assess the results and outcomes of TPACK, teachers may not see the full benefits or completely understand how to improve their administration of educational technology. According to Cavanagh and Koehler, some of the main barriers could include the proper selection and use of models and techniques, the lack of purpose for TPACK measurement, and confusion around the epistemology of TPACK.

Difficulties in assistive technology and instructional technology integration are known to impact teacher competencies and effectiveness of instructional methods. The use of assistive technology devices alone does not improve performance or academic outcomes. For this reason, qualifications that a teacher have and their ideas on the teaching-learning process are constantly being questioned by educational researchers (Baran, Uygun, Altan, Bahcekapili, & Cilsalar, 2014).

Additionally, due to the differences in requirements and needs according to individual teachers, it is difficult to establish legal requirements and guidelines in order to justify the use of assistive technology. The widespread use of the TPACK framework has led to different interpretations of the framework, which has called some of the main principles of TPACK into question (Voogt, Fisser, Tondeur, & van Braak, 2015). Because of the different interpretations, the main concern pertains to the way in which the technology is understood and how the knowledge is shared and utilized within the framework. Without a unified approach, there is no defined way in which to implement the TPACK framework. This makes it difficult to create exacting guidelines by which everyone can follow.
Yeh, Lin, Hsu, Wu, and Hwang (2014) interviewed 40 teachers from a variety of backgrounds in different subjects. These researchers aimed to discover the longitudinal and multidimensional development of knowledge of these teachers. Three groups of teachers were identified: technology-infusive, technology transitional, and planning and design. Results indicated that technology transitional teachers were more teacher-centered when inquired about the use of technology and its applications. Planning and design teachers lacked the level of development exemplified by the two other groups of teachers, but were adept in planning and design. Technology infusive teachers were far more student centered than the other two groups. The science teachers’ TPACK were found bound to the level of “simple adoption” (Yeh et al., 2014). The findings implied that the TPACK requires “an accumulation of contextualized and dynamic experiences during ICT implementation in actual teaching” (Yeh et al., 2014 para. 1). Information communication technologies (ICT) require a defined role with previous successful models in which other teachers may follow. The lack of unanimity in TPACK practice makes comprehending the theory’s appropriations difficult. The TPACK perceptions of pre-service teachers can influence their ability to use technology in classrooms, often much more than other factors.

**Implementing TPACK.** While pedagogical knowledge has a big influence on TPACK framework, context also plays an important role. In a study on the construct validity of a TPACK survey, which was contextualized for the pedagogical approaches, Chai et al. (2013) found that the comparison between the pre and post-course models displayed how pre-service teachers’ perceived relations between content knowledge and TPACK converts from insignificant to significant. As Rosenberg and Koehler (2015)
stated in their paper, context is important in regards to technological and pedagogical content knowledge and research, but is usually missing from TPACK research.

TPACK framework can be seen as a lens for comprehending how participant teachers use information and communication technology in their decision making skills. Research results have shown significant student growth in “the use of rationales grounded in content-specific knowledge and general pedagogical knowledge” (Graham et al., 2012, para. 1). In a unique study by Graham et al., 133 pre-service teachers with content-related and grade-level objectives designed learning activities where they used digital technology to teach students. When students were questioned why they chose to use technology, it gave teachers extra insight from which they could further implement their new knowledge. These student responses gave teachers the opportunity to practice instructional decision making skills, as well as reflect on how technology was incorporated in order to support their teaching.

There are another variety of factors to consider when implementing TPACK professional development; In a study by Terpstra (2014) that examined better practices for TPACK development, the author utilized TPACKtivity to employ mediating tools, rules and community, and activity theory to identify objectives as part of activity settings that contribute to, or detract from, TPACK development (Terpstra, 2014). This was done in order to create a lens by which can be applied in a variety of settings for seven pre-service teachers. The findings showed the effectiveness of TPACKtivity lens when sifting through the complexities of TPACK development across a variety of settings (Terpstra, 2014).
Mouza and Karchmer-Klein (2013) garnered insights from pre-service teachers’ perceptions on TPACK framework, where their experiences were investigated. The authors’ expectations indicated that key components of the course were influential in encouraging a greater appreciation of technology in the context of content and pedagogy (Mouza & Karchmer-Klein, 2013). Unfortunately, their descriptions lacked more detailed information on how they planned to when considering problems with pedagogy and content. The importance of having a strategy by which to implement their methodology could not be expressed more deeply here.

In a study by Kramarski and Michalsky (as cited in Angeli & Valanides, 2013), the researchers compared two groups of teachers in order to determine which TPCAK model performed better. One group practiced TPCK-SRL, while another utilized TPCK only. The results suggested that after exposure to the TPCK-SRL training model, most of the pre-service teachers’ pedagogical beliefs favored student-centered learning rather than the TPCK group (Kramarski & Michalsky, as cited in Angeli & Valanides, 2013). The TPCK-SRL teachers also were shown to have higher levels of confidence when considering their own technological self-efficacy, helping them to create lessons in a constructivist way.

In another study by Jaipal-Jamani and Figg (2015), the authors explored the usefulness of the TPACK framework is explored and discussed a number of professional learning contexts. This is shown in four stages: modeling a technology-enhanced activity type (learning with the tool) to set the context and purpose for tool use, integrating pedagogical dialog in a modeled lesson, developing activity-specific technical skills (TK in context) through short tool demonstrations, and applying TPACK-in- Practice to
design their own task (Jaipal-Jamani & Figg, 2015). These steps provide an outline in which teachers can develop TPACK knowledge through designing content-centric learning contexts. This guideline can create a new platform by which teachers can create a more tailored approach, while sticking to a collective idea.

A study that developed an e-learning system, which focuses on the development of teachers’ TPCK, was based on the implementation of e-TPCK as well as observing its resulting usefulness (Angeli, Mavroudi, & Christodoulou, 2015, para. 1). This system “deploys a technological solution that promotes teachers’ on-going TPCK development by engaging them in the design of learner-centered and ICT infused scenarios, fostering a self-paced and personalized learning experience” (Angeli et al., 2015, para. 1). This approach also accounts for the preferences, information processing constraints, as well as the teachers’ unique needs. After three cycles of revisions over the past 3 years, the implementation of the e-TPCK follows design-based research, an adaptation from a few theoretical and methodological frameworks. This is a special method by which would also be useful for TPACK implementation in a rural environment, which has special needs and extra obligations that weigh upon each teacher.

Another factor to consider when developing a successful TPACK methodology is Jean Piaget’s constructivism, something Piaget observed in children that discovered ways to cope and gain control of their environment (Chai et al., 2013). “Constructivism conveyed the notion that reality is in the mind of the learner” (Jonassen, as cited in Koh et al., 2013, p. 186). This means considering construction as a part of the learning experience, where the components of the socio-cultural dimensions of constructivism support that learning occurred while learners were engaged with the people and tools of
the environment. This deepened the learners’ *enculturation* within the practices of the community (Lave & Wenger, as cited in Koh et al., 2013). Usefulness can be found in the pedagogical methodologies, such as problem-based learning and inquiry-based learning, both created from the theory of constructivism.

Because teaching experiences and teaching levels are found to be correlated with teachers’ confidence for constructivist-oriented TPACK, Koh et al. (2014) suggested that more details studies could investigate teachers in different stages of their professional career. Implementing TPACK in such a way that support the self confidence levels of teachers would provide more successful results. This could include a feedback system, one in which teachers collaborate and reward each other for positive outcomes, or a methodology by which student performance results can be measured easily, providing a tangible method of providing immediate and useful feedback.

Angeli and Valanides (2013) found that technology mapping had a remarkable result when cultivating TPCK competencies. The study revealed findings on 72 pre-service primary teachers, in which there were two main views of TPCK currently in use; The transformative view explains TPCK as a distinct body of knowledge, and the integrative approach sees TPCK as an integrative body of knowledge. Findings showed that the transformative view was effective and efficient in developing TPCK competencies (Angeli & Valanides, 2013). However, these findings were related to the complexity of the task design itself. This could change depending upon what tasks are being employed by teachers.
Summary and Conclusions

Although approximately 20% of the children in the United States are educated in rural school districts (Strange, Johnson, Showalter, & Klein, 2012), there is a huge disparity concerning how the visually impaired students are educated in already an underprivileged environment. Finding a way to work around the barriers concerning the cost, the access, and the proper support network for teachers will require more research efforts in order to create a successful strategy for solving the scarcity of resources in rural schools.

Hechter and Vermette (2013) revealed the implications of school division teacher support when concerning inservice professional development opportunities, planning, and support programs. Themes showed that these components were all integral to the success of teachers utilizing TPACK. According to Sundeen and Sundeen (2013), incorporating TPACK theory in teacher preparation programs improves instructional strategy and technology self-efficacy. TPACK implementation in special education and assistive technology for visually impaired students creates beneficial learning design, which can improve student academic outcomes. In a study that investigated the impact of an integrated approach to the development of pre-service teachers' technological pedagogical, findings exhibited that teachers had significant gains in all TPACK constructs (Mouza et al., 2014). Though there were differences in application, the participants benefited from the integrated approach. This implies that TPACK is flexible in learning environments and can be tailored to each teacher’s needs.

Overall, many of these studies point to the need of providing aid to pre-service and in-service teachers in order to build a deeper understanding of TPACK (Chai et al.,
2013). Additionally, more research is necessary to properly construct a more standardized TPACK methodology that contains more clarity, and better direction.
CHAPTER 3: METHODS

The purpose of this qualitative interview-based study was to determine barriers to assistive technology implementation by examining the experiences and perceptions of a diverse sample of teachers of visually impaired students from five North Carolina Rural County School Districts. In this chapter, the researcher will provide an overview of the study’s research methodology and design, population and sample, materials, data collection, data analysis procedures, and ethical considerations. The chapter concludes with a summary of the key points of the methodology.

Research Method and Design Appropriateness

The current researcher utilized a qualitative research paradigm. Qualitative methods are generally used to capture the narrative experiences of a group of people about a complex phenomenon while incorporating researcher thoughts and interpretations (Lincoln & Guba, 1985). The participants in the study included TVIs in rural school districts in North Carolina. To ensure the heterogeneity of the sample, the demographics of the participants included teachers from different racial and ethnic backgrounds, ages, genders, and professional experience.

Qualitative researchers focus on gaining insights and exploring a phenomenon with depth, richness, and complexity (Marshall & Rossman, 2014). Given these goals for exploration and depth, qualitative research tends to be subjective, inductive, interpretive, and holistic in nature (Marshall & Rossman, 2014). Qualitative research was appropriate for the current study because of the emphasis on exploring the experiences and perceptions of a group of participants in order to generate a detailed description of the barriers to AT implementation.
As opposed to qualitative research, quantitative methods generally focus on using scientific and positivist protocols to quantify behaviors of a group of individuals (Gray, 2013). The nature of quantitative research is often reductionist, deductive, and expressed in terms of numerical values (Babbie, 2015). Although quantitative studies have been used to assess AT practices of TVIs in urban settings, few scholars have qualitatively analyzed the perceptions and experiences of TVIs in rural settings. Using a quantitative research would not be appropriate because of the lack of details and depth needed to generate a deeper understanding of the barriers to AT implementation from the perspectives of TVIs (Moustakas, 1994).

The researcher used an interview-based research design to examine the shared, lived experiences of TVIs implementing AT within classrooms. Interview-based inquiries are qualitative research approaches that seek to understand and describe particular phenomena. The researcher chose an interview-based study as it allows for direct and nuanced examination of a phenomenon based on the experience of a small group of participants. An interview-based research study design was specifically chosen, as the goal of the current study was to determine the perceptions of AT implementation in TVIs applicable to broad populations in modern society. Little is known about perceptions of AT implementation; therefore an interview-based research study approach allowed for detailed descriptions of the phenomenon while still emphasizing shared consciousness between individuals (Moustakas, 1994).

The rationale for the selection of qualitative interview-based design was based on previous studies on assistive technology (Adams, Yin, Vargas Madriz, & Mullen, 2014; Clark & Boyer, 2016; Greenhalgh et al., 2013). Adams et al. (2014) also used interviews
to explore the lived experiences of students participating in large scale virtual tutorials. Clark and Boyer (2016) used interviews to explore how teachers perceived the integration of 21st technology in staff development. Greenhalgh et al. (2013) used interviews to explore the experiences of older people regarding the use of telehealth and telecare.

**Ensuring Trustworthiness**

In qualitative studies, the quality of research is determined by the extent to which the results can be considered trustworthy and underwent rigor (Lincoln & Guba, 1985; Morse, 2015; Shaw, 2013; Yilmaz, 2013). Trustworthiness and rigor are operationalized in terms of four important constructs: (a) credibility, (b) dependability, (c) confirmability, and (d) transferability (Morse, 2015; Shaw, 2013; Yilmaz, 2013). The researcher will now discuss the specific measures or strategies that the researcher used to enhance the trustworthiness and rigor of the study.

Credibility pertains to the extent to which the generated descriptions of the research phenomenon can be considered accurate based on the perspectives of the TVIs who participated in the study. To enhance the credibility of the results, the researcher used transcription review and member checking (Shaw, 2013). After the interviews were transcribed, the researcher reviewed the transcripts by repeated rounds of reading to ensure that the interview responses are clear and understandable. After the coding process and preliminary analysis are completed, the researcher performed member checking by sending a short summary of the individual results through electronic mail. A brief instruction was included indicating the expectation from the participants to gain some feedback about the accuracy of the summarized analysis. The researcher noted that not receiving any reply 7 days after the electronic mail was sent indicated that the
participants do not recommend any corrections or modifications. Participants were given 7 days so that sufficient time was allotted to review the email and respond appropriately.

Dependability pertains to the extent to which the interpretations generated from the study can be applied to all participants (Lincoln & Guba, 1985). The researcher enhanced the dependability of the results of the study by generating an audit trail that can delineate all the key decisions and procedures utilized throughout the study. For example, the researcher documented how the coding process was performed so that an independent reviewer could determine and assess the quality of the analysis based on this audit trail.

Confirmability refers to the extent to which the results can be substantiated or can be considered as objective (Morse, 2015). The researcher enhanced the confirmability of the results of the study by constantly examining the shortcomings or the limitations of the analysis and the interpretations. The researcher checked all data for quality all throughout the analysis stage of the study. For example, the researcher reviewed the themes several times before the final set of findings are presented to ensure there was enough support for the results. The researcher conducted several stages of verification and cross-checking during the analysis so that the findings can be substantiated by raw data.

Transferability means that the results can be generalized outside the sample if the same conditions and context are similar (Lincoln & Guba, 1985). The researcher enhanced the transferability of the results of the study by generating a thick description of the scope, context, and the participants. The thick description that the researcher generated by the researcher will assist other researchers to determine the transferability of the results in other similar studies in terms of context and the sample of participants involved in a specific phenomenon (Yilmaz, 2013).
The methodology commenced with seeking the approval of the Internal review Board (IRB). After approval was secured, the researcher conducted the recruitment of participants. After the five participants were selected, the researcher conducted individual semi-structured interviews. The researcher analyzed the interview data using Moustakas’ phenomenological analysis. After member checking was conducted to confirm the results, the researcher presented the findings. Figure 1 shows the chronological order of the methodology.

![Figure 1. Chronological order of the methodology.](image)

Other qualitative research designs such as ethnography, case study, grounded theory, action research, and Delphi models were not appropriate because of lack of alignment with the study’s purpose. Ethnographic approaches tend to focus on examining how individuals of a particular community interact and function within sociocultural contexts of their community setting (O’Reilly, 2012). Case study was not appropriate because the aim of the present study was to describe rather than explain conceptions and shared experiences (Stake, 1995). Grounded theory and content analysis methods are
generally used to examine research topics have not been thoroughly studied or adequately
defined in theoretical frameworks of understanding (Corbin & Strauss, 2014). Action
research methods are frequently used to elicit social support and participant involvement
in addressing certain research needs as demonstrating by stakeholders in a community
(Perez, 1997). Delphi methods and evaluative research methods were not considered
appropriate for this study’s research design because these methods focus on expert
assessments of participant experiences with a particular occurrence or structure of
guidelines that impact their perceptions (Bryson, Daniels, & Wark, 2004; Cuhls, 2015;
Davidson, 2005; Mosse, 2005).

Given the lack of appropriateness of other qualitative research designs, the
researcher chose an interview-based study design to describe universal experiences,
shared consciousness, and experiences as representative to the broader population of
TVIs. The researcher used qualitative interviews and TPACK theoretical frameworks to
explore the experiences and perceptions of TVIs in utilizing AT in rural school districts
in North Carolina. The researcher chose an interview-based study approach over an
interpretive approach for several reasons. First, in interpretive phenomenological
approaches, individual accounts of experience are emphasized rather than descriptive
accounts of shared experiences (Wojnar & Swanson, 2007). Interview-based study
approaches, on the other hand, focus on shared consciousness and common experiences
that can be generalizable to the broader population (Wojnar & Swanson, 2007). The
purpose of this study was to determine generalizable perceptions of AT implementation
experiences that can be applicable to TVIs in a variety of locales, contexts, and
experience levels. The researcher used the modified van Kaam approach to
phenomenological analysis, focusing on interpreting qualitative data through the
development of themes and categories (Moustakas, 1994). A modified van Kaam
approach to phenomenological analysis was appropriate in order to generate themes
based on the analysis of the individual textual and structural descriptions of each
participant regarding the influence of the phenomenon examined in the study.

Population

The population for this study was teachers of visually impaired students (TVIs) in
rural school districts. Teachers of visually impaired students are professionals that have
expertise in teaching students with visual impairments and recognizing how visual
impairments affect learning (Wong & Cohen, 2012). The scope of the current study was
confined to TVIs in five North Carolina Rural County School Districts. The exact
population of TVIs in these school districts is not known because of the lack of available
data from the government or other credible agencies that provide statistics for public
schools.

Sample

The sample consisted of five TVIs from five North Carolina Rural County School
Districts. TVIs that have an adequate amount of experience working with visually
impaired students will be recruited to participate in this study. The researcher recruited
participants by coordinating with the key administrators from the school districts, and
secured permission to use the school districts as recruitment sites for the study. After the
site permission was secured, the researcher recruited participants by coordinating with
key administrators from the five school districts as follows:
1. The administrative office of each of the chosen North Carolina counties were asked to provide a list of all the teachers of visually impaired students in their county.

2. Two or more TVIs from each county were purposefully chosen to send an electronic invitation letter to participate in the study.

3. Upon response from potential TVIs, the researcher purposefully chose one TVI from each county to participate in the study.

   Individuals who are interested to be part of the study were instructed to contact the researcher through email. To the individuals who sent an email to the researcher to express their interest to be part of the study, the researcher confirmed their eligibility by asking a few questions. The eligibility criteria for the study were the following: (a) teachers within the five selected school districts in North Carolina, (b) at least 2 years of working experience in teaching visually impaired students, and (c) willing to participate in individual semi-structured interviews. Individuals who satisfied the eligibility criteria were informed of the details of their participation in the study if they agreed to become participants.

   The researcher used purposive sampling to identify TVIs in rural school districts in North Carolina. Purposive sampling is the deliberate selection of participants using non-probability techniques based on satisfying key eligibility criteria (Suri, 2011). This allowed the researcher to generate a sample based off of particular participant experiences (Lincoln & Guba, 1985). Sampling criteria focused on generating a sample of English-speaking participants who have been teaching visually impaired students for at least 2 years.
Data saturation is one of the strategies used by researchers to determine the appropriate sample size in a qualitative study (Guest, Bunce, & Johnson, 2006). Even though the achievement of data saturation is not uniform in all studies in terms of sample size, past researchers have generally indicated that main themes start to emerge starting at five participants (Francis et al., 2010). More participants may be added if data saturation is not reached with the target five TVIs.

The researcher deemed a sample size of five participants appropriate to provide in-depth, detailed examination of perceptions and experiences (Lincoln & Guba, 1985). In addition, there may have been variation in cultural backgrounds and experiences of the participants, so an adequate sample size was needed to provide more complex interpretations of the data. In this study, the use of five participants allowed the researcher to collect enough information to adequately determine the common, shared experiences of participants in the study.

The participants in the study had varying number of professional experience. Participant one has been a TVI 20 years. Participant two has been a TVI for three years. Participant three has been a TVI for 15 years. Participant four has been a TVI for ten years. Participant five has been a TVI for 19 years.

**Materials**

A semi-structured interview guide (see Appendix A) served as the material for the study, which will be used to collect the data. The researcher created a semi-structured interview guide based on the data from the literature and the theoretical framework. The guide contained several open-ended questions that allowed the participants to comfortably answer questions while maintaining structure and order throughout the
interview (Spradley, 1979). The interview guide only contained the main questions that were specifically related to the research questions, but the researcher asked probing and follow-up questions based on the individual responses of the participants (Turner, 2010).

To improve the quality of the interview guide, the researcher field-tested the questions by asking three experts in the field of qualitative instrumentation to review the guide (Behkami, Daim, & Dorr, 2011). In order to be considered experts in the field of instrumentation, the selected individuals should either have been published in peer-reviewed journal or have taken graduate-level courses in the development of instruments. The field test of the interview guide was conducted before the actual interview of the participants. The review focused on determining whether the phrasing of the questions is not only clear, but also effective in eliciting rich responses from the participants. The researcher incorporated the feedback that was gained from the experts into the revised interview guide that the researcher used in the actual interview of the participants.

**Data Collection**

The researcher gained approval of Internal Review Board (IRB) prior to data collection, and all IRB protocols were maintained throughout the research process. The IRB application form was needed in order to assess the appropriateness of the design of the study, particularly in terms of the specific procedures that the researcher used to protect the participants from harm or abuse. After the approval of the IRB is secured, data collection commenced.

The researcher used semi-structured interviews to determine the essence of shared experiences of TVIs in rural areas, particularly the barriers in AT implementation. The individual interviews were scheduled based on the chosen time and date of the
participants within a given time period. The scheduling of the interview was conducted through electronic mail or phone call to limit the inconvenience that may be experienced by the participants (Galletta, 2013).

The individual semi-structured interviews lasted for approximately 45 to 60 minutes and were scheduled and conducted in a private location (Galletta, 2013). Participants were required to sign informed consent forms before the start of the interviews. Participants were briefed about the study’s purpose, possible risks and benefits, and confidentiality assurance, and they were informed of their ability to terminate their participation at any time during the course of the study. The participants were informed that the interview would be audio-recorded and would be stored for 7 years, but the researcher assured the participants but that the recordings would remain confidential and inaccessible to other people (Hatch, 2002).

During interviews, the participants elaborated on their experiences and responded to pre-determined semi-structured questions about the barriers to AT implementation among visually impaired students. Concerns with privacy and perceived job vulnerabilities associated with criticizing school policies may have influenced the participants’ responses, but the use of IRB approval, discretion measures, and confidentiality assurances ensured that data were kept confidential. The researcher recorded and transcribed the data with participant consent in order to prepare data for coding and analysis (Schutt, 2011). All participants were informed that member checking should be expected several weeks from the day of the interview to improve the accuracy of the analysis. After the coding process and preliminary analysis are completed, the researcher performed member checking by sending a short summary of the individual
results through electronic mail (Marshall & Rossman, 2014). A brief instruction was included indicating the expectation from the participants to gain some feedback about the accuracy of the summarized analysis. The researcher noted that not receiving any reply 7 days after the electronic mail was sent indicated that the participants did not recommend any corrections or modifications. Participants were given 7 days so that sufficient time was allotted to review the electronic mail so that an appropriate response can be made for proposed corrections.

**Data Analysis**

Before the analysis of data, the researcher organized and coded the interview transcripts using Nvivo 11 coding software. Nvivo facilitated a more organized coding process because all interview transcripts were loaded in a single folder where data from different participants can be compared and contrasted for similarities in content (Bazeley & Jackson, 2013). Nvivo software was particularly helpful in the coding process because portions of text can be classified, linked, or examined for relationships, which were instrumental in the determination of themes.

After all interview transcripts are loaded in Nvivo, the researcher used the modified van Kaam method of phenomenological analysis to analyze data with perceptions on AT implementation as the central phenomena. The following steps indicate how the data will be analyzed in this study (Moustakas, 1994).

**First step: Listing and preliminary grouping.** The first stage of the seven-step analysis of the modified van Kaam method by Moustakas (1994) was the “listing and preliminary grouping” of the experiences from the interviews of the five interviewed TVIs in rural school districts in North Carolina. By listing and marking down of all
distinguished or pertinent aspects of the experience, the researcher followed the “horizonalization” process as well (Moustakas, 1994, p. 120). This stage also included the researcher’s immersion to the research study, managing and removing the possible biases and previous knowledge about the subject.

**Second step: Reduction and elimination.** The second stage of the modified van Kaam method was the process of “reduction and elimination,” which included the management of the codes formed earlier (Moustakas, 1994, p. 121). For the researcher to classify the invariant constituents or the other substantial perceptions and experiences of the TVIs as participants of the research study, the researcher employed two questions:

1. Does it contain a moment of the experience that is a necessary and sufficient constituent for understanding? (Moustakas, 1994, p. 121)

2. Is it possible to abstract and label it? If so, it is a horizon of the experience. Expressions not meeting the above requirements are eliminated. Overlapping, repetitive, and vague expressions are also eliminated or presented in more descriptive terms. The horizons that remain are the invariant constituents of the experience. (Moustakas, 1994, p. 121)

From the two questions suggested by Moustakas, the researcher reread all of the five interview transcripts of the TVIs thoroughly. The researcher then used the above two questions to determine which fragments of the interviews could be added and incorporated into the next five stages of the analysis. Meanwhile, the researcher retained the lived experiences mentioned and shared by the participants which strictly and implicitly talked about and addressed the research questions. The researcher tagged these lived experiences as the preliminary invariant constituents of the research study.
Third step: Clustering and thematizing of the invariant constituents. The third stage of the analysis was the grouping or clustering of the preliminary invariant constituents formed in the third step of the analysis. The clustering of the invariant constituents was patterned on the research questions of the study. Moustakas (1994) explained that the “clustered and labeled constituents” should be translated and considered as the “core themes” of the study (p. 121). Using the computer software of NVivo11 by QSR, the researcher systematically coded both the invariant constituents and core themes. In this section, the researcher presents the findings from the third stage of the modified van Kaam analysis.

Fourth step: final identification of the invariant constituents and themes. The fourth stage of the analysis was the authentication of the established invariant constituents and themes of the study. The fourth process of analysis was performed in order to support the themes and invariant constituents; and at the same time, validate the shared responses from the interviews along with the newly formed and reported experiences. Again, another three questions were recommended by Moustakas.

1. Are they expressed explicitly in the complete transcription?
2. Are they compatible if not explicitly expressed?
3. If they are not explicit or compatible, they are not relevant to the participant's experience and should be deleted. (Moustakas, 1994, p. 121)

Fifth step: Individual textural descriptions. The fifth stage of the phenomenological analysis by Moustakas (1994) was the construction of the individual textural descriptions. Under the fifth stage of the analysis, the authenticated invariant constituents and themes were employed to generate the individual textural structural
descriptions per participant or TVI. Similar to the third stage, verbatim examples or direct quotes from the interviews were presented to support and elucidate more clearly the new findings reported.

**Sixth step: Individual structural descriptions.** The sixth stage of the modified van Kaam method was the report of the individual structural descriptions. Similarly, the stage made use of the experiences of the participants or TVIs from the "Individual Textural Description and Imaginative Variation" of the previous stage of the study (Moustakas, 1994, p. 121).

**Seventh step: Textural-structural description.** The final stage of the current method by Moustakas (1994) was the report of the integration of both the invariant constituents or the other imperative perceptions and experiences of the participants and final themes. In the unification of perceptions and experiences of the participants, the “meanings and essences” of each reported pattern and experience were then emphasized further (Moustakas, 1994, p. 121). The final stage encompasses the experiences of the participants based on the three research questions of the study.

**Eight step: Composite textural structural description.** One stage was added in the process and was performed to recapitulate the established findings of the study. Upon analyzing the last three stages of the modified van Kaam method, the researcher produced composite descriptions. The composite descriptions channel the “meanings and essences of the experience, representing the group as a whole” (Moustakas, 1994, p. 121).

**Ethical Concerns**

In conducting an ethical research, protecting the rights of the participants and ensuring that the study was based on procedures that are based on accepted standards are
important (Miller, Birch, Mauthner, & Jessop, 2012). In order to enhance the ethical standards of the research, the researcher used several strategies and procedures pertaining to recruitment, collection, and analysis of data. Ethical considerations that the researcher addressed with participants included discussing voluntary participation, informed consent, full disclosure of the study’s purpose and possible risks and benefits, restriction to access of data, and participant confidentiality.

Agreements to gain access to participants or data were ensured by coordinating with the proper authorities or leaders and submitting all the necessary and required forms to gain the necessary approval from the recruited institutions. Permission to use the school districts as recruitment sites for the study were secured by coordinating with the appropriate administrators or leaders, which the researcher accomplished email. The researcher also asked for a formal approval letter that would indicate the granting of permission to use their school premises as the recruitment sites for the current study.

Regarding the treatment of human subjects, ethical concerns related to recruitment, refusal to participate or withdrawal, and voluntary participation were important (Miller et al., 2012). During recruitment, participants were informed of the key aspects of the research so that they can decide whether participating in the study would be acceptable. Informed consent forms (see Appendix B) were provided to all participants during recruitment to give them more information about the study. All participants who do not object with the terms stated in the forms were asked to sign the document to formalize their status as participants of the study. Participants had the ability to withdraw from the study before, during, or after the intended individual semi-structured interview. If the request for withdrawal was received during the data analysis
phase of the study, the researcher removed the transcripts and the corresponding coding results from the NVivo software.

In terms of the data treatment, the researcher used several key procedures to enhance the ethical credibility of the study. Participants received coded numbers to protect their real names or identities, and all research data were restricted to ensure privacy and security concerns are met. Paper data will be stored in locked file cabinets and electronic data will be stored on a secured computer that is password-protected. The only individuals who might have access to all the data collected from the participants are the researcher, the mentor, and the dissertation panel. Seven years after the approval and publication of the dissertation, all paper forms of data will be shredded and destroyed and all electronic forms of data will be permanently deleted from the computer archives of the researcher.

**Summary**

The purpose of this qualitative interview-based study was to determine barriers to assistive technology implementation by examining the experiences and perceptions of a diverse sample of teachers of visually impaired students in rural school districts. The selection of a qualitative research approach was appropriate in order to gain insights in the experience and perceptions of participants and explore the research phenomenon with depth, richness, and complexity (Marshall & Rossman, 2014). The researcher selected phenomenology as the most appropriate qualitative research design because it allowed for direct and nuanced examination of a phenomenon based on the experience of a small group of participants (Moustakas, 1994).
The population for this study consisted of TVIs, who are professionals with expertise in teaching students with visual impairments and are able to recognize how visual impairments affect learning (Wong & Cohen, 2012). From that population, the sample consisted of five TVIs in North Carolina. A sample size of five participants was deemed appropriate to achieve data saturation and provide in-depth and detailed data regarding the perceptions and experiences of the participants (Francis et al., 2010; Lincoln & Guba, 1985).
CHAPTER 4: RESULTS

Chapter 4 of the study contains the results upon completion of the seven-step process of the modified van Kaam method by Moustakas (1994). The purpose of this qualitative interview-based study was to determine the barriers to assistive technology implementation by examining the experiences and perceptions of a diverse sample of teachers of visually impaired students in rural school districts in selected North Carolina Counties. The researcher interviewed five TVIs and analyzed their responses and shared experiences using the modified van Kaam method by Moustakas (1994). The said method was deemed appropriate for the study as the researcher wanted to highlight the lived experiences of the TVIs in their employment of AT. Three research questions guided the study,

**RQ1.** What are the shared, lived experiences of TVIs implementing AT in teaching visually impaired students in rural school districts in North Carolina?

**RQ2.** What are the perceptions of TVIs pertaining to their personal, technological knowledge/skills, and capabilities of utilizing AT in teaching visually impaired students in rural school districts in North Carolina?

**RQ3.** Within their work environments, what are the perceptions of TVIs regarding the use of current teacher preparation programs and in-service support available for their classrooms in rural school districts in North Carolina?

The chapter also contains the following sections: demographics and setting, the data analysis, presentation of findings, and chapter summary.
Demographics and Setting

Participants of the study were five TVIs from several rural counties. Given that the study was interview-based the researcher limited the sample size in order to fully capture, interpret, and report the meaningful experiences of the TVIs.

Presentation of Findings

The findings were grouped into clusters based on the invariant constituents that were generated from the analysis. The clustering of the invariant constituents was patterned on the research questions of the study. Moustakas (1994) explained that the “clustered and labelled constituents” should be translated and considered as the “core themes” of the study (p. 121). Using the computer software of NVivo11 by QSR, the researcher systematically coded both the invariant constituents and core themes. In this section, the researcher presents the themes and frequency count derived from the analysis. Themes pertain to the clusters of invariant constituents for each research question. Frequency refers to the number of participants represented for each theme.

**RQ1. What are the shared, lived experiences of TVIs implementing AT in teaching visually impaired students in rural school districts in North Carolina?** The first research question of the study explored on the shared and lived experiences of the TVIs using AT in teaching visually impaired students. From the analysis, three noteworthy experiences were shared by the majority of the participants. The TVIs believed that the following are the experiences directly related to teaching and implementing: building a good relationship with parents; needing for a complete buy-in from stakeholders; and needing to continuously train and improve as educators. Table 2
contains the breakdown of the results, including both the core themes and invariant constituents addressing the first research question.

Table 2

*Breakdown of the Results of RQ1*

<table>
<thead>
<tr>
<th>Themes</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building a good relationship with the parents is effective</td>
<td>2</td>
</tr>
<tr>
<td>Needing for a complete buy-in from stakeholders</td>
<td>2</td>
</tr>
<tr>
<td>Needing to continuously train and improve as educators</td>
<td>2</td>
</tr>
<tr>
<td>Success of AT is dependent on the student</td>
<td>1</td>
</tr>
<tr>
<td>Experiencing the growth of technology</td>
<td>1</td>
</tr>
<tr>
<td>Needing to scaffold on the needs and capabilities of each child</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note: Frequency > 1 denotes a core theme and Frequency < 2 denotes an invariant constituent*

**Major theme 1: Building a good relationship with the parents is effective.** The first major theme formed was the experience that building a good relationship with the parents of the VI students is effective. Participant 1 shared that it is vital to build a relationship with the parents of the students in order to get their support and be able to instill the knowledge and practices to the students even when they are outside their schools:

I feel that it's important to have a good relationship with the student's parents, beginning when you first work with them. One of the things that I've always loved about this program is we get to start with our students when they're young. Some of them as early as three years old, some of them are earlier than three years old, and to have a really good rapport with their parents because we get to follow them from the ages of three all the way through graduation. It's nice to be able to do that, but you gotta have that good relationship with the parents.
Meanwhile, Participant 4 added that it is indeed helpful to build a relationship with the parents, as they can train them and work collaboratively in teaching the students even when they are at home:

Sometimes, if that AT's going home with the student being able to train parents. I think just everybody that's working with that student, knowing what's going on and how to use if effectively.

Yeah. I think the big thing is just that time. Just that all of the students are so different in what types of devices and technology that they can use or need to use in order to help their specific visual impairment. I don't think I have a single student in the county who has the same diagnosis. I've got, I think, around 15 students and none of them have the same visual diagnosis. I'm having to do something totally different with every single student. And so, that's very challenging because I'm having to learn something different for every student. Not all the student need specific assistive technology for their visual impairment. But the ones that do, they're not the same, so.

**Major theme 2: Needing for a complete buy-in from stakeholders.** Another vital experience was the need for a complete buy-in from the stakeholders. Participant 2 stated the importance and need for a complete buy-in from all stakeholders. The participant then shared that all stakeholders and administrative members must work as one in accomplishing and providing the best for the children:

It's very detrimental to what I'm trying to do because you need the iPad to do wireless. I think the most successful implementation of AT in teaching visually
impaired students is a multidisciplinary team approach where everyone's on the same page, which is trying to accomplish with the child.

Lack of administrative support, lack of money, lack of equipment. Let's see what else. Lack of involvement from the regular Ed teachers. A lack of understanding of how the children are learning the information and an understanding of the visual cues that these children miss every single day and other people take for granted.

Participant 3 echoed the need of a supportive administration and leaders in order to ensure that they are provided with the latest and needed equipment for their children. In addition, Participant 3 highlighted the importance of acquiring the support of the decision makers, as it will be much effective when requesting for the latest resources and gadgets for their students:

Also, most importantly, is having a director who will support you and get you the supplies and things that you need. Let me just think. What else? No. I think what is another big factor is, like anything, making sure that you get the parents onboard with you, because in some situations the parents might be limited themselves or feel intimidated. You have to get the parents with you, so that they know you're there for them and that they will reinforce what you do. If I sent a Brailler to your house, don't tear up my Brailler, but let's use it. If I send a speak-and-save to your house, let's use it, but send it back, get batteries, whatever. Getting parents involved with you. Like I said, I was blessed to have excellent directors who supported me. You have to have your director onboard with you.
You have money for quota funds. You have to, like I said, study kids, see what you need, and order your material in quota funds in the proper timing. Make sure you get your quota funds and use them. The main things, too, is when you get this equipment, use it. How come you got a light box? Sometimes you see light boxes sitting around. Use your equipment. A lot of times, you go to staff development, you don't really have time to implement. You have to come back and use what you've got.

**Major theme 3: Needing to continuously train and improve as educators.** The third imperative experience was needing to continuously train and improve as educators. Participant 4 stated that from experience, each teacher must have the initiative to learn and train continuously for the benefit of their students, as technology is also continuously developing:

I think you need a lot of time to learn the assistive technology. Just to be able to practice it yourself in order to be able to teach it to the student. Having extra time for workshops, or some kind of training from whoever you're buying the assistive technology from to be able to learn how to accurately show the student how to use it themselves. So, I think that's huge. Just having that time to practice yourself and to be able to write effective lesson plans in order to teach it. Is probably the best thing for students. That the knowledge yourself, being able to know for yourself how to use it, but then also being able to teach any of the staff members that are gonna be working with that student and that device.
Participant 5 stated that teachers must have the proper tools and behavior to be able to properly assist their students given that technology is constantly evolving as well:

Well, the effective implementation would be first of all having the right tool. Sometimes the technology is determined by the AT person at the school who does not know VI, and that is one of my biggest issues. They choose something because they did a little research online while they were watching TV, and decide what to get for my student, and it's often it's just determined without the TVI input. It's often the wrong tool. Then the school has purchased a very expensive item and is not willing to change their path once I come in.

I'm a contractor, and sometimes things are done, people are trying to do the right thing for these students, especially in rural counties where maybe they have not had access to a TVI, so they're like okay well we'll just buy something and give it to the student, and then there's no follow through, nobody who can teach the student how to use it. If the student is frustrated they will just give up, so it's really important to have a TVI to choose the equipment perhaps with the assistive technology person. To have that TVI introduce it, and have consistent instruction until that tool is mastered.

Invariant constituent 1: Success of AT is dependent on the student. The following grouped experiences were also deemed significant to fully cover and report the lived and shared experiences of the participants. One participant stated that the success of AT is dependent on the student. Given that this was only shared by one participant, more research should be performed in order for the credibility of the said experience to be assured. Participant 1 stated that from experience, the success of AT is dependent on the
motivation and determination of the students to improve using AT. For Participant 1, the most vital aspect is the students’ eagerness and want to employ the technology available to them:

Most of the students experienced a success with their technology, not all of them. It really depends on the individual student and their vision loss, as to their success.

Number one, the most important thing is the student must want to use the technology. You have to get the student to buy into using that piece of equipment. They have to, otherwise it's gonna be an uphill battle, all the way across. The other parts, once you get the student ready and willing to use the equipment, then your teacher must understand and accept the purpose of the device in their classroom.

Invariant constituent 2: Experiencing the growth of technology. Another invariant constituent was the experience of seeing the growth of technology. Again, this invariant constituent received just one occurrence and may need further research for validation. Participant 2 also shared how technology has evolved over the years. The participant added that the growth of technology has caused both positive and negative effects on both the teachers and the visually impaired students. She stated:

This is both positive and negative. Most of my experience in implementing AT for visually impaired has been recently in using an iPad. In the past, a lot of equipment was obsolete and very large and bulky and hard to use in classrooms, so the children didn't like to use them, like the CCTVs and things like that. Often, they were more difficult to use than the benefit that they got out of them. The iPad
is a tremendous improvement over that. I've used electronic braillers and they work very well. Basically, the iPad is the best thing that I've used so far.

I sort of answered some of that in two. Up to date equipment, knowledge with everyone that the child's in contact with. For example, if a child has to use an iPad to communicate or to braille his/her answers, there's a lot of a wide continuum of how you can use it. Low-vision students can use it and completely blind children can use it. You have to have a teacher that is able to adapt to the different ways that the child has to present their information. Also, you have to have up to date technology in the schools. In a lot of the rural counties that's not the case most often. I'm working right now in a county where with a completely blind child that I don't have a wireless connection in my room.

*Invariant constituent 3: Needing to scaffold on the needs and capabilities of each child.* Finally, the last experience was the need to scaffold on the needs and capabilities of each child. Only one participant reported the significance of the experience. Participant 3 highlighted the need for the TVIs to be able to adjust and scaffold their lessons according to the needs and capabilities of each child. The participant expressed that TVIs must always be present to assist their students and design their lessons according to the levels and skills of the students:

Well, I guess I'm looking at the process. As I worked with each of my children, I think I may have had five or six, each one was different, the vision was different, the situation was totally different. So, you really had to design it for each child. I felt like it was pretty much implemented very well, because what I tried to do ...
had an AT director who was very support, but her problem was she brought me on
and if there was anything I needed was like order it and let's get it.
A major component of this, to me, the characteristics, is to know your child,
number one, know what they need, get what they need, and use what they need.
You got to know your child. First of all, you have to assist them. You have to
know what they need, and then go there accordingly. If you have a child that's
blind, you need to get the Braille programs, you need to get the feel, get the touch.
There are so, so many programs that you can start, a child with tactile touch,
getting to know the Braille symbols, go to that to the contractions, reading Braille
books. Getting what they need and using it, and being consistent with it, and
trying of course getting the parent to buy in with you to make sure you go home
and there's reinforcement.

**RQ2. What are the perceptions of TVIs pertaining to their personal,
technological knowledge/skills, and capabilities of utilizing AT in teaching visually
impaired students in rural school districts in North Carolina?**
The second research question of the study investigated on the perceptions of the TVIs that pertain to their
personal, technological knowledge and capabilities in utilizing AT in teaching their
visually impaired students. In the second research question, two noteworthy experiences
were established. These included focusing the perception that TVIs must focus solely on
the needs and learning of their visually impaired students despite the presence of barriers;
and receiving the proper support for and training on AT. Table 3 contains the breakdown
of the results answering the second research question of the study.
Table 3

**Breakdown of the Results of RQ2**

<table>
<thead>
<tr>
<th>Themes</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focusing solely on the needs and learning of the visually impaired students</td>
<td>3</td>
</tr>
<tr>
<td>Receiving the proper support for and training on AT</td>
<td>3</td>
</tr>
<tr>
<td>Lacking consistent and adequate training on AT</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note: Frequency > 1 denotes a core theme and Frequency < 2 denotes an invariant constituent*

**Major theme 4: Focusing solely on the needs and learning of the visually impaired students.** The fourth major theme generated was the perception that TVIs must focus solely on the needs of their students; notwithstanding the issues and barriers in knowledge and resources. Participant 1 stated that in utilizing AT, the barriers faced by the teachers should not be considered as obstacles, because teachers’ main priority should be their students at all times. In addition, Participant 1 believes that it is more important to prioritize the children rather than dwelling on the barriers they are faced with:

> Regardless of the barriers that we might come across, needing something, not having enough of a knowledge, working with it, the important part is the student gets what they need to be successful in the classroom. What I face doesn't matter as long as the kid gets what they need.

> Again, it's just we focus on what the student needs, and we focus on being able to get that. We have a lot of different ways that we can get our materials and the equipment and the technology that the student needs. It just really depends, and we work that. We focus on what they need.

Participant 3 added that she also took it upon himself to improve her knowledge and skills for the benefit of her students:
Well, when I started with it, I didn't have a vast amount of knowledge about assistive technology. Like I said, as I came into it, I learned. I realized that there was this here and that was there. I guess, my background in special ed helped me a lot, having my background, my master's, in special ed helped me a lot. I just knew how to work with kids who were slower, and you just use that to incorporate into a child that's visually impaired or blind. As far as technology, I guess back then I may have had enough of some knowledge of it. I knew computers. I guess, like I said, I just learned to use it. I found resources and taught myself and reached for what I needed. I wasn't so computer savvy or anything, but I did what I had to do for my children.

Meanwhile, Participant 5 described her genuine care and concern for her students; she shared that she considers each student as her own child. She added that she adjusts according to the needs of the students and that she is willing to learn in order to provide the best possible education for the students:

I think of every student as though they're my child. I advocate for them to get what they need, because I feel like what I do for that child makes a difference in where they end up in life. The barriers and skills or knowledge are just keeping up with the changes, and having the time to learn these new things. I used to use the Braille 'n Speak with students. Then I used Braille Note, and then the Braille Note Apex, and there's all these changes. Now I have a student who's using the Braille Sense.

**Major theme 5: Receiving the proper support for and training on AT.** Another major theme that emerged was the belief that the teachers are receiving the proper
support for and training on AT; this entails the support for knowledge building and professional development. Participant 1 highlighted that her school supports the needed training and resources of the teachers. She even shared that she has been sent to several conferences to improve her knowledge and skills on AT. In addition, private companies of their equipment and gadgets also provide several trainings for the teachers:

Again, not so much in this school system because we are allowed to get the training that we need, and we're allowed that time to be able to go and do that training. I'm been lucky to be able to go down to the AT conference in Florida a couple times to be able to see all the new stuff that's coming up, as well as do the workshops that go along with that. The companies that we purchase from will actually come out and do training not only for us, but for the teachers in the classroom that gonna be where the equipment's going to sit. We're really lucky.

Participant 4 stated that she was provided with the time and opportunity to learn about their equipment and gadgets used on AT. In addition, she added that they provided the professional development as needed by the teachers:

That time to learn how to work different pieces of equipment. That's a big thing for me. I'm the only VI teacher for our county so I'm all over the place. And so, just having that extra time to come in and be able to learn it myself, but then also know it well enough to be able to teach the student and the people working with them. And just not being as tech savvy as some people are. I think that's also a personal barrier for me.

I think, in our county, they are very willing to send me to professional development. Anything that I need to go to I can go to. But I think the problem,
my biggest problem is, that within our county, well, with visual impairment, the biggest piece of technology that everybody is pushing and all the workshops are on, is using the iPad paired with something. And our county does not do iPads. And I don't know if we do tablets, I've asked, but I don't think we do tablets either. So, that's a very tough thing because everything that I'm getting is towards that, so then I have to learn what I've learned to try and adapt it to the laptop, with JAWS, and with, you know, so it adds so many more steps. So, my knowledge is not up to where I have to turn my skills, I don't know if that makes sense, or if that's how it should be worded, that what I'm learning does not match to what I have available.

Participant 5 admitted that teachers become overwhelmed with the development and constant changes in development. The school provides each teacher the proper knowledge and training before each school year:

I think that the in-services are just critical. I usually do that at the beginning of the year before school starts, or any time I can get these teachers, and put them under blindfold, or put them under vision simulation, have them try doing some things like their student would be expected in the classroom. Then show them how the tool would help. That really helps a lot. But, the teachers can be very overwhelmed, and some teachers are technophobes, and they're not going to use that.

They're not going to want to log into a screen sharing program on their computer before they get started with their class so that their student with the visual impairment can access their Smart Board. Because these teachers are
overwhelmed by everything else. They have a whole big job, and they may have
130 students to see every day. It's hard for them to remember something for my
kid. So, I put the onus on my students. If they are going to six classes a day.

Invariant constituent 1: Lacking consistent and adequate training on AT. One
participant shared that their school is lacking consistent and adequate training on AT.
Given that only one participant mentioned the said inadequacy, more research is
recommended. Participant 2 admitted that there is a barrier in knowledge present in their
school. She added that there is no consistent and formalized training focused on the
knowledge development of the TVIs:

Barriers in knowledge is basically that I had to find out myself how to do it and a
lot of it is hit and miss because sometimes I'll get equipment in that I don't know
how to use. I have to research it and call people and figure out how to work it
myself. There's no consistent training that I know of. That would make things a
lot easier if I knew how to do it.

RQ3. Within their work environments, what are the perceptions of TVIs
regarding the use of current teacher preparation programs and in-service support
available for their classrooms in rural school districts in North Carolina? The third
and final research question explored the perceptions on the current teacher preparation
programs as well as the in-service support available for the classrooms. In this final
research question, all five TVIs agreed that they are all experiencing an insufficient
preparation and in-support availability in their classrooms. More specifically, they
reported that TVIs must practice the initiative to constantly educate and train themselves
independently. Table 4 contains results for the final research question of the study.
Table 4

Breakdown of the Results of RQ3

<table>
<thead>
<tr>
<th>Themes</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient preparation and in-support availability</td>
<td>5</td>
</tr>
<tr>
<td><strong>Needing for self-initiative to constantly educate and train on AT</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Frequency > 1 denotes a core theme and Frequency < 2 denotes an invariant constituent*

**Major theme 6: Insufficient in-support availability.** The sixth and final major theme of the study was the belief that there is an insufficient preparation and support available for the TVIs. The interviewed participants then suggested the need for self-initiative to constantly educate and train on AT. Participant 1 stated that although in-service support is available, she still considers it inconsistent. This is because the opportunity is limited; the participant stated that teachers must still find the initiative to learn and continue their learning and professional development on their own:

Think the most difficult part is trying to stay up on all the new technology, and having the time to be able to do the research, and get that training of how to use it if you purchase the device. A lot of the companies now will let you borrow it for 30 days to actually trial it and see if it works, whereas in the past we couldn't do that. We'd have to buy it. Sometimes it just really wasn't the right fit. It's nice to have that.

Participant 2 again highlighted how much the in-service support for the teachers is lacking. She even added that the department should do a better job in terms of training and support:

Like I said, I guess my views have got a little skewed because technology's moving so quickly that it's hard for the teacher preparation programs to keep up.
The in-service support, there's really not any. I think the State Department could do a better job of providing support. Again, I think it's just because it's a low-incidence handicapping condition and there's so few out there that it's not a priority. I would say that the programs are weak and they could stand a lot of improvement.

Participant 3 then emphasized that teachers must learn that they have the responsibility to be up to date in terms of the technological advances in assistive technology. The participant shared that teachers must be independent and learn on their own, in the case that support and training are not readily available:

You have to stay abreast of anything, no matter what you do. You have to use current and up-to-date. You have to go out and search. Just like any other profession, you have to stop and do a yearly training or five-year training. You have to go out and learn, to stay abreast, and to be up-to-date on things, because so much in technology has changed. Some many, there's not excuse nowadays that kids aren't getting it, even in the regular classroom, even with the EC kids. There's so much out there, there's no excuse. Just like us. I tell people there's no excuse that you don't get a degree nowadays; that's your fault, because it's there, so go get it, go seek it, stay abreast.

Participant 4 shared that the current preparation programs are not enough to train their teachers with the AT and the latest gadgets and equipment. In addition, Participant 4 stated that a targeted training for AT is needed by most teachers today:

I don't know, I think, and I don't know what some of the prep programs are doing now, but I feel like if they're not doing it, there needs to be a specific class for all
those different types of technology and being able to, for students in these programs, to be able to learn these devices, to be able to know these devices when they come out. Even if they have to do like a test on each one of the devices so they know them and are comfortable when they get out into a classroom, that they can say, "Hey, I know this. This is one that we've used before." And to be able to talk knowledgeably about different things that would work well for different eye conditions. I think that's something that would be great and I don't know if they have anything like that, but I think if we can have some of those types of things. I do know, when you purchase specific technology pieces, a lot of times the company will do some training because they're so expensive. They'll come out and do some of these pieces. But if we get it from like, American Printed House for the Blind, there's really not any kind of training for that.

Finally, Participant 5 admitted that in-service support is present, but the effectiveness is still dependent on the TVIs themselves:

As far as in-service support available for the classrooms with visually impaired students, that's really dependent upon the TVI, and the TVI having the motivation and knowledge, and time to meet with the classroom teachers to do those in-service trainings.

That's really critical, and it's laying the foundation for the whole school year to do that. It's something that should be done, so I always do it. It's just making that time. I think that's all I have to say about that.

**Individual textural descriptions.** The phenomenological analysis also involved the construction of the individual textural descriptions (Moustakas, 1994). The
Authenticated invariant constituents and themes were employed to generate the individual textural structural descriptions per participant or TVI. Verbatim examples or direct quotes from the interviews were presented to support and elucidate more clearly the new findings reported.

**Summarized textural description for Participant 1.** Participant 1 believed that from experience, success with technology is dependent on the students’ determination and eagerness to actually maximize technology. She stated, "Most of the students experienced a success with their technology, not all of them. It really depends on the individual student and their vision loss, as to their success." Meanwhile, Participant 1 also believed that it is important to build a good relationship with the students’ parents in order to gain support and ensure that learning is continuous for the students even beyond the confines of their school. She stated, "I feel that it's important to have a good relationship with the student's parents, beginning when you first work with them. One of the things that I've always loved about this program is we get to start with our students when they're young."

Participant 1 believed that the goals of AT would be achieved more effectively if the teachers decide to prioritize the needs of their children more than their issues with the resources. She stated, "Regardless of the barriers that we might come across, needing something, not having enough of a knowledge, working with it, the important part is the student gets what they need to be successful in the classroom. What I face doesn't matter as long as the kid gets what they need." Participant 1 also believed that their school system as well as the private companies that they are connected with are currently able to provide them the proper trainings and courses, "Again, not so much in this school system
because we are allowed to get the training that we need, and we're allowed that time to be able to go and do that training. I'm been lucky to be able to go down to the AT conference in Florida a couple times."

Finally, Participant 1 believed that teachers need the determination and will to learn independently as support and trainings from the schools and companies are inconsistent. She stated, "I believe that it's really is part of the job that a TVI needs to do. It is their responsibility to be able to stay up on the technology that's going on and the new stuff that's coming in."

**Summarized textural description for Participant 2.** Participant 2 believed that over the years, she has experienced the growth of technology. She stated, "This is both positive and negative. Most of my experience in implementing AT for visually impaired has been recently in using an iPad. In the past, a lot of equipment was obsolete and very large and bulky and hard to use in classrooms." Participant 2 also believed that a complete buy-in is needed in order for the lack of resources and equipment to be avoided, and all children should benefit and learn accordingly. She stated, "I think the most successful implementation of AT in teaching visually impaired students is a multidisciplinary team approach where everyone's on the same page, which is trying to accomplish with the child."

Participant 2 believed that their school is lacking the effort and ability to provide the training needed by their TVIs. She stated, "Barriers in knowledge is basically that I had to find out myself how to do it and a lot of it is hit and miss because sometimes I'll get equipment in that I don't know how to use. I have to research it and call people and figure out how to work it myself. There's no consistent training that I know of."
Lastly, Participant 2 believed that the current training programs are weak; and may need more improvement. She stated, "The in-service support, there's really not any. I think the State Department could do a better job of providing support. Again, I think it's just because it's a low-incidence handicapping condition and there's so few out there that it's not a priority. I would say that the programs are weak and they could stand a lot of improvement."

**Summarized textural description for Participant 3.** Participant 3 believed in the making sure that administrators and parents are involved in the process of teaching the visually impaired students. She stated, "You have to get the parents with you, so that they know you're there for them and that they will reinforce what you do." Meanwhile, Participant 3 believed that as teachers, they should have the responsibility to provide the most appropriate method of learning to their students. She stated, "A major component of this, to me, the characteristics, is to know your child, number one, know what they need, get what they need, and use what they need. You got to know your child. First of all, you have to assist them."

Participant 3 believed that the focus of the teachers should always be the learning and progress of their students; despite the presence of barriers and changes in their environment. She stated, "As far as technology, I guess back then I may have had enough of some knowledge of it. I knew computers. I guess, like I said, I just learned to use it. I found resources and taught myself and reached for what I needed. I wasn't so computer savvy or anything, but I did what I had to do for my children."

Lastly, Participant 3 believed that TVIs must always stay well-informed with regard to the technological advances related to the learning and knowledge acquisition of
their students. She stated, "You have to stay abreast of anything, no matter what you do. You have to use current and up-to-date. You have to go out and search. Just like any other profession, you have to stop and do a yearly training or five-year training."

*Summarized textural description for Participant 4.* Participant 4 believed that working with the parents increases the knowledge and skills of the students in using AT. She stated, "Sometimes, if that AT's going home with the student being able to train parents. I think just everybody that's working with that student, knowing what's going on and how to use if effectively." Furthermore, Participant 4 believed that teachers must continuously train themselves along with the constant development of technology. She stated, "So, I think that's huge. Just having that time to practice yourself and to be able to write effective lesson plans in order to teach it. Is probably the best thing for students."

Participant 4 believed that the proper support for their development is provided to the teachers. She stated, "I think, in our county, they are very willing to send me to professional development. Anything that I need to go to I can go to. But I think the problem, my biggest problem is, that within our county, well, with visual impairment, the biggest piece of technology that everybody is pushing."

Finally, Participant 4 believed that a more targeted training for AT should help the TVIs better. She stated, "I feel like if they're not doing it, there needs to be a specific class for all those different types of technology and being able to, for students in these programs, to be able to learn these devices, to be able to know these devices when they come out."

*Summarized textural description for Participant 5.* Participant 5 believed that teachers must be well-trained and updated to keep up with the development in
technology. She stated, "Sometimes the technology is determined by the AT person at the school who does not know VI, and that is one of my biggest issues."

Participant 5 believed that each student must be prioritized and given importance; despite the presence of changes in the environment. She stated, "I think of every student as though they're my child. I advocate for them to get what they need, because I feel like what I do for that child makes a difference in where they end up in life. The barriers and skills or knowledge are just keeping up with the changes, and having the time to learn these new things." Meanwhile, Participant 5 believed that it is critical to provide the teachers with the proper training and knowledge on how to use the equipment under AT. She added, "I think that the in-services are just critical. I usually do that at the beginning of the year before school starts, or any time I can get these teachers, and put them under blindfold, or put them under vision simulation, have them try doing some things like their student would be expected in the classroom."

Finally, Participant 5 believed that the effectiveness of support is dependent on the TVIs. She stated, "As far as in-service support available for the classrooms with visually impaired students, that's really dependent upon the TVI, and the TVI having the motivation and knowledge, and time to meet with the classroom teachers to do those in-service trainings."

**Individual structural descriptions.** The modified van Kaam method also involved the reporting of the individual structural descriptions. Similarly, the stage made use of the experiences of the participants or TVIs from the "Individual Textural Description and Imaginative Variation" of the previous stage of the study (Moustakas, 1994, p. 121).
**Structural description for Participant 1.** Participant 1 believed that from experience, success with technology is dependent on the students’ determination and eagerness to actually maximize technology. Participant 1 also believed that it is important to build a good relationship with the students’ parents in order to gain support and ensure that learning is continuous for the students even beyond the confines of their school.

Participant 1 believed that the goals of AT would be achieved more effectively if the teachers decide to prioritize the needs of their children more than their issues with the resources. Meanwhile, Participant 1 also believed that their school system as well as the private companies that they are connected with are currently able to provide them the proper trainings and courses.

Finally, Participant 1 believed that teachers need the determination and will to learn independently as support and trainings from the schools and companies are inconsistent.

**Structural description for Participant 2.** Participant 2 believed that over the years, she has experienced the growth of technology. Participant 2 also believed that a complete buy-in is needed in order for the lack of resources and equipment to be avoided, and all children should benefit and learn accordingly. In addition, Participant 2 believed that their school is lacking the effort and ability to provide the training needed by their TVIs. Lastly, Participant 2 believed that the current training programs are weak; and may need more improvement.

**Structural description for Participant 3.** Participant 3 believed in the making sure that administrators and parents are involved in the process of teaching the visually impaired students. Meanwhile, Participant 3 believed that as teachers, they should have
the responsibility to provide the most appropriate method of learning to their students. Participant 3 also believed that the focus of the teachers should always be the learning and progress of their students; despite the presence of barriers and changes in their environment. Lastly, Participant 3 believed that TVIs must always stay well-informed with regard to the technological advances related to the learning and knowledge acquisition of their students.

**Structural description for Participant 4.** Participant 4 believed that working with the parents increases the knowledge and skills of the students in using AT. Furthermore, Participant 4 believed that teachers must continuously train themselves along with the constant development of technology. Participant 4 also believed that the proper support for their development is provided to the teachers. Finally, Participant 4 believed that a more targeted training for AT should help the TVIs better.

**Structural description for Participant 5.** Participant 5 believed that teachers must be well-trained and updated to keep up with the development in technology. Participant 5 also believed that each student must be prioritized and given importance; despite the presence of changes in the environment. Subsequently, Participant 5 believed that it is critical to provide the teachers with the proper training and knowledge on how to use the equipment under AT. Finally, Participant 5 believed that the effectiveness of support is dependent on the TVIs.

**Textual-structural descriptions.** This section presents the integration of both the invariant constituents or the other imperative perceptions and experiences of the participants and final themes. In the unification of perceptions and experiences of the participants, the “meanings and essences” of each reported pattern and experience were
then emphasized further (Moustakas, 1994, p. 121). The final stage encompasses the experiences of the participants based on the three research questions of the study.

**The lived experiences of TVIs implementing AT in teaching visually impaired students in rural school districts in North Carolina.** For the first research question, three major themes were formed, reporting the shared and lived experiences of the TVIs in their implementation of AT in teaching their VI students. The first major theme discussed the need to build a good relationship with the parents of the VI students. Participant 1 stated the importance of working with the parents and ensuring that the students are also well-guided even at their own homes, "I feel that it's important to have a good relationship with the student's parents, beginning when you first work with them."

Participant 4 then believed that it is very much helpful to collaborate and build a good relationship with the parents, "Sometimes, if that AT's going home with the student being able to train parents. I think just everybody that's working with that student, knowing what's going on and how to use if effectively."

The second major theme that followed indicated the need for a complete buy-in from the stakeholders. Participant 2 believed that support is vital in achieving the goals of the employment of AT, "Lack of administrative support, lack of money, lack of equipment. Let's see what else. Lack of involvement from the regular Ed teachers."

Participant 3 added that it is important to get the support of both parents and staff members, "Also, most importantly, is having a director who will support you and get you the supplies and things that you need... I think what is another big factor is, like anything, making sure that you get the parents onboard with you."
Finally, the third major theme discussed the need to continuously train the educators based from the experiences of the TVI participants. Participant 4 shared that teachers must be determined to also learn and improve themselves so that they can effectively share their knowledge to their students, "Just having that time to practice yourself and to be able to write effective lesson plans in order to teach it. Is probably the best thing for students." Meanwhile, Participant 5 expressed the importance of training and education for teachers, "Well, the effective implementation would be first of all having the right tool. Sometimes the technology is determined by the AT person at the school who does not know VI, and that is one of my biggest issues."

The lived experiences of TVIs pertaining to their personal, technological knowledge/skills, and capabilities of utilizing AT in teaching visually impaired students in rural school districts in North Carolina. The second research question was addressed through two major themes from the analysis. It was then discovered that teachers believe in focusing solely on the needs and learning of the visually impaired students; and receiving the proper support for and training on AT. For the fourth major theme of the study, the participants highlighted the need for the TVIs to prioritize the needs of their students despite the presence of barriers. Participant 1 believed that success in the classroom can only be achieved if the teachers will prioritize their students even with the presence of certain barriers with the employment of AT. She specified, "Again, it's just we focus on what the student needs, and we focus on being able to get that. We have a lot of different ways that we can get our materials and the equipment and the technology that the student needs. It just really depends, and we work that. We focus on what they need."
Participant 3 highlighted the need for the TVIs to be open enough to learn independently despite the lack of support and resources for the benefit of their children, “Well, when I started with it, I didn't have a vast amount of knowledge about assistive technology. Like I said, as I came into it, I learned.” Finally, Participant 5 also highlighted her concern and care for each student, "I think of every student as though they're my child. I advocate for them to get what they need, because I feel like what I do for that child makes a difference in where they end up in life."

The fourth major theme also emphasized that the proper support and training are provided. Participant 1 shared that they are provided with the proper support such as courses and trainings needed, "Again, not so much in this school system because we are allowed to get the training that we need, and we're allowed that time to be able to go and do that training." Participant 4 added that the school provides the needed professional courses and training for the benefit of their teachers; and more so, their visually impaired students, "I think, in our county, they are very willing to send me to professional development. Anything that I need to go to I can go to. But I think the problem, my biggest problem is, that within our county, well, with visual impairment, the biggest piece of technology that everybody is pushing and all the workshops are on, is using the iPad paired with something." Participant 5 shared that there is a need to constantly train and assist the teachers along with the development of technology, “I usually do that at the beginning of the year before school starts, or any time I can get these teachers, and put them under blindfold, or put them under vision simulation, have them try doing some things like their student would be expected in the classroom.”
The lived experiences of TVIs regarding the use of current teacher preparation programs and in-service support available for their classrooms in rural school districts in North Carolina. The third and final research question which explored the experiences on the use of current teacher preparation programs and in-service support had one major theme. All participants reported that there is an insufficient program in-service support. Participant 1 believed that it is difficult to keep up with the technological changes especially when the support is inconsistent, “They give you the good information, but it changes, and the needs of the kids change.” Participant 2 shared that the school should focus more on the consistency of the training for their teachers, “I would say that the programs are weak and they could stand a lot of improvement.” Participant 3 highlighted the need for the teachers’ own initiative to learn on their own; and be up-to-date with the latest technological advances, “You have to go out and learn, to stay abreast, and to be up-to-date on things, because so much in technology has changed.” Lastly, Participant 4 believed that a more targeted training for AT should help the TVIs better, “I don't know, I think, and I don't know what some of the prep programs are doing now, but I feel like if they're not doing it, there needs to be a specific class for all those different types of technology.”

Composite textural structural description. One stage was added in the process and was performed to recapitulate the established findings of the study. Upon analyzing the last three stages of the modified van Kaam method, the researcher produced composite descriptions. The composite descriptions channel the “meanings and essences of the experience, representing the group as a whole” (Moustakas, 1994, p. 121).
The lived experiences of TVIs implementing AT in teaching visually impaired students in rural school districts in North Carolina. Under the first research question, three vital experiences were developed in terms of using AT in teaching visually impaired students. It was then discovered that the following were the most prevalent and notable experiences by the TVIs: needing to build a good relationship with the parents is effective; needing for a complete buy-in from stakeholders; and needing to continuously train and improve as educators. Meanwhile, other important experiences in teaching VI students while employing AT were: the observation that success of AT is dependent on the student; experiencing the growth of technology; and the importance of the needing to scaffold to meet the needs and capabilities of each child.

The lived experiences of TVIs pertaining to their personal, technological knowledge/skills, and capabilities of utilizing AT in teaching visually impaired students in rural school districts in North Carolina. Under the second research question, two major themes and one invariant constituent emerged. From the analysis, majority of the participants believed in focusing solely on the needs and learning of the visually impaired students despite the presence of certain issues and barriers in their classrooms and teaching environment. In addition, the teachers believed that they were receiving the proper support for and training on AT. There was one participant who admitted that their school is lacking consistent and adequate training on AT.

The lived experiences of TVIs regarding the use of current teacher preparation programs and in-service support available for their classrooms in rural school districts in North Carolina. Finally, the last research question explored the use of current teacher preparation programs and in-service support available for their classrooms. From the
analysis, it was determined that contrary to the earlier finding that TVIs were receiving the proper training; the next question opened the concern on the insufficient in-service support availability. More specifically, it was reported that there was a need for self-initiative from the TVIs to constantly educate and train on AT.

**Summary**

The fourth chapter of the study contained the complete presentation of the results from the analysis of the five interviews with the TVIs. The purpose of this qualitative interview-based study was to determine barriers to assistive technology implementation by examining the experiences and perceptions of a diverse sample of teachers of visually impaired students in rural school districts in selected North Carolina Counties. The researcher addressed three research questions using the modified van Kaam method by Moustakas (1994) to analyze the interviews of the participants. As reported, six major themes were formed and several other invariant constituents. In the next chapter, the findings should be discussed in relation to the literature of the study as well as the limitations, recommendations, implications, and conclusions.
CHAPTER 5: SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

Assistive technology is crucial to academic outcomes, self-efficacy, and quality of life for students with disabilities (DePountis et al., 2015). The lack of standards and inadequate teacher preparation programs, however, compromise the competency of special education teachers to implement AT (Abner & Lahm, 2002). The problem of inadequate training and competency is further exacerbated for teachers of visually impaired students in rural school districts. Researchers studying assistive technology competency have frequently focused on quantitative analyses of skill capabilities, but few scholars have focused on the experiences of AT implementation using the technological pedagogical content knowledge (TPACK) framework (Kaplon-Schilis & Lublinskaya, 2015). Even scarcer is the research qualitatively analyzing the self-efficacy and competency perceptions of TVIs in rural schools (Ault et al., 2013; Wood, 2015), specifically in consideration of how TVIs’ ethnicity and gender impact their self-efficacy (Teo et al., 2015). In the current study, the researcher set out to investigate the perceptions and experiences of a diverse sample of rural teachers of students with visual impairments to assess barriers to assistive technology implementation within sociocultural and gender contexts.

To determine barriers to AT implementation by examining experiences and perceptions of a diverse sample of TVIs in rural school districts, the researcher conducted the study within the TPACK framework. As the needs of visually impaired students are unique, it is difficult to identify universal standards for general AT implementation for these students. TPACK theory allows an approach that can be tailored to each individual
student and teacher for diverse needs. The current researcher conducted semi-structured interviews of a sample of five teachers of visually impaired students in rural North Carolina school districts. The sample consisted of participants from different racial and ethnic backgrounds, age, and professional experience to ensure a heterogeneity applicable to TVIs in a variety of locales, contexts, and experience levels. The researcher investigated the following three research questions:

**RQ1.** What are the shared, lived experiences of TVIs in implementing AT in teaching visually impaired student in rural districts in North Carolina?

**RQ2.** What are the perceptions of TVIs pertaining to their personal, technological knowledge/skills and capabilities of utilizing AT in teaching visually impaired student in rural school districts in North Carolina?

**RQ3.** Within their work environment, what are the perception of TVIs regarding the use of current teacher preparation programs and in-service support available for their classrooms in rural school districts in North Carolina?

Through the use of van Kaam method of phenomenological analysis, the researcher identified six major themes and other invariant constituents among responses to the three research questions. In this chapter, the researcher will provide analysis of the findings and their implications, limitations, and further recommendations for research.

**Summary of the Findings**

The current study’s most significant findings concerned the relationships among assistive technology stakeholders as well as availability of technology and training to use the technology. In response to the first research question about shared, lived experiences among TVIs, the major themes that resulted were building relationships with parents,
need for full commitment from stakeholders, and the need for continuous training and improvement. Participants voiced that parents played a significant role in the adoption of assistive technologies. This is because parents could aid teachers in identifying the unique needs of each visually impaired student, as well as reinforce the use of the assigned technology outside the classroom.

Concerning the technology itself, participants voiced how important it was for schools to supply not only current and appropriate equipment to meet individual students’ needs but a classroom environment that facilitates technological use. One participant communicated that they would be provided with a device (iPad), but not the proper infrastructure (wireless in the classroom) to use it effectively. Another participant revealed that some classrooms may be equipped with obsolete technology that does not access wireless whatsoever. Participant 4 claimed that their district does not allow for the use of iPads and tablets, despite iPads starring in many instruction trends and professional development conferences. The use of alternative technologies such as JAWS and laptops add additional work for the teacher, with fewer positive outcomes for the students. Compounding this problem is that TVIs are not always consulted as experts when selecting AT for classrooms (Participant 5). AT personnel that are unfamiliar with the special needs of visually impaired students may be charged with technology selection and give technology to students without any individual needs assessment or instructional follow-through (Participant 5). In sum, while schools have ensured technological endowments for their students with disabilities, they have not equally ensured that the technology is the most effective for the students or secured conditions to make the technology effective in the classroom.
This major theme of greater commitment needed from stakeholders was contradictory to the major theme in responses to Research Question 2, which asked about the participants’ self-perception of technical knowledge, skill, and capability of implementing AT in the classroom. Three participants indicated that schools do provide professional development and training opportunities in AT. One participant noted that the private technology companies themselves provide several trainings of their products for teachers. Another participant indicated inconsistencies in school policy, in which the school did provide funding for the teacher to attend professional development conferences, but the training was for a device that the district does not use in classrooms. This conflict was represented in the contradicting themes found in response to Research Questions 1 and 2, in which participants felt they received support for training in AT but that the choice of AT and its compatibility with classrooms and actual student needs required greater attention from stakeholders. This conflict may account for the other major theme in response to the second research question, in which three participants indicated that TVIs must focus on individual student needs and not the barriers faced in implementing AT. Thus, persistence through barriers was a significant finding that relate to inconsistent support.

These inconsistencies in support account for the responses to the third research question regarding participants’ perceptions of teacher preparation programs and in-service support. While participants gave mixed responses as to the sufficiency of AT equipment providence and support for professional development in AT, all participants were unanimous about the need for greater preparation and in-support availability in their classrooms. Four participants indicated that the support available was either inadequate,
inconsistent, or frequently obsolete due to the pace of ever-changing technology available, and all five participants agreed that the responsibility therefore fell on teachers to stay current with available assistive technologies. This echoes the major theme found for Research Question 1, in which two participants directly expressed the need for teachers to continuously train and improve as educators. All five participants indicated that successful AT implementation was the responsibility of the TVIs themselves. These findings support the current study’s justification for proposing a TPACK theory for understanding the interrelated domains of technological pedagogical content knowledge and to address diverse teacher needs, student needs, and technology resource conditions.

**Interpretation of the Findings**

Of the major themes that arose from the findings—one that had not been dominant in previous literature—was the importance for the teachers to build a good relationship with parents of visually impaired students. Building strong relationships with parents was of practical significance for teachers in that it better allowed teachers to identify the individual needs of students with whom they may work for an extended amount of years through the aid of parents. Additionally, rapport and communication with the parents could better ensure that parents reinforced the use of teacher-assigned assistive technology at home. Parents’ reinforcement of technology use at home can strengthen the individual student’s ability for technology use to circumvent frustrations that might lead to the student giving up altogether (Participant 5).

Because the needs of each visually impaired student vary, teachers may often be working with a different type of assistive technology per student, which poses a significant challenge for teachers. This echoes the literature in that teachers often found
that assistive technology need be tailored to individual student needs for effective learning (Ajuwon et al., 2016; Lusk, 2012). Juggling so many individual student needs has been found to be challenging for teachers. This challenge may be exacerbated when students themselves lack the knowledge of how to use assistive technology (Participant 1).

Another major finding was the perceived lack of sufficient preparation and support regarding the use of assistive technology. This finding is consistent with the literature indicating that many special education teachers lack sufficient preparation in using assistive technology (Abner & Lahm, 2002; Kamei-Hannan et al., 2012; Mulloy et al., 2014; Seale et al., 2015; Smith et al., 2009; Yue-Ting & Morash, 2014; Zhou et al., 2012). This lack of preparation in using assistive technology has implication to their effectiveness as educators in terms of students not benefitting from being exposed to assistive technology (Wong & Cohen, 2012).

According to Gallo and Beckman (2016), issues related to teacher preparation is one of the most widely acknowledged difficulties that affect the quality of instruction of teachers. The results of the study indicated that TVIs had to practice the initiative to constantly educate and train themselves independently as a result of lack of institutional support. These findings support the prevailing experience of many special education teachers in rural areas regarding the insufficient support in using assistive technology in classroom instruction (Ault et al., 2013; Berry & Gravelle, 2013; Gallo & Beckman, 2016).

Inconsistent use has been a dominant theme in the barriers to successful assistive technology adoption. Previous researchers have highlighted a relationship between the
frequency of technology use and the perceived importance of the devices in successful adoption of assistive technology for positive outcomes (Kamei-Hannan et al., 2012). The current study’s participants echoed the importance of consistent use of assistive technology while positing the importance of building consistency outside the classroom.

The participants were split regarding whether they felt empowered to implement AT in the classroom. Two participants indicated frustrations with inadequate equipment for meeting students’ needs. A dominant theme in previous literature indicated that teachers found access and cost of technology to be significant barriers in its implementation (Flanagan et al., 2013; Hetcher & Vermette, 2013; Sundeen & Sundeen, 2013). This study’s findings differ, in that the schools were found to budget and provide for technology, but the technology was obsolete, ineffective, or not selected with the expertise of the TVI and therefore fit for individual student needs.

The participants were unanimous in the belief that more in-service support and teacher training were necessary. This is in agreement with much of the literature, which found that continuously evolving technologies led teachers to require more consistent, current training to manage the technological proliferation (DePountis et al., 2013; Flanagan et al., 2013; Hetcher & Vermette, 2013; Wong & Cohen, 2012; Zhou et al., as cited in DePountis et al., 2015). One participant expressed that teachers grow frustrated with lack of knowledge or skill in using technology or the technology’s usability itself. Although voiced by only one participant, technophobia, lack of knowledge for technology, and resistance to technology were similarly common among previous research (Alkahtani, 2013; Bausch et al., 2015; Bouck et al., 2016). Improving self-efficacy and attitudes of technology may ameliorate some barriers to its implementation.
At the very least, these results indicated that teachers may persist through barriers by focusing less on the challenges to AT implementation and more on meeting their students’ needs with or without it.

**Implications for Practice**

Teachers and students have been found to struggle with technology. The participants unanimously echoed the research’s findings that teachers feel overwhelmed by the need to master constantly updating trends and innovations in technology. Researchers have found that a standardized toolkit or learning model would aid teachers in managing the scope and speed of available instructional technology with the already-demanding responsibilities of their students’ unique special needs and limited school resources (DePountis et al., 2015).

The results of the study indicated that TVIs in rural areas do not have adequate preparation and organizational support in using assistive technology. The implication of this finding is that special education teacher preparation systems in rural areas must incorporate methods to improve assistive technology competency in teachers (Ault et al., 2013; Berry & Gravelle, 2013; Gallo & Beckman, 2016). Providing access to training and other organizational resources is needed in order to address the current deficits in support experienced by TVIs. Support systems and mentoring networks to address special education and assistive technology could help in addressing the perceived lack of support and preparation among TVIs regarding the use of assistive technology (Quintana & Zambrano, 2014).

School leaders should be able to create preparation programs in order for teachers to improve their specific assistive technology expertise (Cramer, Coleman, Park, Bell, &
Because of the various difficulties already faced by rural teachers, having a supportive system that can encourage their pedagogical performance could foster improved instructional effectiveness. In order to provide more insight into how rural teachers of VIS can best apply technology, more technology integration techniques are necessary. The foundational knowledge of special education teachers need to base rooted in evidence-based research in order to be effective instructors, underscoring the importance of preparation programs that are based on the literature (Cramer et al., 2015).

Assistive technology can only be impactful for students when consciously integrated as an integral part of education and not as an option (Schelly et al., 2015). Although only one participant voiced that the students’ ability to use technology impacted learning, researchers have found that positive outcomes depend upon not only teacher competency but the students’ frequency of use, skills in using the technology, and perceived importance of the technology to their learning (Kamei-Hannan et al., 2012). Placing technology in a classroom does not ensure success; the meaningful incorporation of technology requires pedagogy and content to give it direction. As such, administrators must heed the expertise of teachers of visually impaired students regarding how to make technology most effective when implemented in classrooms and as to what kinds of devices serve their students’ needs specifically. The findings have shown that schools do well to provide opportunities for professional development and training, but there must be follow-through with ensuring teacher-recommended technology reaches the classrooms and has the proper technical support and infrastructure to allow its success.

This study’s findings are significant for educators, administrators, policy scholars, and policymakers of schools in rural districts. There is difficulty and lack of research in
defining what the universal needs of visually impaired students in the classroom may be. This complicates the possibility of identifying legal requirements for a general guideline among teachers. The implementation of assistive technology in the classroom is further exacerbated in rural school districts due to a lack of resources as much as research on AT in rural schools.

Rural schools are currently experiencing vast shortages of fully credentialed teachers (Ault et al., 2013; Berry & Gravelle, 2013; Gallo & Beckman, 2016). This has resulted in overcrowding, high pupil-to-teacher ratios, and compromised educational quality for all students (Berry & Gravelle, 2013). The shortage has forced unqualified teachers to further take on additional responsibilities to compensate for the deficit (Berry & Gravelle, 2013). Increase in unqualified teachers and constrained resources compromises visually impaired students particularly, which is common when unqualified teachers lack necessary professional preparation in appropriate technological instructional techniques and intervention practices (Gallo & Beckman, 2016). This crisis is exacerbated in rural school districts where financial constraints to purchase new or used computers is compounded if a significant portion of rural school teachers’ lack computer literacy (Herring et al., 2016). If educators are to implement assistive technology in schools according to law, AT training need be rigorous to produce professionals highly qualified in making AT decisions (Edyburn et al., 2005). It is necessary to improve upon the current deficit in resources at rural schools to prevent them from falling behind their urban counterparts.
Limitations

**Validity.** Because experiences and perceptions cannot be quantitatively measured, the researcher chose an interview-based study approach. Previous research on assistive technology has also implemented phenomenological research design (Clark & Boyer, 2016; Greenhalgh et al., 2013). An interview-based study approach was useful for focusing on shared consciousness and experiences among the sample population to be made generalizable to a broader population (Wojner & Swanson, 2007). The researcher deemed a sample size of five participants appropriate to provide in-depth, detailed examination of perceptions and experiences to obtain validity and credibility (Lincoln & Guba, 1985). An adequate sample size is needed to provide more complex interpretations of data in consideration of variation in the participants’ cultural backgrounds and experiences. Although their heterogeneity did not provide evidence to support the researcher’s speculation as to the impact of sociocultural and gender factors on responses, the heterogeneity of the participants ensured diversity comparable to similar research and applicable to diverse teaching populations in other rural school districts.

**Limitations.** Prior to conducting the study, the researcher anticipated three major limitations to the study. The first limitation that the researcher anticipated was their bias as far as the researcher held assumptions about what responses would be uncovered during interviews. To address possible bias, the researcher utilized field note journaling to document research biases, concerns, and comments throughout the research.

Other limitations the researcher anticipated concerned the participants. One concern was the participants’ change in opinion about their experiences over time due to issues such as lack of funding or proper training. Although the research estimated that
this problem may not be as relevant as time went on, the researcher asked participants to
describe their perceptions about their particular circumstances and if they foresaw any
future changes in perception. The study’s results indicated that this limitation did not
significantly influence the results, as expected by the investigator. The most significant
limitation anticipated by the researcher was participants’ concerns with privacy and
perceived job vulnerability associated with criticizing school policies insofar as these
concerns influence participants’ responses. To address this concern, the researcher
assured participants that the study’s discretion measures met IBR standards of
confidentiality and that the information obtained was accessible to only the researcher
and would not affect their employment. The respondents’ openness regarding current
school policies seemed to indicate the final limitation was not as restricting as anticipated
by the investigator and helped to identify current shortcomings in schools to be addressed
in future practice and research.

Finally, the researcher identified the gap in the literature regarding studies that
investigated how gender and sociocultural factors influenced self-efficacy for
implementing AT in the face of perceived barriers. The final sample consisted of five
females, which did not provide the heterogeneity needed to conduct a gender comparison
of perceived self-efficacy. Nonetheless, the sample accomplished a diversity of
experiences to achieve a heterogeneity applicable to other teaching populations in rural
districts.

**Recommendations for Further Research**

There is a gap in the literature regarding how well assistive technology can be
better incorporated into rural schools. Researchers have fallen short in investigating rural
teacher technological pedagogical content knowledge (TPACK). The current study corroborated the literature’s findings that feeling overwhelmed by the proliferation of technology leads many teachers to give up or resist technology altogether. Rural school teachers, many of whom may lack fundamental computer literacy (Herring et al., 2016), are at greater risk of resisting technology or lacking ability to use it. Because positive outcomes for students with disabilities, particularly visually impaired students, depend so heavily on effective assistive technology, research in assistive technology should further pursue the universal design of products that can be understood and used by all people to maximum ability (Burgstahler, as cited in Alkahtani, 2013). Improved and standardized usability may alleviate technical complications for special education teachers already juggling individual student demands.

Further research in universal design would also benefit the students. The current study’s findings, as well as those in previous literature, have indicated that students would benefit from a skill and knowledge base in assistive technology to make its use effective for their learning (D’Andrea, 2012). The risk of students growing frustrated with inaccessible technologies or lack of access to technology is too detrimental to their educational outcomes to forego. Further researchers should continue to test which assistive technology devices best serve the needs of visually impaired student as much as their teachers. In exploring standardized implementations of technology, scholars have found that screen magnifiers, closed-circuit televisions, screen readers, electronic magnifiers, portable and refreshable Braille displays, scanners and optical readers, accessible cell phones, digital and electronic data, and digital readers are some examples of useful AT (Wong & Cohen, 2012). The current researcher found that iPads and tablets
are among the most frequently used devices in rural North Carolina districts. To determine whether each device may capably be integrated into the classroom and how, however, further research is needed.

Research regarding assistive technology use should also feature teachers’ genuine explorations of technological implementation. This has previously been shown to improve teachers’ self-efficacy towards integration and use of technology in the classroom (Peled & Oster-Levinz, 2015). Students were also more encouraged by interacting with their lessons through straightforward and entertaining technological applications (Argyropoulos et al., 2014). Technology implemented for the unique learning habits and individual needs of the students has proven to be beneficial in improving their educational outcomes (Ajuwon et al., 2016; Lusk, 2012). To investigate which technological tools may be beneficial in the classroom, the researcher therefore recommends that studies investigate genuine teacher and student explorations of these technologies. Such studies should investigate correlations between authentic explorations and improved self-efficacy as anticipated by the TPACK framework. More importantly, the current study found that special education teachers with expertise in individual student needs are often left out of the decision-making process of which AT will be purchased and implemented in schools. Such studies may discover improved self-efficacy as well as more significant outcomes for students and are worth pursuing.

Finally, research need be pursued at the policy level to continue to search for universal guidelines to support teachers in implementing AT. Because the needs of students with disabilities are so unique on an individual basis, it is difficult to make blanket policies or assessments to identify what those needs are. However, the current
study’s findings have emphasized the importance of having administrator, district, and
government support in funding resources and professional development for the special
education experts charged with this responsibility. It is especially incumbent upon
schools in rural districts, who are pressed by teacher shortages and inexperienced
educators, to ensure policies that streamline the funding, resources, and authorities of
those teachers with specialized competencies for ensuring the needs of students with
disabilities are not disproportionately impacted. Further research in financial and
organizational policies that can support these teachers is necessary.

Conclusion

Researchers have shown that assistive technologies provide significant and
beneficial outcomes for the academic performance of students with disabilities,
particularly visually impaired students. Many teachers, however, do not feel prepared and
supported to implement assistive technology in their classes (Abner & Lahm, 2002;
Kamei-Hannan et al., 2012; Mulloy et al., 2014; Seale et al., 2015; Smith et al., 2009;
Yue-Ting & Morash, 2014; Zhou et al., 2012). Without the appropriate preparation and
support, the effectiveness of teachers to deliver instruction using assistive technology is
compromised (Wong & Cohen, 2012).

This problem is especially acute in rural school districts, where teacher shortages
result in the hiring of unqualified teachers, many of whom lack computer literacy. Special
education teachers in rural areas are particularly more likely to experience limited
preparation and support in using assistive technology (Ault et al., 2013; Berry &
Gravelle, 2013; Gallo & Beckman, 2016). Without in-service professional development
opportunities and pre-service training, special education teachers in rural areas are not able to implement assistive technology effectively (Wong & Cohen, 2012).

The lack of special education experts, resources, and time disproportionately compromises the learning of students with disabilities. This lack of preparation in using assistive technology has implication to the effectiveness of special education teachers in terms of students not benefitting from being exposed to assistive technology (Wong & Cohen, 2012). When assistive technology is not properly implemented as a result of lack of preparation or support for training, the intended positive effects may not be fully experienced by students.

The current study provided information to help resolve some of the barriers teachers of visually impaired students face when integrating assistive technology into the classroom. The technological pedagogical content knowledge framework anticipated that knowledge of technological use would be found to impact educational outcomes for visually impaired students. As such, administrators need ensure consistent support for the training of teachers in assistive technology and the funding for devices and infrastructure to make assistive technology successful in the classroom. A standardized approach like the technology content knowledge framework allows flexibility in supporting teachers to stay current among ever-evolving technologies to meet diverse student needs. To ensure schools make accommodations in accordance with the law, future researchers should expand upon the minimal studies available regarding teachers of visually impaired students and perceived barriers of implementing assistive technology in rural school districts. This chapter concludes the current study.
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Appendix A: Interview Guide

1. Can you share your experiences in implementing AT in teaching visually impaired students? What positive experiences can you share? What negative experiences can you share?

2. What are your perspectives in the effective implementation of AT in teaching visually impaired students?

3. What are the key components or characteristics of an effective implementation of AT in teaching visually impaired students? Among the components that you mentioned, what component is the most essential in a successful implementation of AT in teaching visually impaired students?

4. What are the personal barriers that you experienced in utilizing AT in teaching visually impaired students?

5. Can you describe a specific example of a personal barrier that you experienced in utilizing AT in teaching visually impaired students? How did this experience affect your views on the utilization of AT in teaching visually impaired students?

6. What are the organizational barriers that you experienced in utilizing AT in teaching visually impaired students?

7. Can you describe a specific example of an organizational barrier that you experienced in utilizing AT in teaching visually impaired students? How did this experience affect your views on the utilization of AT in teaching visually impaired students?

8. What barriers in knowledge/skills that you experienced in utilizing AT in teaching visually impaired students?
9. What are your views on the use of current teacher preparation programs and in-service support available for classrooms with visually impaired students? How sufficient are these programs? What are the strengths and weaknesses of these preparation programs?

10. Do you have any other relevant experience or views relevant to AT implementation in teaching visually impaired students that have not been discussed?
Appendix B: Informed Consent Form

My name is Gwen Blue and I am a doctoral student at the North Carolina State University. I am conducting a research study about assistive technology implementation of teachers of visually impaired students. Your participation will involve being part of an individual face-to-face interview, which will take 45 minutes to one hour. Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, you can do so without penalty or loss of benefit to yourself. The results of the research study may be published but your identity will remain confidential and your name will not be disclosed to any outside party. In this research, there are no foreseeable risks to you. If you have any questions concerning the research study, please email me at: GBTVISTUDY@GMAIL.COM.

As a participant in this study, you should understand the following:

- You may decline to participate or withdraw from participation at any time without consequences.
- Your identity will be kept confidential.
- The researcher has thoroughly explained the parameters of the research study and all of your questions and concerns have been addressed.
- Data will be stored in a secure and locked area. The data will be held for a period of seven years, and then destroyed.
- The research results might be used for publication.

“By signing this form you acknowledge that you understand the nature of the study, the potential risks to you as a participant, and the means by which your identity will be kept
confidential. Your signature on this form also indicates that you give your permission to voluntarily serve as a participant in the study described.”

Signature of the interviewee _____________________________ Date ______________

Signature of the researcher ______________________________ Date ______________