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Teachers' Value Beliefs and Perceived Barriers of One-To-One Devices: A Descriptive Study of Technology Integration at a Middle School for Students With Dyslexia

Deborah Anne Irwin

TEACHERS' VALUE BELIEFS AND PERCEIVED BARRIERS OF ONE-TO-ONE DEVICES: A DESCRIPTIVE STUDY OF TECHNOLOGY INTEGRATION AT A MIDDLE SCHOOL FOR STUDENTS WITH DYSLEXIA

by

Deborah Anne Irwin

Bachelor of Science
Florida International University, 1987

Master of Science
Florida International University, 1994

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Accepted by:

William Morris, Major Professor

Ismahan Arslan-Ari, Committee Member

Hengtao Tang, Committee Member

Anna Clifford, Committee Member

Tracey L. Weldon, Interim Vice Provost and Dean of the Graduate School

DEDICATION

To my husband and daughters who are, and have always been, a constant source of support, love, and encouragement in all of life but especially in finishing this work; to my mom and dad for their unconditional love and instilling in me the importance of education; and to my students with dyslexia, former and future, for their bravery, wit, and perseverance.

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ABSTRACT

One-to-one devices provide the opportunity to develop 21st century skills, improve academic learning, access information, and increase student independence. Prior to the one-to-one initiative, device use among the teachers of students with dyslexia had included low-level integration. The administration at this site made the decision to implement a one-to-one device program with the intent of increasing how devices were utilized during instruction. This descriptive study explored the value beliefs and perceived barriers held by middle school teachers at a school for students with dyslexia following the implementation of one-to-one devices. This study sought to describe the value beliefs and perceived barriers of middle school teachers as to the importance of technology for students with dyslexia, the change in value beliefs after the one-to-one initiative was implemented, how the value a teacher held toward the use of devices for students with dyslexia affected their integration of one-to-one devices in the classroom, and how teachers integrated devices during the instruction of students with dyslexia.

Using a convergent parallel mixed method design, quantitative and qualitative data was collected from 10 participants using a survey, interviews, and classroom observations. Using descriptive statistics from the survey and observations along with inductive analysis of interviews and observations, each data source was analyzed separately with the findings merged in order to draw conclusions. Survey results showed participants valued the use of technology in the teaching and learning process and felt they had the skills necessary to integrate one-to-one devices during instruction. The

findings of this study revealed (a) technology was used as a supplemental resource, (b) had a positive impact as an assistive technology, (c) had a positive impact on learning, and (d) found teachers increased in their self-efficacy. Based on these findings, extended professional development incorporating 21st century skills with a focus on integration of devices into content areas is needed to develop the skills and knowledge to incorporate student-centered activities.

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LIST OF ABBREVIATIONS

AOGPE ..... Association of Orton-Gillingham Practitioners and Educators

IT ..... Information Technology

ITC ..... Information Technology & Communication

OG ..... Orton-Gillingham

SOM ..... School Observation Measurement

TAM ..... Technology Acceptance Model

TOT ..... Technology Observation Tool

TTQ ..... Teacher Technology Questionnaire

VBTI ..... Value Beliefs of Technology Integration

ZPD ..... Zone of Proximal Development

CHAPTER 1

INTRODUCTION

Schools across the country have instituted one-to-one device initiatives as a way to enhance learning and cultivate 21st century learning skills in students (U.S. DOE, 2017; Project Tomorrow, 2018). Whether and to what extent one-to-one devices are used in the classroom, however, depends on teachers' beliefs as to the benefit of technology in the teaching-learning process and their perspectives on barriers to using devices effectively during instruction (Ertmer, 1999; Ertmer, 2005; Kwon, Ottenbreit-Leftwich, Sari, Khlaif, Zhu, Nadir, & Gok, 2019; Inan & Lowther, 2010; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010). While one-to-one devices for students resolves the issue of sufficient hardware, other barriers, such as infrastructure, software, support, and training, can impact a teacher's perspective of technology integration and thereby limit the frequency and type of integration which occurs. When teachers are confronted with barriers they deem too difficult to overcome, they are hesitant to use digital tools effectively (Inan & Lowther, 2010; Ottenbreit-Leftwich et al., 2010).

A teacher's belief system about the usefulness of technology within their teaching pedagogy plays a role in how technology is integrated into the curriculum. (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, Sendurur, 2012; Ottenbreit-Leftwich et al., 2010). For teachers with a traditional, teacher-centered instructional style, one-to-one device integration often involves using devices as a word processor, a research tool, and a drill and practice device (An & Reigeluth, 2011; Grant, Ross, Wang, & Potter, 2005;

Ottenbreit-Leftwich et al., 2010). For teachers with a student-centered pedagogy, one-to-one devices can offer a means for students to interact with information which involves collaboration, creative thinking, and problem solving as they evaluate and create materials to share with authentic audiences (Ertmer et al., 2012; Lawson & Miller, 2011; Ottenbreit-Leftwich et al., 2010). Additionally, for teachers of middle school students with dyslexia, the implementation of technology within classroom instruction should be interwoven with their paradigm of systematic, structured, and multi-sensory instructional principles, such as those taught through the Academy of Orton-Gillingham Practitioners and Educators (AOGPE) (AOGPE, 2018a; Gillingham & Stillman, 1999). For each classroom teacher, the connection between their value beliefs about technology integration and the teaching-learning process is vital for positive academic results.

This descriptive study will explore the value beliefs and perceived barriers of middle school teachers at a school in the Southeast regarding the use of one-to-one devices for students with dyslexia. Dyslexia is characterized by difficulties learning to read and write effectively despite an individual having an average to above average ability to learn (American Psychiatric Association, 2013; IDA, 2020; Shaywitz, Morris, & Shaywitz, 2008). Many teachers of students with dyslexia receive training through the Academy of Orton-Gillingham Practitioners and Educators (AOGPE, 2018b). Orton-Gillingham (OG) training involves intensive instruction in the foundations of language using a systematic, structured, multi-sensory approach. (AOGPE, 2018a). Teachers of students with dyslexia can use one-to-one devices to build academic skills and access learning material (Adam & Tatnall, 2017; Lowther et al., 2012; Mahoney & Hall, 2017).

This study will describe the one-to-one device initiative at a school for students with dyslexia, during the 2020-2021 school year.

National Context

The reality of a global economy and changes within the workforce necessitates equipping students with reading and writing skills which can be applied to real world, authentic contexts (Battelle for Kids, 2019; ISTE, 2022; Larson & Miller, 2011; Saletta, 2018). Many graduates entering the workforce are often doing so without the 21st century skills needed to be successful (Casner-Lotto & Benner, 2006). In addition, those with dyslexia continue to struggle with literacy and self-advocacy skills within the workplace (Saletta, 2018). In response, policy makers, administrators, employers, and parents have called for increased use of problem solving, creativity, and collaboration through the use of technology so students are adequately prepared for the future (Battelle for Kids, 2019; ISTE, 2022; Project Tomorrow, 2018; U.S. DOE, 2016; U. S. DOE, 2017). However, teachers often lack the knowledge, skills, and resources related to technology integration needed for effective change (Hew & Brush, 2007; Ottenbreit-Leftwich et al., 2010; Project Tomorrow, 2017). These barriers to technology implementation ought to be understood and addressed as a school begins a one-to-one initiative and before teachers can effectively integrate technology (Ertmer et al., 2012; Freeman, Adams Becker, Cummins, Davis, & Hall Giesinger, 2017; Hew & Brush, 2007).

School administrators understand the need for students to apply learning using technology. While 71% of district administrators and 60% of principals reported the importance of effective technology use as extremely important for student success, only 43% of teachers had the same belief (Project Tomorrow, 2017). One third of technology

leaders said altering teachers' motivation and instructional practices to a more student-centered approach was their greatest challenge (Project Tomorrow, 2017). Additionally, one out of three school leaders saw personalized learning as being a transformative way to improve education with 57% believing that technology was an important component to learning (Projects in Education, 2018).

Schools have made significant gains in equipping classrooms, teachers, and students with portable technology. Compared to the early 2000's, when 30% of teachers reported having one or two computers in their classrooms and access to a computer lab (U.S. DOE, 2003), students in grades 3-12 now report they have access to a portable device, tablet, or Chromebook in at least 50% of their classes (Evans, 2019). Many schools have gone further to address the need of technology access providing students with personal devices such iPads or Chromebooks. According to Project Tomorrow's national survey of administrators in K-12 (Evans, 2019), roughly 38% of students have access to one-to-one devices at both at school and home. By issuing devices to each student for their use throughout their day, schools are creating a ubiquitous environment which provides equity of access for all students and makes it possible for students to develop 21st century digital literacy skills needed for their future (U.S. DOE, 2017; Freeman et al., 2017; Selwyn, Nemorin, Bulfin, & Johnson, 2017). Access to educational tools not only impacts all demographics and socio-economic levels, it also provides students with dyslexia and other learning disabilities valuable tools for learning and communication.

At the onset of one-to-one initiatives, teachers are apprehensive about how the inclusion of devices will impact them and their students (Donovan, Hartley, & Strudler,

2007). Teacher concerns range from their technology skill level, classroom management, reliable infrastructure, and the impact of technology on the teaching and learning process. These myriads of barriers, beliefs and perspectives interact with one another, impacting how and to what degree teachers integrate technology into their instructional time (Ertmer et al., 2012; Francom, 2020; Kwon et al., 2019; Lowther, Inan, Strahl, & Ross, 2008; Ottenbreit-Leftwich et al., 2010). Due to the combination of beliefs and barriers, most teachers have integrated technology to support current teacher-centered instruction and supplement their curriculum by including videos and cloud-based storage systems (Project Tomorrow, 2017). Little improvement has been made, though, in increasing student-centered practices which integrates technology into the classroom (Freeman et al., 2017; NAEP, 2015). According to the Nation's Report Card (NAEP, 2015), while there had been an increase in computer use in fourth grade classrooms from 2009-2015, only 4% of teachers reported using technology for research, 12% for website access, or 15% for extended practice in math. Technology was often used for low-level learning with an emphasis on drill and practice or independent seat work (U.S. DOE, 2003). The difference was primarily due to individual teacher beliefs and perceptions about technology integration (Ertmer, 2005; Inan & Lowther, 2010). A higher percentage of teachers who have integrated iPads and Chromebooks into their instructional practice believed that technology enabled differentiated learning, application of learning to real world problems, collaboration, and increased creative, critical thinking skills compared to teachers in a traditional classroom for each area (Lowther et al., 2008; Project Tomorrow, 2017). For many teachers it was not an unwillingness to change teaching strategies or

methodologies, rather it was their uncertainty and lack of knowledge on how to leverage the transformative nature of technology in learning (Ertmer et al., 2012).

Many teachers of students with dyslexia have been trained in a philosophy of teaching which involves structured, multi-sensory language instruction (AOGPE, 2018a; IDA, 2020a; Sheffield, 1991). Based on the work of Dr. Samuel Orton, a neuropsychiatrist, and Anna Gillingham, an educator and psychologist, the Orton-Gillingham (OG) method of reading and writing involves direct, systematic instruction of reading and writing. Certification in OG requires a bachelor's degree as well as completion of course work, a practicum, and observations using OG strategies (AOGPE, 2018b). The training is based on a philosophy of multi-sensory instruction (Sheffield, 1991). For OG teachers, this philosophy must be interwoven with the value placed on technology since it will impact how devices are used in the classroom.

For students with dyslexia, one-to-one device initiatives offer both a tool to access information as well as one to develop and strengthen academic skills (Degirmenci, Baglama, & Yucesoy, 2020; Shaywitz et al., 2008; Xie, Basham, Marino, & Rice, 2018). Dyslexia is a neurobiological disorder which affects language processing and phonemic awareness (IDA, 2020a; Shaywitz et al., 2008). Not otherwise attributed to low cognitive ability or lack of learning opportunities, dyslexia affects an estimated 10% of students, impacting their reading, spelling, written expression, and oral language skills (APA, 2013; IDA, 2020a; Shaywitz et al., 2008). Technology, such as one-to-one devices, can be used as an assistive technology tool by converting text-to-speech, speech-to-text, organizing materials, and allowing students to access learning material independently (Mahoney & Hall, 2017; Ok & Rao, 2017; Shaywitz et al., 2008). Instruction using

devices can aid in increasing math, written expression, reading fluency, and organizational skills in students with dyslexia (Conway & Amberson, 2011; McClanahan, Williams, Kennedy, & Tate, 2012; McKnight et al., 2016; Sessions, Kang, & Womack, 2016). The advent of technology, and particularly one-to-one devices, has helped students "to be on a level playing field" (Tilton & Hartnett, 2016, p. 84) with their peers and provide an avenue for literacy enrichment.

Local Context

The one-to-one initiative for this descriptive study took place at a school for students with dyslexia during the 2020-2021 school year. For the purpose of this study, a pseudonym was given to the school, and all identifying information, including references to the school, have been omitted. Pinewood Academy (PA) was a private, grade 1-8 school for students with dyslexia located in the southeastern United States. It was founded over 30 years ago with the mission to provide a multi-sensory education for students diagnosed with dyslexia. All of the teachers at the school held at least an associate certification from the Academy of Orton-Gillingham. The school was a certified training center for OG, providing model instruction for other schools. It was accredited by the South Carolina Independent School Association, Orton-Gillingham Academy, and the International Dyslexia Association. Other than accrediting agencies, the school was an independent, private school lead by the head of school and overseen by a school board.

As a private school, students had to seek admission. The school accepted students with a diagnosis of a language-based learning difference. Students could have other comorbid diagnoses such as Attention Deficit-Hyperactivity Disorder (ADHD), but the

school did not accept students whose primary disability is autism, emotional disabilities, or conduct disorders. In addition to having a language disorder, students had an average to superior intelligence as measured on cognitive ability assessments. The inclusion of a cognitive ability was in keeping with the definition of a learning disability (APA, 2013) as well as the intended use of OG training for language acquisition (Gillingham & Stillman, 1999). By having specifications within the admission policy, the school sought to ensure that the instruction provided to students was effective.

The teachers at the school were specially trained to work with students with dyslexia. In order to qualify for employment, teachers had to hold at least a bachelor's degree and certification through AOGPE. In order to obtain an associate certification, teachers had to complete 60-70 hours of training by an OG Fellow, successfully complete 100 hours of practicum, and have 10 observations (AOGPE, 2018b). Successful completion of an associate OG certification ensured that teachers and tutors were well versed in the OG theory of teaching and could appropriately apply literacy instruction with students. Teachers were then to use OG elements in every aspect of their teaching including content area classes.

The school was housed in a new, state of the art building with open seating areas for collaboration, large windows for natural light, and spacious classrooms. It was divided into two school sections with both division meeting on one campus. Elementary included grades 1 - 4; middle school contained grades 5 - 8. There were 65 students enrolled at the school with a teacher-student ratio of 1:3. Classes were intentionally small in order to provide individualized instruction in all courses. Each student received one-to-one intervention using OG tutoring twice a week for 60 minutes. OG is a systematic,

research-based approach to teaching phonemic principles needed for reading decoding and spelling (Peavler & Rooney, 2019; Stebbings & Kline, 2020). OG tutoring was an important element which all students at the school received to assist them in overcoming dyslexia.

Teachers had used a variety of technology tools over recent years. The new building was equipped with interactive white boards, and the school purchased two 3D printers. Initially, both were used quite a bit, but many teachers have moved back to a dry erase board, and the school was no longer using the 3D printers. One printer was given away, and the other printer needed repaired. Classrooms had a combination of iPads, Chromebooks, and laptops to meet technology needs for teachers and students. The new building contained technology storage rooms with charging stations spread throughout the classroom portion of the building for easy access by students and teachers. In addition, there were eight computer carts which could be shared between classrooms.

Device use within the classes had been somewhat inconsistent. While English classes in upper grades had been using class sets of Chromebooks, other classes such as social studies and literature needed to share devices. This resulted in some classes not using devices consistently due to limited availability. The lack of resources resulted in less technology integration than desired. Since the devices were underutilized, the technology manager started moving them into classrooms, providing each class with eight to ten iPads or Chromebooks and moved away from storing them in the technology room and on carts.

The school was a Google based school. While the administration used *RenWeb* as a student management system, teachers and students used Google to create, store, and

share documents. Some teachers created Google classrooms prior to the one-to-one initiative. The school had site licenses for *IXL*, *AmplifyScience* (Amplify Education, Inc., 2022), and *Learning Ally*. OG tutors used *ReadNaturally* and *WordWall* to build reading fluency. Other applications and Google products were used to aid in reading, written expression, and accessibility.

There were three individuals which helped to support teachers in their integration of technology and who worked to equip teachers with the training and support they needed throughout the one-to-one initiative. The head of middle school provided oversight to grades 5 - 8. In addition to providing direction to the middle school, he taught English and Drama and had been using devices with his students for several years. He was very comfortable integrating different technology tools into the curriculum and regularly had students collaborate as they worked on assignments. The technology manager maintained and supported the administration and teachers in the replacement and use of all hardware and software. He worked to provide large group and individual training in the use of the student management system, Google products, and classroom applications. Due to his technical skills, he also wrote programs to meet the needs of the school, including a report card adaption to integrate with *RenWeb*. Lastly, an academic dean position was added for the 2020-2021 school year. Her role was to work with teachers not only on improving curriculum but also aiding them in connecting technology-based lessons to their teaching. She and the technology manager had a goal that teachers would learn to use one-to-one devices in interactive, creative ways to support student learning.

Statement of the Problem

While the teachers at the school have been using technology in their classes for several years, its application had been primarily used to replace paper-pencil activities and lacked interactive, creative applications. Other than science teachers using devices for simulations as part of their *AmplifyScience* curriculum (Amplify Education, Inc., 2022), most teachers had primarily used iPads and Chromebooks within the classroom to develop fluency in math and reading, take online reading quizzes, and write papers similar to the low-level integration expressed in research (U.S. DOE, 2003; Inan & Lowther, 2010). Due to COVID-19, teachers had to implement online learning with very short notice. For those students who did not have a computer at home, the school provided an iPad or a Chromebook. Overall, the teachers made the shift to online platforms and Google Classroom very effectively. For the fall of 2020, students in grades 5 - 8 were issued one-to-one devices by the school. Teachers then blended their face-to-face approach of teaching with digital technology. This descriptive study sought to understand and communicate how the teachers implemented one-to-one devices in their classroom based on objectives set by the school (Gay, Mills, & Airasian, 2009; Mertens, 1998; Powell & Powell, 2006). The school was able to take the results of the study and improve instructional practices.

Purpose Statement

The purpose of this research was to describe the value beliefs and perceived barriers of teachers following a one-to-one device initiative in grades 5 - 8 at a school for students with dyslexia.

Research Questions

This research study sought to answer the following questions:

1. What are the teachers' value beliefs about one-to-one devices for students with dyslexia?
    1a. What are the teachers' value belief about the importance of technology for students with dyslexia?
    1b. How does teachers' value beliefs change after the one-to-one initiative was implemented?
2. How does the value a teacher hold toward the use of devices with students with dyslexia affect their integration of one-to-one devices in the classroom?
3. How do teachers integrate devices during the instruction of students with dyslexia?

Statement of Researcher Subjectivities and Positionality

I am an educator who desires to equip students and teachers to be effective, life-long learners by utilizing their gifts, talents, and resources. I hold a bachelor's degree in special education, a master's degree in reading, and decided to pursue a doctorate in education with an emphasis on learning design and technologies in order to help equip others. I have been a special education educator for the past thirty-five years. During this time, I taught in a public middle school in southern Dade County, Florida for five years, worked as a classroom teacher and administrator for twenty-six years in private Christian schools in South Florida and South Carolina, and am currently working as an independent tutor and consultant for students with learning needs. My roles have included being a classroom teacher for language arts, reading, math, academic support, and individualized

educational therapy. In addition, I taught critical thinking courses through an online university for five years. I have also served in administrative roles including the Academic Resource Center Director at Southside Christian School in Simpsonville, South Carolina, a position I held for twenty-four years. There I was a member of the Lower School Leadership Team and the administrative counsel where I worked with principals on curriculum evaluation, student activities, teacher training, and strategic planning. I have conducted numerous professional development sessions for teachers and administrators at the local and regional levels, providing teaching and learning strategies to support all students but more specifically the needs of those with diagnosed learning disabilities and dyslexia. I have also served on regional accreditation teams and evaluated special education programs as an outside consultant. Through my various roles, I have gained skills as a teacher, administrator, and outside observer; all of which were useful in a descriptive research study.

Through my various roles in education, as well as personal use, I developed numerous skills to manage, create, and utilize educational technology to facilitate learning and improve performance. I became interested in technology as I worked with students and sought ways to make learning and expression more accessible. This, in turn, led me to brainstorming, collaborating, and training teachers on resources and tools available to not only to make them more productive but also to equip them in meeting the diverse needs of students in their classroom. As an educational technology user and professional, I understand there is a balance between reaching an end goal and the comfort and values of others associated with technology (Ottenbreit-Leftwich et al., 2010). As an outside researcher describing what was happening at a specific location, I

had to understand that my experience and comfort level could not be placed on others; instead, I needed to seek to understand the beliefs and perspectives of the teachers I was working with without attempting to influence their thinking (Dwyer & Buckle, 2009; Merriam, Johnson-Bailey, Lee, Kee, Ntseane, & Muhamad, 2010).

My research incorporated quantitative and qualitative data using a constructivist pragmatic paradigm. I needed to understand the knowledge and skills of the classroom teachers in grades 5 - 8 regarding their technology beliefs, perspectives, and use. Then through reflexive collaboration and open coding (Mertler, 2017), I needed to analyze and present the participants' thoughts and practices in a manner which could later be used by the school to direct future technology training and integration. My role was that of an outsider observer with some insider insight (Dwyer & Buckle, 2009). I was an outsider in that I was not employed at the school. An advantage of being an outsider was I had the opportunity to ask questions which an insider might not had been as likely to ask due to peer pressure or apprehension of others (Merriam et al., 2010). The disadvantage of being an outsider was I needed to work to gain the trust of the teachers in order for them to feel comfortable providing open, honest responses during the individual interviews so that I could gather sufficient data to understand how the one-to-one initiative was affecting them (Mertler, 2017). In some ways I was also an insider in that I had been associated with the school for many years and had worked with students with dyslexia throughout my career. I had worked professionally with the administrator and several teachers at PA during my role at an area school. These previous relationships enabled me to establish trust for the research process.

The descriptive study results reflected those of the participants and could be used by the school for their benefit to improve educational practice and transform learning (Herr & Anderson, 2005). In order to accomplish this goal, I needed to seek to listen and understand the challenges and barriers teachers were experiencing while implementing one-to-one devices in their instruction, catalogue the ways teachers had students use their devices as part of the learning activities, and analyze the data to better understand this group of teachers' beliefs and perspectives. I had to be aware of my own biases during this process and not evaluate the use of devices based on my own beliefs and practices. My role was to record their reflections and add their comments to notes gathered throughout the study period. It was important for me to take objective notes. I had used the process of objective notetaking when observing students in their classes and conducting teacher observations which benefited me in the qualitative data collection and analysis portion of this study.

I recognized that one of my biases was to become too student focused, and I held a desire for students to engage in student-centered learning. I needed to balance my personal goals with those of the teachers and school. This balance was accomplished through on-going reflexive collaboration with the participants and member checking (Mertler, 2017). The use of triangulation of data sources also served to ensure that data results were reliable (Gay et al., 2009). By using the feedback of outside professionals as well as member checking, I worked to safeguard the rigor and reliability of the results (Mertler, 2017).

Definition of Terms

Assistive Technology: includes "any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (Pub. L. No. 108-364)

Barriers: The "practical and philosophical problems posed by the [technology] integration process" (Ertmer, 1999, p. 50)

Beliefs: The "suppositions, commitments and ideologies held by an individual" (Calderhead, 1996 as cited in Ertmer, 1999)

Dyslexia: A reading disability not otherwise attributed to below average intelligence, cognitive impairment, or lack of education, but which impacts the ability to process language and affects executive functioning skills (IDA, 2020; Shaywitz et al., 2008)

One-to-one devices: "The ubiquitous or mass presence of devices in schools" (Selwyn, Nemorin, Bulfin, & Johnson, 2017) "in which all the students in a class, grade level, school, or district are provided computers for use throughout the school day and … at home" (Zheng, Warschauer, Lin, & Chang, 2016, p. 1053)

Perceptions: How a person receives and interprets information from the outer world (Uzunboylu & Ozdamli, 2011)

Self-efficacy: An individual's belief in their ability to perform a given task (Bandura, 1977)

Student-Centered Learning: Student-centered learning is "focused on the needs and abilities of students" (Smith & Throne, 2007, p. 7), allowing students to choose topics of

interest with appropriate support of content knowledge which is based on curriculum standards (Krahenbuhl, 2016)

Value Beliefs: Beliefs and or assumptions about students and learning (Kagan, 1992) which directly impact a teacher's use of instructional practices (Richardson, 1996), including technology integration (Ryba & Brown, 2000)

CHAPTER 2

LITERATURE REVIEW

One-to-one device initiatives offer powerful learning tools for students with dyslexia (Adam & Tatnall, 2017; Ok & Rao, 2017; Xie et al., 2018). Since students with dyslexia have language processing difficulties and executive functioning weaknesses, both of which often linger even after intervention, one-to-one devices provide tools and applications that allow students to access learning materials and increase their academic skills. However, it is the classroom teacher's beliefs and perspectives about technology integration which determines how and to what extent one-to-one devices are implemented during the teaching-learning process.

Research Purpose

The purpose of this research was to describe the value beliefs and perceived barriers of teachers following a one-to-one device initiative in grades 5 - 8 at a school for students with dyslexia.

Research Questions

This descriptive study sought to answer the following questions:

1. What are the teachers' value beliefs about one-to-one devices for students with dyslexia?

    1a. What are the teachers' value belief about the importance of technology for students with dyslexia?

1b. How does teachers' value beliefs change after the one-to-one initiative was implemented?

2. How does the value a teacher hold toward the use of devices with students with dyslexia affect their integration of one-to-one devices in the classroom?

3. How do teachers integrate devices during the instruction of students with dyslexia?

Literature Review Method

Various combinations of two to three keywords in ERIC-ProQuest, ERIC – Education Source, EBSCO, JSTOR and Google Scholar were used to find relevant articles. Search parameters were set to review articles published between 2000 to 2020 from peer reviewed journals. Initial keyword searches included the terms *technology integration*, *teacher perceptions*, *barriers*, *teacher beliefs*, and *one-to-one initiatives*. As the research progressed, the search by publication year was narrowed, and a greater variety of key words was used. Additional key words included *executive functioning*, *ITC*, *1:1*, *constructivism*, *professional development*, *21st century learning*, *academic achievement*, *reading*, *literacy*, *teacher self-efficacy*, and *middle school*.

Searches for specific researchers such as Ertmer, Ottenbreit-Leftwich, and Lowther were conducted after noting those researchers were cited repeatedly in different articles. Each of the researchers had conducted seminal work in the field of teacher perspectives and beliefs related to technology integration. For these searches, a direct search either by author name in a database or within specific journals was conducted. A search through the table of contents of key journals was also conducted with the realization that there might be articles which could be beneficial to the literature review.

Table 2.1 *Keywords, Databases, Journals, and Other Resources for Literature Search*

Keyword	Index/Database	Journal	Other
• Technology integration • Teacher perceptions • ICT • Student learning • One to one • K-12 • Reading • Professional development • Literacy • Cognitivism • Student-centered education • 21st century skills • Professional Development • Ertmer • Ottenbreit-Leftwich • Lowther • 1:1 • One-to-one • Barriers • Middle School • Academic achievement • Teacher Self-efficacy • Tech? • Social? • Dyslexia • Orton-Gillingham • Working memory • Executive functioning • Teacher Acceptance Model	• ERIC – ProQuest • ERIC – Education Source • EBSCO • JSTOR • Google Scholar	• *Journal of Special Education Technology* • *British Journal of Educational Technology* • *TechTrends* • *Dyslexia* • *Education Technology Research and Development* • *Computers & Education* • *Contemporary Educational Technology* • *Journal of Learning Disabilities* • *Annals of Dyslexia*	• Course readings • Recommended reading from professors or colleagues • Websites • IDA • Project Tomorrow

While journal searches were time consuming, they allowed the consideration of other key words which had not been considered previously. As articles were located and selected as part of the literature review, other articles were discovered by mining the reference sections. Some of the mined articles lead to earlier works, which provided historical and foundational studies related to technology integration and teacher perceptions. Table 2.1 provides a list of the keywords, databases, and journals used for the literature review.

The literature review includes four sections. These sections are (a) one-to-one initiatives and their benefits and barriers, (b) barriers to technology integration, (c) value beliefs about technology integration, (d) training for teachers of students with dyslexia including OG and cognitivism, and (e) one-to-one devices for students with disabilities.

One-to-One Initiatives

One-to-one initiatives have become prevalent in today's classroom as schools seek to integrate technology into the learning process. Through one-to-one devices, schools provide ubiquitous learning tools for students (Penuel, 2006). One-to-one devices offer opportunities for students to develop 21st century learning skills such as problem solving, critical thinking, and creativity while collaborating with their peers (Adam & Tatnall, 2017; Lowther et al., 2012; Mahoney & Hall, 2017). Utilizing individual devices has also been effective in improving academic skills including reading, writing, and mathematics (Lowther et al., 2012; Zheng et al., 2016). The improved academic skills could be attributed to an increase in student attention on learning. Lowther et al. (2012) observed students using laptops as a learning tool in 66.3% of the classroom observations. When used within a student-centered classroom, one-to-one devices can be

used to foster a collaborative, cooperative learning environment (Harper & Milman, 2016). Furthermore, one-to-one devices strengthen the learning process offering authentic learning experiences which mimic real life application. The following section of the literature review will (a) provide an overview one-to-one initiatives, (b) provide rationales for one-to-one programs, and (c) note the benefits of one-to-one devices in the learning process.

Overview of One-to-One Initiatives

One-to-one initiatives, which provide a device for each student's personal use, allow access to technology on a regular basis making it more likely that teachers will implement technology-based activities (Penuel, 2006). The ubiquitous availability of devices makes it more likely for teachers to include technology-based assignments into the curriculum knowing that students will have the resources needed to complete them. While one-to-one devices can be considered "the ubiquitous or mass presence of devices in schools" (Selwyn et al., 2017), the current initiative was more accurately described as a "one-to-one laptop programs, in which all the students in a class, grade level, school, or district are provided computers for use throughout the school day and … at home" (Zheng et al., 2016, p. 1053). In other words, a device was assigned to each individual student for the duration of the school year. This allowed students access to technology on a consistent, 24/7 basis. "Ubiquitous, 24/7 access to computers makes it possible for students to access a wider array of resources to support their learning, to communicate with peers and their teachers, to become fluent in their use of the technological tools of the 21st century workplace" (Penuel, 2006, p. 330). In this way, teachers know that students will access to resources to complete assignments whether at school or home.

One-to-one devices have been popular in education since the early 1990's when both Microsoft and Apple began to sponsor one-to-one initiatives in schools (Penuel, 2006). Before that time, most students accessed computers in computer labs or other central locations which were shared between classes and grade levels (U.S. DOE, 2003). This meant that access to computers was scheduled and limited. As such, activities were designed to be completed within the designated class time, limiting their capability. Students often worked alone on assignments and primarily used devices to improve their computer skills, practice typing, search the internet, use word processing software, or as a classroom reward (U.S. DOE, 2003). While the early uses of technology did not fully utilize their capabilities, it did begin the process of integrating technology into classrooms.

However, since computers have become more compact and portable, many schools have moved to either providing class sets of Chromebooks or iPads or issuing devices to students. Some of the unique features of one-to-one devices are their relatively low cost, portability, and continual access to learning (Evans, 2019; Penuel, 2006; Zheng et al., 2016). School districts have purchased Chromebooks, tablets, and devices due to the relative low purchase price and ease of use (Evans, 2019). This has enabled more schools and districts to provide class sets of devices, and many schools have been able to purchase devices for students to use at home as well. Fifty-seven percent of administrators surveyed said students had one-to-one devices at school, and 38% stated students could also take devices home (Evans, 2019). The low cost, portability, and access to the internet has increased the use of one-to-one devices for students, particularly in the middle grades.

Reasons for Implementing One-to-one Initiatives

Perhaps one of the primary driving forces behind one-to-one initiatives in schools is the desire to build 21st century learning skills into the curriculum (Adam & Tatnall, 2017; Evans, 2019; Lowther et al., 2012; Mahoney & Hall, 2017; Mucetti, 2017; U.S. DOE, 2017). 21st century skills include creativity, critical thinking, collaboration, problem solving, and innovation using technology in order to be effective learners both in school and careers (Battelle for Kids, 2019; ISTE, 2022; U.S. DOE, 2016). Baylor and Richie (2002) found students were more likely to develop higher-order thinking skills when working collaboratively on creative assignments than when working independently. When working in groups, students learned negotiation and problem-solving skills in ways they were not able to do accomplish while working alone. Other skills, such as digital literacy, can be improved with the use of devices (Lipson, 2017). Technology provides a way to increase basic literacy skills, gain knowledge, and evaluate information, all of which are skills needed for the workplace (Conway & Amberson, 2011; Larson & Miller, 2011). While working through writing assignments, Conway and Amberson (2011) noted that students began to form a network of learning communities in their classrooms which allowed for collaboration and peer review. Such types of interactions are needed in the workplace as colleagues problem solve and negotiate on a regular basis. Due to a global economy, students need to develop lifelong skills for the marketplace (Adam & Tatnall, 2017; Evans, 2019). The use of one-to-one devices and other technology tools in the classroom provides a safe, structured means for students to practice critical skills while teachers facilitate and coach discussions.

Another reason schools are moving to one-to-one initiates is to provide students with consistent, equitable access to learning (Mucetti, 2017; Penuel, 2006; U.S. DOE, 2017). Early one-to-one initiatives were meant to provide equal access to learning resources regardless of socio-economic status, ethnic background, or geographic location (Penuel, 2006). In a survey conducted by the U.S. Department of Education (2003), 37%-77% of teachers responded that students lacked technology resources outside of the school building depending on the students' economic level. For this reason, schools and school districts have found the need to provide students with one-to-one devices in order to address equality and access issues (Mucetti, 2017). In a mixed methods study of a Midwest school district which included 106 participating teachers, 71% of teachers felt that students were using their school issued devices to access learning material while at home (Gherardi, 2017). By issuing devices and laptops for student use at home, schools have helped close the unequal access to technology which can sometimes occur (U.S. DOE, 2017). The investment of one-to-one devices by schools allows students to make use of learning materials throughout their day, not just during school hours.

Benefits of One-to-One Initiatives

In order for one-to-one initiatives to be beneficial, they should aid in supporting student achievement. Research has shown implementing one-to-one devices in the curriculum has positively impacted math and writing (Harper & Milman, 2016; Zheng et al., 2016). While the results for academic achievement have been mixed based on numerous studies (Lowther et al., 2012; Williams & Larwin, 2016), other studies have shown positive gains and note devices offer opportunities to personalize learning (Bippert and Harmon, 2017; Clariana, 2009; Zheng et al, 2016).

Academic impact. One-to-one devices have been shown to have a positive impact on writing skills including content, organization, and style (Zheng et al, 2016). Teachers found students' writings increased in length when using one-to-one devices (Suhr, Hernandez, Grimes, & Warschauer, 2010). In this same study, students mentioned using a Chromebooks at home to complete assignments, another example of the increased access to technology resulting in furthering learning opportunities. Similar findings were shown when students used iPad writing applications for assignments. Sessions et al. (2106) found written expression skills increased and writing products were more sequential and detailed after using the iPad during writing activities. While neither study showed an improvement in the conventions of punctuation and capitalization, both studies noted the increase in writing fluency as the result of using mobile computing devices. Since students would otherwise have grammar and spell check capabilities while using a device, the increase in writing organization, length, and structure supports the benefit of one-to-one use during instruction.

Some studies have shown mixed results in academic achievement following one-to-one device initiatives. Lowther et al. (2012), in a mixed methods study of 90 schools, found that while some groups of students demonstrated increases in their achievement scores following a one-to-one initiative, other students' scores decreased. Similar results were found in a quantitative study involving 48 public and parochial schools in Ohio (Williams & Larwin, 2016). Each of the schools utilized one-to-one devices for at least a year. A comparison of performance scores on the Ohio Graduation Test showed no significant difference between the control group and the experimental group. While reading achievement results showed mixed results, teachers still expressed benefits in

using one-to-one devices as well as the flexibility that digital reading materials offered. Perhaps the differences between scores could be attributed to other factors which have yet to be explored.

In terms of academic achievement, the greatest impact of one-to-one initiatives occurred when devices were used at school and home (Babell & Kay, 2010; Shapely, Sheehan, Mahoney, & Caranikas-Walker, 2010). Shapley et al. (2010) conducted a longitudinal quasi-experimental study involving 42 schools over a four-year period. The experimental group of schools had initiated one-to-one devices as part of a state funding project. The researchers found that students who were able to use their devices both at school and home demonstrated greater academic gains in reading and math compared to the control group. Teachers have noted that the majority of students now use school issued devices at home for learning and entertainment (Gherardi, 2017). Since students have personal devices at their disposal, they are likely to not only watch videos and play games, but they expand their reading and writing activities.

Individualized instruction. One-to-one devices allow teachers to better differentiate instruction and individualize instruction by using a variety of learning materials (Bippert & Harmon, 201; Harper & Milman, 2016; McKnight et al., 2016). With each student having a device, teachers have greater flexibility in creating reading assignments which can best fit a student's needs. Clariana (2009), in a quasi-experimental study, found students in a one-to-one device program showed statistically significant positive math scores compared to the control group which had access to one device for every five students. Individualization of instruction can also take place in reading. McKnight, O'Malley, Ruzic, Horsley, Franey, and Bassett (2016) conducted a case study

involving nine schools which had been recognized for their exemplary integration of technology. Teachers reported they were able to differentiate learning material for all students, especially for those with learning needs. Bippert and Harmon (2017) conducted a qualitative study with 19 middle and high school teachers from 12 different schools. The teachers stated they were able to differentiate reading materials based on reading levels and interests easier through the use of technology than they would have been able to accomplish with physical books. In a qualitative study at a lab school for students with learning disabilities, special education teachers found that one-to-one devices allowed them to individualize instruction and present lessons in a variety of formats to meet individual student needs (Anderson and Putman, 2019). In each setting and across grade levels, teachers reported the ability to individualize instruction due to the availability of student access to technology.

Student ownership of learning. When students have the tools to access information, they are inclined to take ownership of their learning. Because of the availability of one-to-one devices, the majority of students will access knowledge for personal and school use (Clariana, 2009; Gherardi, 2017). Ertmer et al. (2012) found that students took ownership of their learning as teachers provided more student-centered activities and placed greater responsibility on them. At times, students do not take ownership of their learning, not because of a lack of desire, but lack of opportunity presented by their teachers. Clariana (2009) conducted a quasi-experimental study with eight elementary schools, one of which had a one-to-one laptop program. His study showed that students in the one-to-one laptop program not only experienced a statistically significant gain in math achievement scores, but most students also took ownership for

their learning by engaging more with the learning material. Students will spend time exploring personal interests and became more active learners when provided the opportunity

To equip students with 21st century skills, districts and schools have moved to providing individual devices to students in the classroom. One-to-one devices offer ways to individualize instruction, enhance academic achievement, and allow students to take ownership of their learning (Ertmer et al., 2012; Gherardi, 2017; Ottenbreit-Leftwich et al., 2010). Through the use of technology in and out of the classroom, one-to-one devices can be especially beneficial for all students.

Barriers to Technology Integration

Since the introduction of technology to the classroom, much has been written about the barriers, both actual and perceived, of technology integration. Ertmer (1999) defined barriers as the "practical and philosophical problems posed by the [technology] integration process" (p. 50). First order barriers are extrinsic from the teacher and include needed resources and support to implement and maintain technology use. Second order barriers are intrinsic of the teacher and include a teacher's beliefs and perceptions of technology (Ertmer, 2005). There is an interplay between first and second order barriers; even as one barrier is addressed, another becomes more prominent. Teachers can become frustrated and uncertain of their ability to implement technology if barriers are not addressed (Ertmer, 1999; Ertmer, 2005; Ottenbreit-Leftwich et al., 2010). This section will cover (a) first order barriers and (b) second order barriers.

First Order Barriers

First order barriers are institutional in nature and extrinsic from the teacher (An & Reigeluth, 2011; Ertmer, 1999; Ertmer et al., 2012). They are areas which are outside of a teacher's direct control, yet impact the teacher's resources, schedule, and support. Many of the first order barriers have a large financial impact on schools in order to cover the costs of technology and infrastructure (U.S. DOE, 2017). In addition to lacking resources, teachers cite not having the needed time to plan effectively, explore new software, and manage classroom devices (An & Reigeluth, 2011; Bippert & Harmon, 2017; Ertmer, 1999; Tilton & Hartnett, 2016). Additional first order barriers include lack of appropriate support and training (Hsu, 2017; Inan & Lowther, 2010). Often it is not a single barrier which impedes the effective use of technology but, instead, the interconnected limitations which hinder teachers in their efforts to create a technology rich environment.

This portion of the literature review will cover first order, external barriers. These include (a) resources, (b) time, (c) training, (d) technical support, (e) administration, and (f) peers.

Resources. Perhaps one of the most cited barriers regarding technology integration is the lack of resources. Even with the advent of one-to-one devices, many teachers still do not feel they have the technology needed to effectively integrate them into the curriculum. But resources do not only mean hardware, it can also mean software (Mucetti, 2017). Mucetti (2017) presented a case study of a K-12 school district in California which moved from limited technology resources in the district to a robust one-to-one device program. Part of the early barriers to technology integration was found in hardware, software, and infrastructure which significantly hampered teachers' abilities to

use technology in the curriculum. As the school system worked to address resources issues, they were then able to attend to other barriers such as teacher training. The lack of resources, especially due to the need to upgrade systems and software, is not a one-time fix. Instead, schools must have a continual process in place otherwise tools teachers are expecting to use will not be available. Bippert and Harmon (2017) conducted a qualitative study with 19 middle and high school teachers from 12 different schools near a large metropolitan area in Texas. The investigators were seeking to understand teacher perspectives of computer assisted reading programs. The teachers noted the challenges of implementing the program due to old computers, the shared devices, and unreliable internet. Difficulties with the reliability and availability of devices and software can present a challenge in fully integrating a computer-based reading program. Frustrations such as these, whether due to software or hardware issues, impede a teacher's ability to use one-to-one devices as intended.

While many schools have addressed the limited computer resources for classrooms, limited infrastructure and connectivity to support technology presents a lingering barrier to technology integration (Keane & Keane, 2017; Kwon et al., 2019; McKnight et al., 2016). Broadband access and reliability are essential for teachers to consistently use technology in their classrooms (U.S. DOE, 2017). In a longitudinal study of a secondary school's implementation of a one-to-one project involving different types of devices, the need for a reliable infrastructure was found to be one of four elements required for a successful technology integration program (Keane & Keane, 2017). While teachers did increase their integration of student-centered learning activities over the years, the inconsistent internet connection interrupted lessons. In a qualitative study

Tilton and Hartnett (2016) found that insufficient infrastructure was noted by teachers as the most significant barrier in fully utilizing the iPad minis in lessons. Since the availability of WiFi exists in almost every setting, teachers expect a strong, reliable infrastructure within their classrooms to support student devices.

Time. The lack of time is seen as a major barrier for teachers in order to effectively include technology and student-centered activities into the curriculum (An & Reigeluth, 2011; Dole, Bloom, & Kowalske, 2016). An & Reigeluth (2011) conducted a study with 126 K-12 teachers using a 5-point online Likert-style survey. The results of the study showed that overall teachers were willing to invest time learning and preparing to integrate technology into their lesson (M=4.52); however, the 57% of teachers perceived lack of time as a barrier to adequately prepare, set up, and research new applications (An & Reigeluth, 2011). In order to include technology as more than an 'add on' tool or used as a word processor, teachers need time to research simulations, videos, and interactive Web 2.0 tools to enrich and transform student learning. Francom (2020) conducted a quantitative study of K-12 teachers. The number one barrier noted by teachers was insufficient time. This outcome was in contrast to an earlier study which involved teachers who felt comfortable integrating technology (Ertmer et al., 2012). This group of researchers found the issue of time was less of a factor than the beliefs of other teachers, technology support, state standards, money, and access. For both novice and experienced technology users, without the adequate time to plan effectively, technology is either not integrated into the curriculum or it becomes an add-on to teacher driven instruction (Ertmer et al., 2012).

Training. The need for professional development has been cited as a challenge to one-to-one implementation (Harper & Milman, 2016). Teachers often note they lack technology skills and are uncertain of how to utilize devices in their instruction (Zheng et al., 2016). If teachers are not comfortable using technology, the devices or resources will not be used. In a survey of public-school teachers, Francom (2020) found the need for training and support was second only to time as a barrier to technology integration. Even through technology has been a part of education for over two decades, teachers still need appropriate training in order to have the skills needed to implement devices into the curriculum. Teachers will have a difficult time implementing one-to-one devices if they do not have sufficient skills and confidence to use them. A one-size fit all professional development is not effective (An & Reigeluth, 2011). Instead training should be differentiated to meet the needs of teachers. Training that is seen as too broad or too difficult is less likely to support teachers in using one-to-one devices.

Technology is constantly changing. Because of this, professional development needs to be ongoing, relevant, and timely (Ertmer, 2005; Kwon et al., 2019). Professional development should address the technology needs of the teacher, including technical skills and curriculum applications (Ertmer, 1999; Hsu, 2017). If training is not useful or too complex, the teacher is less likely to remember what was taught at a later time. Since technology tools are ever changing, ongoing training is needed rather than a one-time, stand-alone professional development. Extended professional development, however, results in higher confidence and positive attitudes (Lowther et al., 2008). Since teacher confidence in their ability to effectively use technology is the greatest predictor of technology integration, providing appropriate training becomes a necessity of educational

leaders (Kwon et al., 2019). A one-to-one initiative will offer little benefit to the school and its students if teachers are uncertain of how to effectively adopt the devices and related software.

Technical support. Another first order barrier to technology integration is technical support for devices (Ertmer, 1999). Hew and Brush (2007), based on an analysis of previous research, found that technology support was a persistent barrier to technology integration. Ongoing technical issues were cited as a significant challenge to one-to-one device implementation. Without technical support to address computer issues, the integration of devices diminishes (Harper & Milman, 2016). Francom (2020) found the need for technical support increased over the three-year period of his mixed methods study. While the increased need for technical support may have been due to the age and wear of the devices, teachers consistently reported the need for training and technology support as two significant barriers to technology integration. When technical support is available though, both students and teachers are more likely to use technology with better productivity since little instructional time is lost (Inan & Lowther, 2010). With the investment schools are making to purchase devices for one-to-one use, the needed technical support should also be considered so it does not become a barrier to the device initiative.

Administration. Administration can either provide support or act as a barrier to technology integration. Administrative policies can limit or hinder one-to-one initiatives. For instance, administrators set schedules and planning times for teachers. Both can have an impact on how much time teachers have to adequately prepare their classrooms and lessons in order to implement one-to-one devices effectively. In a longitudinal case study

of four preservice teachers, Ottenbreit-Leftwich, Yin-Chan Liao, Sadik, & Ertmer (2018) found those teachers who had supportive administrators expanded their technology knowledge and increased their use of technology in their classes. However, those whose administrators had policies which limited the use of technologies found barriers difficult to overcome. In a contrasting study, teachers with strong self-efficacy and belief in the usefulness of one-to-one devices initiated a program on their own and overcame barriers presented by administrators (Heath, 2017). The experienced teachers were more successful in overcoming administrative barriers whereas the preservice teachers were not as persistent in trying to push for technology integration.

Administration sets the climate and vision for a school. A clear vision and rationale enables all stakeholders to understand the intended outcome of a one-to-one initiative and provides a common goal (Ertmer, 1999; Keane & Keane, 2017; Mucetti, 2017). However, a conflict of visions can hinder technology integration (Dole et al., 2016). If the vision of the school is uncertain, then teachers are less motivated to find effective ways to integrate one-to-one devices. But, a continual emphasis on the goals and expectations can result in continued, effective integration of one-to-one programs (Keane & Keane, 2017). Administrators have the opportunity to clearly communicate the rationale and objectives of one-to-one initiatives and seek the support of stakeholders prior to implementation.

Peers. Teachers' peers play a valuable role in supporting technology integration. Inan and Lowther (2010) conducted a path analysis study based on responses from 1,382 teachers who had participated in Tennessee's EdTech Launch One. Second only to teacher readiness, overall support from peers was vital for technology integration.

Kopcha (2010) noted that peers, in the form of mentors and/or communities of practice, play a vital role in technology adoption. Within a framework for technology integration, Kopcha noted that peers can either have a positive or negative effect depending on the level of support and pressure presented. Too much pressure and a teacher will likely back away from trying something new. With enough support, teachers are willing to learn from each other. Teachers want to be connected to their colleagues and collaborate to find solutions for learning. When there is a disconnect, it can hinder motivation and excitement about one-to-one initiatives (Heath, 2017; Virture, Downes, & Bishop, 2015). Even having a few peers to elicit advice can provide encouragement and ideas for effective one-to-one implementation (Heath, 2017; Tilton & Hartnett, 2016). It is possible that collaboration between teachers aids in fostering ideas for technology integration and developing more student-centered paradigms (Applefield, Huber, & Maollem, 2001; Ertmer, 1999). Without peer support, one-to-one devices risk being set aside during instructional time.

First order barriers are outside hindrances which either prevent or frustrate a teacher in their attempts to integrate technology into teaching. While one-to-one devices for students resolves the issue of not enough hardware resources for technology integration, other barriers, such as infrastructure, software, technology support, administration, peers, and training can impact a teacher's perspective of technology integration and, thereby, limit the frequency and type of integration which occurs.

Second Order Barriers

Second order barriers, which are intrinsic to teachers, are harder to change because they are personal in nature (Ertmer, 1999). Second order barriers refer to the

beliefs, or suppositions, one makes about the teaching and learning process. These beliefs relate to how a teacher interacts with students, how information is presented, how classrooms are set up and structured, and what type of strategies and resources are used in the learning process (Applefield et al., 2001; Ertmer, 1999; Ertmer, 2005). Teaching beliefs play a significant role in what value teachers place on technology and how technology tools are integrated into the curriculum.

Teacher beliefs are perhaps the greatest hinderance to technology integration because they are so ingrained into the individual (Ertmer, 2005). Beliefs are the "suppositions, commitments and ideologies held by an individual" (Calderhead, 1996 as cited in Ertmer, 1999). They determine what is deemed important or valuable and, therefore, are extremely personal in nature. Teachers' beliefs regarding teaching and the usefulness of technology in teaching will impact the degree of technology integration (Ertmer et al., 2012; Ertmer & Newby, 2013; Ottenbreit -Leftwich et al., 2010). Teachers tend to provide instruction either from a teacher-centered, often lecture based, pedagogy or from a student-centered, constructivist, pedagogy (Applefield et al., 2001; Dole et al., 2016; Ertmer & Newby, 2013). Teachers align their use of technology based on their belief about teaching and learning (Ertmer et al., 2012). Those teachers who are more traditional in nature are less likely to integrate technology as effectively as those with a constructivist pedagogy (Applefield et al., 2001; Ertmer, 2005; Ertmer & Newby, 2013). Beliefs, though, are difficult to change, requiring considerable time and training before implementation of technology in the classroom occurs (An & Reigeluth, 2011; Ertmer, 2005; Kopcha, 2010). Even when teachers have access to one-to-one devices for their

students, how and to what extent those devices are used in the classroom are contingent on a student-centered, constructivist theory about learning.

Teacher-centered beliefs. Those with a teacher-centered belief framework tend to have a traditional form of instruction and possess a behavioral or cognitive theory mindset (Ertmer & Newby, 2013). When using a teacher-centered pedagogy, the teacher is the driving force of instruction and the main presenter of information. Often the teacher is the one delivering lectures while students are in rows or small groups engaged in notetaking. Teachers direct the curriculum and determine the pace of instruction (Dole et al., 2016) rather than student understanding or mastery of the content being the criteria for the lesson progression. Within a teacher-centered paradigm, instruction is meant to provide objective truths to the learners (Ertmer & Newby, 2013). There are several reasons teachers might cite as to why they hold a teacher-centered belief system. For some it was how they were taught, and the process has been engrained in them. Other teachers often cite the concern of high stakes testing as a reason they are reluctant to change to a student-centered instructional model (Dole et al., 2016; Grant et al., 2005). Dole et al. (2016) conducted a qualitative study involving 50 teachers who had participated in a university course for gifted licensure. The results from electronic surveys and phone interviews noted that the pressure of district mandates, high stakes testing, and the number of Common Core objectives hindered them from shifting from a teacher-centered paradigm. To prepare students for achievement testing and benchmark assessments, teachers become concerned that if they are not setting the pace of instruction, students' scores will be low and reflect poorly on the teachers' instructional ability.

Student-centered beliefs. Student-centered beliefs are based on the constructivist theory of learning in which meaning is created by learners based on their experiences and personal interpretations (Ertmer & Newby, 2013). Known as constructivism, student-centered learning has its early beginnings in the work of Piaget, Bruner, and Vygotsky. Constructivism emphasizes the building of knowledge based on discovery learning, mediation, and dialogue (Applefield et al., 2001). Learning should include the exchange of ideas where students are discussing and interacting within content as they work to make sense of the material and connect new learning to what they already know and understand. For this to best occur, activities should mimic authentic, realistic settings and include social interactions (Ertmer & Newby, 2013; Krahenbuhl, 2016). Student-centered activities can include real-life scenarios, authentic experiences, personalized goals, and problem/project-based learning to name a few (An & Relgeluth, 2011; Applefield et al., 2001; Ertmer & Newby, 2013). In each method, learning involves solving real-world problems and produces realistic ideas, solutions, and products. These real-world applications prepare students for life beyond the classroom and teaches them valuable 21st century learning skills (Zheng et al., 2016).

A constructivist method of teaching is best used after students have learned basic facts and ideas through more objective means (Ertmer & Newby, 2013; Krahenbuhl, 2016). Initial instruction should be introduced and taught directly by teachers. Novice students need foundational knowledge and experience before they can create their own understanding (Ertmer & Newby, 2013; Krahenbuhl, 2016). This may be especially true for those with dyslexia and those who struggle to learn. These students often benefit from direct, explicit instruction or using a combined approach which alternates between

teacher-centered and student-centered methodologies (Stapleton & Stefaniak, 2018). If students need explicit instruction, then teachers should be sensitive in designing instruction and deciding when and how to integrate one-to-one devices (Xie et al., 2018). As proposed by Bruner, an approach which moves through a continuous cycle of exposure to material then direct teaching may be an appropriate method of teaching students with dyslexia (Stapleton & Stefaniak, 2018). The application of constructivist teaching methodologies should be flexible and designed with the learner in mind.

Several notable changes can be seen in a student-centered classroom (An & Reigeluth, 2011; Dole et al., 2016). In a student-centered classroom, the role of the teacher shifts from the knowledge expert to more of a facilitator of learning (Ertmer & Newby, 2013). Fifty percent of the respondents in Dole et al.'s study (2016) reported "they learned to let go of control and become facilitators in the classroom" (p. 6). The teacher's role is to facilitate the learning process as they support students in the creative learning process. This support takes the form of mentoring, modeling, and coaching (Ertmer & Newby, 2013). While students are engaged in authentic learning activities, the teacher should be circulating, asking questions, and assisting students as they clarify their understanding.

The physical layout of a student-centered classroom tends to look and sound different than the traditional classroom. Instead of sitting in rows facing the teacher, a learner centered classroom is filled with dialogue and students clustered in groups to collaborate in the learning process (Applefield et al., 2001). In order to facilitate greater group discussion and collaboration, desks and chairs are often clustered in small groups of three or four rather than being in straight rows facing the front of the classroom.

Observers have noted the changes in class set up and the interaction which occur when students are in close proximity and can work together (Windschitl & Sahl, 2002). Students are often up and moving around rather than sitting and facing the teacher.

Changing paradigms. The change to a student-centered pedagogy from a teacher-centered one does not come easily or quickly. Belief systems are very personal and, therefore, hard to change (Ertmer, 2005). Changing teacher beliefs takes time and is influenced by many factors. It can take five to six years to change pedagogical beliefs to a constructivist approach (Ertmer, 2005). Just as beliefs were formed over time based on individual experiences, so too it will take time to alter those beliefs. In moving from a teacher-centered to a student-centered pedagogy, it may take up to six years for the transformation to fully take place (Ertmer, 2005). As teachers make incremental changes in their teaching strategies and technology usage, their perceptions about the ease or frustration of changes will impact their perception of technology as an educational tool. Those perceptions will impact a teacher's belief system (Ertmer, 1999; Ertmer, 2005; Kwon et al., 2019).

Belief systems are impacted and strengthened through the experiences of others (Bandura, 1977; Ertmer, 2005). Just as paradigms are formed through lived experiences and dialogue with others, so too changes in paradigms best occur through collaboration and interaction with others (Applefield et al., 2001). Whether through informal interactions with peers or intentional communities of practice, belief systems are impacted and strengthened through the experiences of others (Ertmer, 2005). Downes and Bishop (2015) conducted a four-year participant observation case study of two teachers who implemented a one-to-one laptop program using a university/foundation grant.

During the study, participants noted that when they committed to team building and sharing ideas, the one-to-one program thrived. Similarly, when two social studies teachers collaborated to initiate their own one-to-one device program in their classrooms, they were able to support and learn from each other despite barriers presented by administrators (Heath, 2017). The shared experiences of others can impact teaching paradigms and support teachers as they experiment with new technologies in their classes.

One of the core secondary barriers to technology integration is a teacher's belief system (Ertmer, 1999). The application of teaching beliefs is central to ways in which teachers will choose to have students utilize one-to-one devices in the classroom. For teachers who have a teacher-centered paradigm, one-to-one devices will be used as an extension of a lecture driven instructional model. Those teachers who hold a student-centered paradigm will tend to seek activities which allow for personal choice, student direction, and a problem solving, creative process (Dole et al., 2016; Downes & Bishop, 2015). Moving from one belief system to another is not something which will happen automatically or easily due to the deep-rooted nature of beliefs (Ertmer, 2005). Much of the change will result slowly over time due to professional development, peer support, and personal skill.

Relationship Between Perceptions and Barriers

Another potential barrier associated with technology integration is perception (Ertmer, 1999; Ertmer, 2005). Perception is how a person receives information from the outer world (Uzunboylu & Ozdamli, 2011). Perceptions, while an influencer to behavior, are not as deeply engrained as beliefs. Perceptions can change as more information is

gathered and processed. Whether, and to what extent, one-to-one devices are used in the classroom often depends on a teacher's perspective of how technology benefits the teaching-learning process (Ertmer, 1999; Ertmer, 2005; Inan & Lowther, 2010; Kwon et al., 2019; Ottenbreit-Leftwich et al., 2010). While one-to-one devices for students resolves the issue of whether or not there are sufficient hardware resources available, other barriers, such as infrastructure, software, support, and training, can impact a teacher's perspective of technology integration and, thereby, limit the frequency and type of integration which occurs. In addition, a perception of technology's usefulness plays a role in how technology is integrated into the curriculum. (Ertmer et al., 2012; Ottenbreit-Leftwich et al., 2010). Perceptions, as a second-order barrier, are more easily impacted than beliefs. This section will cover (a) how barriers impact perceptions and (b) how perceptions can overcome barriers.

Impact of barriers on perceptions. Perceptions can be negatively influenced by barriers (Ertmer, 1999; Ertmer, et al., 2012; Francom, 2020; Kopcha, 2010). Too many barriers can cause frustration, resulting in a teacher feeling overwhelmed. When this happens, teachers are less likely to adopt and integrate technology (Ertmer, 1999). Barriers can include lack of resources, time, and/or support. The frustration due to barriers can result in a negative perception of technology and decrease the chances that it will be incorporated effectively into instruction. Also, if teachers perceive technology as being too difficult to use, they are unlikely to integrate them into their instruction (Kwon et al., 2019). Kwon et al. (2019) investigated the self-efficacy of 57 middle school teachers beginning a one-to-one initiative. The researchers found a correlation between a mobile device's ease of use and a teacher's perception of its benefit in teaching. Ease of

use can be applied to software, applications, and reliability of resources. Since barriers can constantly change, the perceptions of barriers change over time, with one barrier presenting a greater hindrance to technology integration over another (Ertmer, 1999; Francom, 2020). There is a constant interaction and tension between barriers and teachers' perceptions.

Impact of perceptions on barriers. Those with student-centered beliefs tend to implement technology regardless of barriers and their perceptions about barriers (Ertmer et al., 2012). In a multi-case study with 12 K-12 teachers who were adept at technology integration, Ertmer et al. (2012) found teachers were able to implement, or enact, practices which were closely aligned with their beliefs. Their belief system strengthened their perceptions of technology even in the midst of obstacles. Teachers who have positive attitudes towards technology are more likely to try new tools and strategies compared to those who have negative attitudes (Hew & Brush, 2007). As teachers gain more skills, they tend to have a more positive perception and willingness to overcome barriers (Ertmer et al., 2012; Tilton & Hartnett, 2016). Since perceptions are influenced by experiences, it is important to provide opportunities which foster positive perceptions and minimize the negative effects of barriers.

Perceptions can be positively influenced by outside factors. (Inan & Lowther, 2010; Keane & Keane, 2017; Kopcha, 2010). Inan and Lowther (2010) studied the links between five factors which influence technology integration. Their results showed that those teachers who had positive beliefs about the usefulness of technology along with possessing the necessary readiness skills were more likely than their peers to engage in integrating technology. In addition, teacher beliefs and perceptions increased as they

received support from administrators and peers. Peers can offer suggestions for technology use within the curriculum and share positive experiences with one-to-one devices in their classroom. As such, others are able to vicariously experience success (An & Reigeluth, 2011; Bandura, 1977; Ertmer, 2005). These vicarious experiences can occur informally or within communities of practice to help shape perspectives and support technology integration (Ertmer, 2005; Kopcha, 2012). When provided time to plan, exchange ideas, and collaborate, teachers can develop positive perceptions of technology and one-to-one integration which can then positively impact the curriculum.

Teacher beliefs and perceptions play a significant role in the degree of technology integration. Numerous studies show a teacher's paradigm about the learning process and perceptions about benefits of technology impact how he/she utilize digital tools in the curriculum (Ertmer, 2005; Kopcha, 2012; Ottenbreit-Leftwich et al., 2010). While perceptions are more readily altered compared to teacher beliefs, both impact the role teachers place on technology and often have a greater influence on integration compared to first order barriers.

Value Beliefs about Technology Integration

A teacher's value belief system is the value or importance placed on technology as an instructional tool to meet educational goals (Ottenbreit-Leftwich et al., 2010). While most teachers have a positive value belief and perception regarding the use of technology in instruction, some fail to implement one-to-one devices in their instruction due to barriers, perceived difficulty of use, classroom environment, and understanding of what student-centered education looks like (An & Reigeluth, 2011; Chaaban & Moloney, 2016; Ertmer et al., 2012). Those who espouse technology use but do not fully utilize

devices to maximize their effectiveness tend to use low-levels of technology integration (An & Reigeluth, 2011; Ottenbreit-Leftwich et al., 2010). Other teachers will more fully integrate technology into their curriculum by having students incorporate creative, collaborative means to demonstrate their learning (Ertmer et al., 2012; Lawson & Miller, 2011; Ottenbreit-Leftwich et al., 2010). When a teacher has a strong constructivist belief system about what works best for their students and setting, they are more likely to integrate technology to foster 21st century learning goals. The following section will (a) define value beliefs, (b) explain espoused beliefs and low-level integration, (c) relate the technology acceptance model to technology integration, and (d) explain enacted beliefs and high-level integration.

Value Beliefs

Value beliefs are the "perceived importance of particular goals and choices" (Ottenbreit-Leftwich et al., 2010, p. 1322). Value beliefs as they relate to technology are the "teacher's perceptions of technology's influence on student learning and achievement and impact on classroom instruction and learning" (Inan & Lowther, 2010, p. 142). If teachers believe that technology will have a positive impact on learning and student achievement, then their value belief is high compared to a teacher who is uncertain of its effectiveness. An and Reigeluth (2011) conducted a mixed methods study of 126 K-12 teachers in the Midwest. Their study showed that teachers tend to have a positive belief on the importance of technology use in instruction and its positive impact on student learning. Ertmer et al. (2012), in their qualitative case study, found that teacher beliefs had a significant impact on technology integration. The participants in this case study were K-12 teachers already incorporating technology into their teaching practices.

Certainly, their perceived value of technology within the teaching and learning process was demonstrated through their practice.

Espoused beliefs

It is possible for teachers to have a strong, espoused belief about the role of technology in classroom instruction yet fail to implement it. (Ertmer et al., 2012; Chaaban & Moloney, 2016). An espoused belief is a belief which is held but not acted upon (Ertmer et al., 2012). There may be several reasons for this to occur. Many teachers lack the understanding of what a student-centered classroom looks like even when they hold a constructivist, or student-centered, pedagogy (An & Reigeluth, 2011). Some teachers may mistakenly think that having students working alone on a device researching information is a student-centered activity. Other teachers need to be able to see how technology can be implemented into their classrooms (Ottenbreit-Leftwich et al., 2010). This group of teachers is not able to readily take a technology resource or software and connect it to the curriculum they are teaching. Other teachers indicate that time constraints prevent them from implementing more student-centered, high-level technology integration into their instruction (An & Reigeluth, 2011; Dole et al., 2016). For these reasons, teachers should engage in professional development and training prior to one-to-one initiatives being implemented in order to connect technology to their curriculum (Heath, 2017). During professional development, Baylor and Richie (2002) found it is best to introduce technology and constructivist learning principles simultaneously in order to support the teacher as he/she transitions away from teacher-centered practices. By pairing technology integration with student-centered learning

paradigms, teachers will be more effective in designing activities which support 21st century skills and engage students in the learning process.

Teachers without a strong student-centered belief tend to integrate technology at a low-level (An & Reigeluth, 2011; Chaaban & Moloney, 2016; Ertmer, 2005). Low-level uses of technology include such activities as using email or word processing for communication, drill and practice of facts and content, watching PowerPoint presentations, and conducting internet searches (Ertmer et al., 2012; Dole et al., 2016; Ross, Smith, Alberg, & Lowther, 2004). Many teachers use technology to display slide presentations, show videos, or allow students to play games (Ruggiero & Mong, 2015). These types of activities tend to be passive in nature, yet teachers are often pleased with the fact that technology is being used in the classroom. Low-level technology integration may supplement and enrich the learning environment, but they are not transformative in nature (Ertmer et al., 2012). Low-level integration also does not require critical thinking on the part of the student. Baylor and Ritchie (2002) found that a student's independent use of a computer did not stimulate critical thinking. It is possible for students to search the internet and write a paper about what they read but not evaluate or analyze the content.

Technology acceptance

Closely tied to espoused beliefs is a teacher's acceptance of technology. The technology acceptance model (TAM) states that individuals make decisions on whether or not to implement new technologies dependent upon their perceived usefulness of the technology as well as the perceived ease of use of the technology (Davis, 1989). TAM has been shown to be highly predictive in explaining why some individuals intend to use

technology and then actually implement its usage (Venkatesh & Bala, 2008), and it can be useful in explaining the value and efficacy of a particular system (Ghavifekr & Rosdy, 2015). Based on TAM, moving from a positive belief in technology to integration is contingent upon an individual's acceptance of the technology's benefit for the task and its ease of use (Venkatesh & Bala, 2008). While a teacher may value the use of technology in education, their perception of whether or not a given resource will lead to better productivity or be difficult to use will impact its adoption. Even if a teacher believes in the value of one-to-one devices, if he/she determines they are too difficult to use in the classroom, there is less likelihood they will be integrated effectively.

Technology adoption is also influenced by the perceived ease of use of the item, meaning it will require little effort to implement it (Davis, 1989). Perceived ease of use is subjective and can be influenced by a teacher's skill level, computer complexity, computer anxiety, and individual self-efficacy (Davis, 1989; Venkatesh & Bala, 2008). A teacher's self-efficacy and computer skills are strong predictors of technology integration (Heath, 2017; Inan & Lowther, 2010). As teachers explore educational technology tools including websites, applications, and software, they are more likely to implement those resources into their teaching since they are no longer seen as difficult to use (Alhassan, 2017; Heath, 2017). The more teachers can expand their knowledge and skills using a variety to technology tools, the more positive their beliefs on the usefulness and ease of use of technology becomes, and the more likely they will be to work through barriers.

Enacted beliefs

Teachers with a strong student-centered belief pedagogy are more likely to enact technology integration in their instruction. In a review of literature on technology

integration between 2004 and 2014, Harper and Milman (2016) found that technology is most useful when it is combined with cooperative learning and student-centered instructional strategies. This is perhaps since student-centered instruction is considered best practice in education (Lowther et al., 2012; Ottenbreit-Leftwich et al., 2010). Teacher beliefs about the importance of technology integration on students' learning resulted in the greatest change of how they implemented technology into their teaching practices (Ertmer et al., 2012). Positive teacher beliefs related to the impact of technology on student learning provides motivation for change as teachers navigate technology integration. Those with student-centered beliefs tend to implement technology regardless of barriers (Ertmer, et al., 2012).

Teachers with a strong student-centered, constructivist pedagogy often integrate technology using high-level activities (Ertmer, 2005). High-level activities are also known as high yield instructional strategies because they are designed to increase student achievement (Williams & Larwin, 2016). Student-centered activities include project-based learning, collaboration, and individual inquiry (Ertmer et al., 2012; Lowther et al., 2008; Williams & Larwin, 2016). With student-centered activities, technology can be used to organize, evaluate, and create forms of communication to share with others (Lawson & Miller, 2011). McKnight et al. (2016), in their qualitative study of seven schools at different levels of technology integration, found that students were able to present their learning to larger audiences through discussion boards and blogs. These enriched experiences provided students opportunities to apply and synthesize information within authentic contexts, which are critical to 21st century skills (Lawson & Miller, 2011). As noted by Baylor and Ritchie (2002) the use of one-to-one devices in higher-

order, constructivist activities leads to the development of higher-order thinking skills among students However, higher level integration activities do not occur without intentionality and training (Lowther et al., 2008). Teachers need to be equipped with the computer competencies and curricular connections to student outcomes for them to effectively implement one-to-one devices.

Training for Teachers of Students with Dyslexia

Teachers at PA have a unique training which impacts their philosophy of teaching across academic areas. Based on cognitive learning theory, OG training is a structured philosophy for reading and spelling instruction (Sheffield, 1991). The core elements of OG are integrated into all areas of instruction at PA. This section will (a) review the core elements of OG training, (b) review the theoretical framework of cognitivism found in OG training, and (c) explain how cognitive strategies and OG principles support students with dyslexia.

Orton-Gillingham

All teachers at PA have been trained in OG principles which provide explicit, direct instruction in reading and spelling. The OG method of reading instruction was founded by Dr. Samuel Orton, a neuropsychiatrist, and Anna Gillingham, an educator (Sayeski, Earle, Davis, & Calamari, 2018). OG focuses on the explicit instruction in language elements and their application in reading and writing (Sayeski et al., 2018). OG is considered a philosophy of instruction rather than a step-by-step process (Sheffield, 1991). There are 12 guiding principles of OG which are as follows:

- Individualized: meeting the needs of learners, no two of whom are alike.
- Multidisciplinary: drawing on the minds of experts in many different fields.

- Multisensory: combining sight, hearing, and tactile/kinesthetic pathways in a thinking brain.
- Alphabetic phonics: learning letter sounds to facilitate spelling and reading. This includes learning the feel of correctly pronounced sounds.
- Synthetic/Analytic: The process that means putting sounds together to spell words and taking them apart to read.
- Systematic and Logical: language is organized and taught in a way that can be understood by intelligent learners.
- Sequential: the learning process moves from simple to complex in a gradual, orderly progression.
- Cumulative and Integrated: the learner moves from known to new material, alternating reading and spelling so that both develop together as skills.
- Cognitive: the student is taught to think through language problems rather than to guess at words.
- Fluency: drill brings about the automatic response, which enables better comprehension and attention to ideas.
- Communication is paramount: the learner is able to convey his or her thoughts to others and receive their ideas better.
- Emotionally Sound: the approach grows out of an understanding of how the person is able to learn, and an appreciation of the effort needed to master language.

(Gillingham & Stillman, 1999, p. 301)

According to AOGPE (2018b), in order to be certified at the Associate level in OG, individuals need to be trained and supervised by a certified OG Fellow over an eight-month period. During this time, the perspective OG tutor must complete a minimum of 60 coursework hours, implement OG sessions with students for 100 hours, and be observed for 10 sessions. The course readings, training, and practicum are intended to aid teachers in understanding the nature of dyslexia, the neurobiology of reading, the reading process from decoding to comprehension, the OG Approach, the history of language, and provide an overview of tests and measurements (AOGPE, 2018b). The training process instills the principles and practices set forth by Orton-Gillingham through systematic replication of standards.

OG teachers plan structured sessions focused on explicit instruction in decoding and encoding of phonemic principles using multi-sensory techniques based on individual student needs. After conducting diagnostic assessments to determine a student's reading ability, teachers identify areas requiring remediation and instruction (Gillingham & Stillman, 1999; Sayeski et al., 2019). Each session includes drill and practice of previously learned letter-sound patterns, reading words in isolation, reading sentences and paragraphs, spelling words in isolation, writing dictated sentences, and listening comprehension (Gillingham & Stillman, 1999). Sounds and spelling patterns should be presented in small, incremental steps based on what the student is able to learn effectively (Gillingham & Stillman, 1999; Sayeski et al., 2018). For some students this might mean that only one or two sounds are presented each day or covered over numerous days before others are introduced. The purpose of teaching the reading and spelling of sounds concurrently is to demonstrate the structure of language (Sheffield, 1991). For each letter-

sound correspondence, teachers show a sound card, pronounce the sound, and have students say the sound while tracing or writing the corresponding grapheme. This process connects all three learning modalities, visual, auditory, and kinesthetic, while actively engaging the student in the learning process (Gillingham & Stillman, 1999; Sayeski et al., 2018; Sheffield, 1991). Teachers present material in a similar fashion during each session while assisting students in applying and analyzing linguistic patterns in reading and writing activities.

Cognitivism

The training OG instructors receive has its foundation in cognitivism. Based on the work of Piaget and Vygotsky, cognitivism seeks to explain what is happening in the mind of the learner as he/she processes, assimilates, and retrieves information (Ertmer & Newby, 2013; Yilmaz, 2011). It places emphasis on complex thinking, including language and problem solving, by providing learners with tools to make sense of new learning (Ertmer & Newby, 2013). During an OG session, students are able learn and apply phonemic principles to reading and writing while being guided by a trained linguistic teacher.

Cognitive development. Drawing on the early work of Piaget, cognitivism considers the stages of learning development, moving from simple, concrete pieces of knowledge to complex reasoning and problem solving (Yilmaz, 2011). In order to make sense of new concepts and ideas, children develop organizational structures, or schemata, as part of their cognitive development. As they interact with their environment and others, children assimilate new information to what is already known or adapt their understanding (Wadsworth, 1971). This ongoing process makes students active learners,

seeking to understand and connect new knowledge to what has been previously learned (Ertmer & Newby, 2013; Wadsworth, 1971; Yilmaz, 2011).

When teachers provide instruction in an organized fashion, students can more easily add the new information to what they already know. OG teachers present material to students in an organized, structured manner. While OG is not meant to be a step-by-step system but rather a philosophy of instruction (Sheffield, 1991), Gillingham and Stillman (1999) offer a sequencing of phonemic sounds and rules which progress from simple to complex. The recommended sequence is flexible and should consider individual mastery of patterns and pace of instruction (Sayeski et al., 2018; Sheffield, 1991). New learning is consistently connected to what has already been taught in order to strengthen the student's internal organization of language.

Zone of proximal development. Another primary component to cognitivism is connected to Vygotsky's zone of proximal development (ZPD) (Brieger, Arghode, & McLean, 2020). ZPD is the range between where a student can solve problems and process information on their own and what they are able to accomplish when supported by an adult or more capable peer (Yilmaz, 2011). New information needs to be presented at just the right level for students to grasp and comprehend its concepts (Anderson, 2011). For the cognitivist, assessing individual learning profiles and needs in order to support their processing takes precedence over the content itself.

An OG teacher will present new concepts and principles in small, sequential steps (Gillingham & Stillman, 1999; Sheffield, 1991). Since the teacher seeks to individualize instruction and conducts ongoing diagnostic evaluations, emphasis is placed on teaching concepts at a level where the student can be successful with mediation. Teachers can

present the number of concepts and spend the amount of time needed for a student to achieve mastery before moving on to new concepts. Being able to teach within a student's ZPD helps to ensure learning takes place and can be applied in other contexts.

Social interactions. Closely connected to the ZPD, cognitivists such as Vygotsky place emphasis on social interactions during the learning process. Vygotsky's social learning theory recognizes the role of social interactions and language in the cognitive development of children (Yilmaz, 2011). Children not only model what they see and hear but are guided by the feedback they receive from others (Ertmer & Newby, 2013). The guided feedback assists children in modifying their thinking and creating structural frameworks for understanding. Feedback can also occur between peers as children interact with content and their environment. Social interactions, both with peers and mentors, shape and clarify existing schemas.

OG is a language-based program which focuses on communication (Sheffield, 1991). Within an OG session or classroom, the teacher provides feedback on a student's understanding of phonic principles and its application in reading and spelling. Most sessions are one-on-one or in a small group so feedback can be frequent and specific. Much of the feedback is in the form of questions in order to encourage students to analyze their mistakes and be active in the learning process. Students then use the skills to communicate with peers and adults through reading, writing, and speaking activities.

OG teachers place a heavy emphasis on language and communication (Gillingham & Stillman, 1999; Sayeski et al., 2018). They provide cognitive explanations of language rules and principles during instruction (Sayeski et al., 2018). In an OG session, the instructor provides the explanation and models analytical and synthetic

reasoning for the rules of reading and spelling. The student then practices the skills in isolation before integrating them within contextual reading and writing. Understanding and applying the patterns of language are especially beneficial to students with dyslexia whose primary difficulty is language based (Shaywitz et al., 2008).

Memory. Cognitivism focuses on the schema development of children to aid in the retention and recall of knowledge as evidence of learning. Memory involves taking information in through the senses, processing it in short term memory and working memory, connecting it to what is already known, then storing it in long term memory to be retrieved at a later time (Anderson, 2011). Gagne, a psychologist who studied learning, noted the importance of activating prior knowledge and presenting the prerequisite skills for learning to aid in memory (Wadsworth, 1971). If students do not have the knowledge base to connect new learning, they are less likely to be able to recall the information in the future. But if new information is stored in long term memory and the student can actively engage his/her schema, there is a greater likelihood of recall (Morrison, Ross, Kalman, & Kemp, 2013). For cognitivists, the ability to recall information is evidence of a well-developed schema and framework of knowledge.

Teachers can aid memory storage and recall by assisting students in connecting new material to what has previously been learned by providing the structure of language. Ausubel, an early cognitive theorist, supported teaching principles or rules before having students practice facts (Morrison et al., 2013). During an OG session, the therapist directly teaches the phonemic principles and spelling rules before having students practice them in reading and writing (Gillingham & Stillman, 1999). The direct instruction aids in building the language structure for students and assists them in their

schema development. To assist in the retention and fluent recall of phonemic principles, OG techniques employ the use of multiple senses including touch, sound, and sight (Gillingham & Stillman, 1999).

Fluency. Closely connected to memory is the ability to recall what has been learned quickly and accurately. "Fluency is a system capability requiring subsystem parts to seamlessly interact, such that efficiency and accuracy are maximized (Meiri, Levison, & Horowitz-Kraus, 2017, p. 280). Fluency is part of executive functioning, which also controls problem solving, planning, and organization (Reiter, Tucha, & Lange, 2005). When there is a strong schema system and facts have been stored in an organized fashion, individuals can be more automatic in their recall. Fluency is also impacted by working memory (Meiri et al., 2017). If students have fluency in grapheme and phoneme recall, then they are better able to use their working memory to focus on reading comprehension.

One way OG seeks to increase memory recall and fluency is by presenting phonemic principles and spelling patterns using multi-sensory techniques (Gillingham & Stillman, 1999). For each new letter-sound representation, a teacher will use visual, auditory, and kinesthetic activities to strengthen learning. The use of all modalities is intended to build connections in the brain and make recall easier. Another way OG seeks to build fluency is by overlearning material. During each session, the teacher will have the student review previously learned phonograms. This constant review is meant to build automaticity and fluency so that phonemic principles can be applied during reading and spelling.

Teacher Training and Students with Dyslexia

Those who have been trained in OG understand the nature of dyslexia and how it impacts learning (AOGPE, 2018b). They understand that students with dyslexia can experience difficultly learning due to weaknesses in reading, working memory and executive function skills (Alloway, Wootan, and Deane, 2014; IDA, 2020a; Jeffries & Everatt, 2014; Reiter et al., 2005; Shaywitz et al., 2008). Students with dyslexia have difficulty processing language which is not due to an intellectual, cognitive, or educational issue (IDA, 2020a; Shaywitz et al., 2008). In addition, they struggle with executive functioning which causes difficulties in organization, planning, and working memory, all of which can impact reading comprehension, note taking skills, and written expression (Alloway et al., 2014; Jeffries & Everatt, 2004; Reiter et al., 2005). Since so much of learning in school requires the ability to read and write efficiently and effectively, students with dyslexia often require additional support to access and present information (Alloway et al., 2014; Reiter et al., 2005).

The following section explains the nature of teaching those with dyslexia by providing (a) the definition of dyslexia, (b) the language-based aspects of dyslexia, and (c) its impact on executive functioning.

Definition of dyslexia. Dyslexia a reading disability not otherwise attributed to below average intelligence, cognitive impairment, or lack of education (IDA, 2020a; Shaywitz et al., 2008). Those with dyslexia have average to above average intelligence (IDA, 2020a). When compared to their grade and age level peers, students with dyslexia possess the same potential for learning. However, they exhibit difficulty with language, whether it is in written or oral form, even though they have been afforded learning

opportunities (Shaywitz et al., 2008). Dyslexia is a neurologically based disability with many individuals exhibiting other learning disorders as well (Shaywitz et al., 2008; Tamboer, Vorst, & Oort, 2014). In some cases, those with dyslexia are also diagnosed with ADHD, anxiety, and math disabilities. Since dyslexia is primarily a processing disorder, students tend to struggle learning information as well as expressing their knowledge.

Impact on language. Dyslexia is a language-based disability which impacts phonological processing (IDA, 2020a; Shaywitz et al., 2008). Phonological processing is the ability to manipulate, blend, and segment sounds, all of which play a significant role in understanding and producing language (Peavler & Rooney, 2019). For this reason, dyslexia impacts all areas of reading including word recognition (IDA, 2020a; Tamboer et al., 2014); reading fluency (IDA 2020b; Meiri et al., 2019); and reading comprehension (IDA, 2020b). Even if students receive specialized instruction through multi-sensory instruction such as OG, weaknesses with phonological awareness often continue through adulthood (Shaywitz et al., 2008; Tamboer et al., 2014).

Dyslexia can impact other areas of learning in addition to reading. Due to the impact of language processing, dyslexia can impede spelling, written expression, math calculation, math fluency, and foreign language acquisition (IDA 2020a; Meiri et al., 2019; Shaywitz et al., 2008). Many students with dyslexia have difficulty spelling both sight words and words based on the phonemic principles. At the same time, students with dyslexia have difficulty organizing their thoughts for writing and applying writing mechanics such as punctuation and capitalization (IDA, 2020a). Math can also be difficult since it possesses its own language which students must process in order to

accurately complete problems (IDA, 2020b; Meiri et al, 2019; Stebbings & Kline, 2020). Another area individuals with dyslexia struggle to learn which is also impacted by weak phonological processing abilities is a foreign language (Shaywitz et al., 2008). Not only does learning a foreign language require spelling abilities, it also requires auditory discrimination, auditory memory, working memory, and syntax knowledge (Peavler & Rooney, 2019). Collectively, the demands of processing language can be difficult and frustrating to those with dyslexia.

Impact on executive functioning. In addition to difficulties in phonemic awareness and language processing, those with dyslexia also have weak executive functioning skills, even compared to their non-dyslexic peers (Alloway et al., 2014; Jeffries & Everatt, 2004; Meiri et al., 2019; Reiter et al., 2005). Executive functions are cognitive processes which influence the ability to organize and plan effectively (Reiter et al., 2005). Executive functioning and working memory are needed to comprehend text and formulate ideas to write a story. Words, ideas, and images need to be retained and organized in order for a student to give a response. Therefore, those with dyslexia often take longer to learn, process, and store material, often leaving them mentally fatigued (Alloway et al., 2014). The longer processing time and poor working memory which impacts phonological processing (Jeffries & Everatt, 2004) causes students with dyslexia to need additional time for reading assignments and writing responses (Alloway et al., 2014; Reiter et al., 2005). While each student with dyslexia is unique in their individual strengths and weaknesses, understanding the nature of dyslexia and its impact on academic attainment enables teachers to select appropriate instructional tools including one-to-one devices.

One-to-One Devices for Students with Disabilities

For students with disabilities and dyslexia, the use of one-to one devices provides a way to develop literacy skills and support executive functioning (Adam & Tatnall, 2017; Conway & Amberson, 2011; Mahoney & Hall, 2017; Shaywitz et al., 2008). Students with dyslexia often struggle to accurately read material for classes (IDAa, 2020) and express their thoughts in an organized manner. Text-to-speech and speech-to-text applications can be used as assistive tools for students (Ok & Rao, 2017; Shaywitz et al., 2008). Teachers can utilize a variety of literacy applications and sites to differentiate instruction and develop students' reading, writing, math, and organizational skills (Bippert & Harmon, 2016; Mahoney & Hall, 2017; Ok & Rao, 2017). With each student having a device for personal use, teachers can ensure that students' learning needs are supported and developed both individually and collectively.

This portion of the literature review will describe ways one-to-one devices support (a) access to learning materials, (b) building literacy skills, and (c) student agency. Due to the limited number of studies which have been done with students with dyslexia specifically (Xie et al., 2018), some studies included in this review refer to students with learning disabilities or other mild disabilities.

Assistive Technology

One-to-one devices can be used in assisting students to access learning material (Adam & Tatnall, 2017; Mahoney & Hall, 2017; Shaywitz et al., 2008). Assistive technology is compensatory in nature, allowing students with dyslexia to access, organize, and present information so their weaknesses in reading, written expression, and listening comprehension are minimized (Adam & Tatnall, 2017; Shaywitz et al., 2008).

Assistive technology was originally established as part of the federal legislation of Individuals with Disability Education Act (IDEA) (IDEA, 1997, § 300.105) and supported through the Assistive Technology Act (ACT) in 2004 (Pub. L. No. 108-364). Assistive technology includes "any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (Pub. L. No. 108-364). For public schools, federal money aids in providing assistive technology to students (Pub. L. No. 108-364). While students attending private schools may at times seek assistive technology from the public sector, families seek assistance provide devices for students through insurance or grants or schools supply them out of operating expenses or donations (AT3Center, 2016; Day & Huefner, 2003; Pub. L. No. 108-364). Since that time, assistive technology has served to "level the playing field" (Tilton & Hartnett, 2016). For those with mild disabilities, such as dyslexia, audio recordings can provide access to printed material to support those with poor decoding or reading comprehension abilities (Shaywitz et al., 2008). In a similar fashion, speech-to-text applications can aid those with written language, handwriting, and spelling difficulties (Shaywitz et al., 2008).

One way one-to-one devices are frequently used is to support those with learning disabilities (Mahoney & Hall, 2017; Ok & Rao, 2017; Shaywitz et al., 2008). Text-to-speech applications allow the user to convert text, such as docs, PDFs, and web pages, to speech. There are many free applications which exist to read text aloud to students including Dragon *Speak Naturally*, *ReadWrite*, and *NaturalReader* (Google, 2020; Ok & Rao, 2017). The user can adjust the reading speed, change the voice, and access highlight overlays as material is being read. In a small study with high school students with

disabilities, the use of a text-to-speech application resulted in increased reading comprehension for the participants (Young, Courtad, Douglas, & Chung, 2019). However, for some students, including those with dyslexia, text-to-speech can become more of a distraction and decrease the efficiency of learning the material (Knoop-Van Campen, Segers, & Verhoeven, 2020). Using text-to-speech can be a vital tool to access knowledge for those with reading disabilities and dyslexia, but teachers and students need to ascertain whether it is the most appropriate resource depending on the ability of the student and nature of the assignment.

Various devices and applications allow teachers to provide support for written activities and, thereby, accommodate students' disabilities (Mahoney & Hall, 2017; Shaywitz et al., 2008). One tool which can be used to gather a quick assessment of learning is *Plickers* (Mahoney & Hall, 2017). *Plickers*, a digital assessment tool, can gather student response data without singling out a specific student. This form of assessment can be especially beneficial for students who become anxious or fear their peers' response. Graphic organizing tools such as *Bubbl.us* and *Connected Mind*, benefit those with executive functioning weakness by proving a way to organize thoughts before writing (Mahoney & Hall, 2017; Ok & Rao, 2017). Students can begin visually grouping ideas together before they begin the writing process. One-to-one devices provide students with disabilities or dyslexia a means to access learning materials and present what they know in ways which minimize their academic weaknesses.

Building Literacy Skills

Technology can be used to build literacy skills in students with dyslexia (Mahoney & Hall, 2017; Lipson, 2017). Applications for e-books, student responders,

interactive whiteboards, and augmented reality can be used to enhance instruction (Lipson, 2017). Resources such as QR codes, Plickers, and Padlet engage students in a variety of literacy skills (Mahoney & Hall, 2017). Teachers who have used these tools feel that students' literacy skills improved as a result. In a qualitative study involving one-to-one devices and students with literacy difficulties, participating teachers reported the applications for reading and writing had a positive influence on students, particularly those with dyslexia (Conway & Amberson, 2011). Carreon, Smith, and Rowland (2020) reviewed the use of augmented reality for students in special education. Augmented reality can be used to create interactive word walls and notes by presenting multi-media presentations for words and concepts. There are numerous tools and applications which can be used to support students with dyslexia in building their literacy skills. Teachers and students should continue to explore and experience emerging technology.

Reading. Computer assisted reading programs can be beneficial in supplementing teacher instruction (Bippert & Harmon, 2017). In a study by Anderson and Putman (2019), special education teachers were able to use built-in formative assessment as a way to track student progress. While the study did not focus on student achievement outcomes, the teachers were able to differentiate reading material for their students. They also perceived that student's reading abilities improved. McClanahan et al. (2012) studied a fifth grade male ADHD who used an iPad for learning over a 10-week period. The researchers found the student increased his word reading and vocabulary skills. In addition, the student's self-confidence and well-being improved once he had more control over his learning. While somewhat limited in scope, the studies which relate specifically

to students with dyslexia and learning disabilities point toward promising reading outcomes when students use personal devices.

Writing. Portable devices have been effective tools for students with disabilities during writing activities. In a case study involving nine students with specific learning disabilities, Steiner (2017) provided rich narratives on one boy with dyslexia's use of a Chromebook for writing activities. 'Noah' supported his writing and gained confidence in his abilities as he used a Chromebook while learning. 'Noah' was able to type his essays, use spelling and grammar check to edit his work, and express himself through self-made videos as alternatives to writing. In a similar study, Lipson (2017) explored literacy instruction with the support of technology for students with disabilities. In this study, 'Jody, a young girl with dyslexia, used a Chromebook in her general education classes to take notes. After class she would listen to lectures as needed while she learned the material. The use of a Chromebook allowed 'Jody' to experience independence in her classes while using it as a learning tool. By using personal devices, students were able to work alongside their peers in class despite their dyslexia.

Support for Student Agency

For students with disabilities and dyslexia, assistive technology increases student agency and independence (Adam & Tatnall, 2017; Conway & Amberson, 2011; McKnight et al., 2016). In a grounded theory study involving 31 students, 21% of whom were diagnosed with dyslexia while another 79% had weaknesses in reading and writing, the researchers found that students using laptops increased their involvement in learning when they were either provided the use of a device during the school day or when they were able to also take it home (Conway & Amberson, 2011). In this study, students not

only took responsibility for the care for the devices but also for their literacy skill and development. In a similar manner, teachers noted that students with learning needs would select presentation modes which fit their comfort and ability levels, participate in discussion board activities, and record themselves reading book selections when they each had a device for personal use (McKnight et al., 2016). Students with disabilities are willing to take ownership for their learning when they have the tools and support to do so.

Self-efficacy for students with disabilities and dyslexia is positively impacted by one-to-one devices since it gives them greater independence. Adam and Tatnall (2017) conducted a case study involving two schools for students with learning disabilities. The researchers found technology integration in the learning process provided greater independence for students and resulted in increased self-esteem. Students' self-efficacy increased about their academic performance after using one-to-one devices in the classroom. Digital devices can equip students with dyslexia with tools to foster independence and confidence.

For students with learning disabilities and dyslexia, one-to-one devices offer students access to knowledge and learning. Devices such as iPads, Chromebooks, and laptops can be used to develop literacy skills through various applications and platforms. As teachers begin incorporating more technology into the classroom, students with disabilities will be able to use to minimize their learning weakness and demonstrate their knowledge and creativity.

CHAPTER 3

METHODOLOGY

The purpose of this research was to describe the implementation of a one-to-one device initiative in grades 5 - 8 at a school for students with dyslexia. This research study sought to answer the following questions: 1). What are the teachers' beliefs about one-to-one devices for students with dyslexia? 1a.) What are the teachers' value belief about the importance of technology for students with dyslexia? 1b.) How does teachers' value beliefs change after the one-to-one initiative was implemented? 2). How does the value a teacher hold toward the use of devices with students with dyslexia affect their integration of one-to-one devices in the classroom? and 3). How do teachers integrate devices during the instruction of students with dyslexia? This chapter will cover the study's (a) research design, (b) setting and participants, (c) data collection methods, (d) data analysis, (e) procedures and timeline, and (f) methods of rigor and trustworthiness.

Research Design

This research was a descriptive study using mixed methods design. A descriptive study was useful to investigate what was happening for a given context and understand what was actually occurring (Onwuegbuzie & Leech, 2006). As a descriptive study, it sought to answer "who, what, when, and to what extent" (Loeb, Dynarski, McFarland, Morris, Reardon, & Reber, 2017, p. 1) of a given situation. In this case, the research questions and objectives sought to understand the value beliefs and perceived barriers of middle school teachers of students with dyslexia following a one-to-one device initiative and how each impacted technology integration

in instruction. The intent of the study was to gain insight into the value beliefs and perceived barriers of a specific group of teachers at a specific school with a specific group of students.

There were several descriptive elements used in this study to support its objective. First, the research questions were intended to understand what was happening at the school by asking 'what' and 'how' (Onwuegbuzie & Leech, 2006). For instance, this research study sought to answer, "What are the teachers' value beliefs about one-to-one devices for students with dyslexia?" and "How do teachers integrate devices during the instruction of students with dyslexia?" This descriptive study focused on the value beliefs and perceived barriers of a particular group of teachers, so comparison between or among groups did not occur (Onwuegbuzie & Leech, 2006). I, as a researcher, was not trying to directly influence or change the setting, context, or value beliefs of teachers; neither did I provide an intervention where a comparative study would be appropriate. Lastly, a descriptive study was appropriate to understand the local context in which I, the researcher, was an outsider. Therefore, as an outside researcher with the intent to improve the educational process without a direct intervention, a descriptive study was appropriate.

To best understand the context and current condition, a convergent parallel mixed methods design was used for data collection and analysis. A descriptive study, which incorporated both quantitative and qualitative sources, allowed me to use the strengths of each method while minimizing their weaknesses (Creswell & Creswell, 2018; Johnson & Onwuegbuzie, 2004; Williams, 2007). A mixed methods study was also beneficial for studying a special education population. Collins, Onwuegbuzie, & Sutton (2006) stated, "In the field of special education, it is not unusual for researchers to study populations who exhibit a heterogeneous set of characteristics that differentially impact individuals' instructional

responsiveness (e.g., individuals with learning disabilities)" (p. 76). In the present study, not only did all of the students have a diagnosis of dyslexia, but some students also had comorbid diagnoses which further impacted their academic progress and executive functioning (Meier et al., 2019) As such, I had to consider that the teachers might integrate one-to-one devices differently than another special education setting and/or a general education setting. Lowther et al. (2012) used a mixed methods descriptive study to investigate teacher beliefs and technology integration. The researchers combined surveys and classroom observations to describe the impact of teacher readiness and beliefs of technology integration. The use of a mixed methods design allowed for both empirical and descriptive data to best understand this setting.

In particular, I used a concurrent-parallel mixed method design. A concurrent mixed methods design placed equal emphasis on the quantitative and qualitative data without either influencing the collection and interpretation of the other (Onwuegbuzie & Leech, 2006). A focus on quantitative analysis, which focuses on understanding the results within a larger context, would not necessarily reflect the goals of this group of teachers. In contrast, a focus on qualitative analysis would have yielded rich details about the participants' value beliefs but would have been limited due to the time I could be immersed in the setting. Equal emphasis on the research methods allowed me to describe the current context to a greater degree than quantitative or qualitative alone could have provided (Creswell & Creswell, 2018). The study was concurrent since the data collection occurred during the same time frame (Creswell &Creswell, 2018; Leech & Onwuegbuzie, 2009). I collected survey results, conducted interviews, and engaged in observations during the same time frame. One piece of data was to be analyzed using both quantitative and qualitative methods. Each set of data was analyzed independently then merged for final analysis and theme development. Since the merging of data

was done after individual quantitative and qualitative analyses was complete, the study was considered a concurrent mixed methods study (Leech & Onwuegbuzie, 2009). By drawing final conclusions after data analysis of individual parts had been completed, I was able to fully understand and describe the current setting and participants' value beliefs.

Setting and Participants

Setting

This descriptive research study was conducted at a school for students with dyslexia in the Southeast. The school was established over 30 years ago in order to provide Orton-Gillingham instruction for students with dyslexia. The school was only one of seventeen schools accredited by the Academy of Orton-Gillingham Practitioners and Educators in the United States (AOGPE, 2018c) and served as a model school for those in the Southeast desiring to learn and expand their knowledge of OG training. "AOGPE Accreditation is a process leading to the recognition of education organizations as having a level of performance, integrity, and quality that entitles them to the confidence of the educational community and the public they serve" (AOGPE, 2018c). AOGPE accredits the OG training program and use of OG instruction with students, not the educational process itself. To qualify for this accreditation, all the teachers had, or were in the process of receiving, OG training. At the time of the study, most of the teachers had an Associate certification level, and five teachers had a Certified level. According to AOGPE's accreditation standards, one faculty member had to be a certified AOGPE Fellow. While the school did not currently have an AOGPE Fellow on staff, one staff member was seeking the needed training for this certification. Table 3.1 shows the number of teachers at each certification level.

Table 3.1 *Teachers' OG Certification Level (N* = 19)

Certification Level	Number of Teachers Certified
OG Educator	1
Associate	12
Certified	5
Fellow	1 (in process)

Note. The above table indicates the OG certification held, or in process of attaining, for the middle school teachers.

PA is located on a large piece of land off a major interstate which connects two large metropolitan areas, allowing students from nearby counties easy access to the campus. Housed inside a newer building, PA has large spacious classrooms for instruction as well as outdoor space for its playground and outdoor learning area. The middle school, which consists of grades 5 - 8, has numerous technology tools for teacher and student use. Some classrooms have interactive Smart boards as well as either a set of Apple iPads or Google Chromebooks. Each classroom in the middle school has individual student desks and chairs. Individual desks allow for various room configurations depending on the intended learning activity and outcome. Desks can be clustered for small groups of students or combined to form a large central workspace. Rooms are spacious, allowing for open areas for students to collaborate and work in groups.

Participants

The teachers at the school met the qualifications of highly qualified in both their content area as well as OG training. In all, there were 19 potential middle school faculty members to participate in the study, 12 content area teachers and seven tutorial teachers. A breakdown of their demographics is shown in Table 3.2. A head of middle school and academic dean provided oversight for the middle school. Two of the faculty members were males and 17 were females. All of the faculty and staff were Caucasian. Teachers ranged in age from 21 to over 50 years old.

There were two teachers aged 21 - 30; two teachers between 31 - 40 years of age; four aged 41 - 50 years old; and 11 teachers over the age of 51. Most teachers had been at the school for less than ten years. Eight teachers had been at the school for 1 - 5 years; eight teachers had worked at the school for 6 - 10 years; one teacher had worked at the school for 11 - 15 years; and two teachers had been at the school for 16 - 20 years. None of the faculty had been at the school for over 21 years.

Table 3.2 *Middle School Teacher Demographics (N* = 19)

Demographics	***N***	**%**
Teacher ages		
21-30	2	11
31-40	2	11
41-50	4	21
51 and older	11	52
Years of Experience		
1-5	1	5
6-10	8	42
11-15	8	42
16-20	2	11
21 or more	0	0
Years at PA		
1-5	8	42
6-10	8	42
11-15	1	5
16-20	2	11
21 or more	0	0

Note. The above data shows the demographics by frequency (*N*) and percentile of the middle school teachers at the site school.

All middle school content area, related arts, and tutorial teachers in the middle school were invited to participate in the research study. At the time of the study, there were 12 content area teachers in middle school. There were two English teachers, three math teachers, two social studies, two science, and two language teachers. In addition, there was one related arts teacher who taught drama. There were seven OG tutorial teachers who were also invited to participate in the study, although the use of devices was intentionally limited in that setting due to the

intentionality of following OG methods for reading and spelling instruction during that time. The teaching content areas for the teachers is displayed in Table 3.3.

Table 3.3 *Content Area of Teaching (N* = 19)

Content Area	***N***	**%**
English	2	11
Math	3	16
Social studies	2	11
Science	2	11
Language	2	11
Tutorial	7	37
Related arts	1	5

Note. The school had 12 middle school content area teachers and seven tutorial teachers. The number of teachers per content area as well as the percentage per content area are listed above.

After consent letters had been sent out and returned, ten faculty members agreed to be a part of the study. The demographics along with each participant's pseudonym is included in Table 3.4. Two of the participants were males while the other eight were females. Teachers

Table 3.4 *Study Participants' Pseudonym and Demographics (n* = 10)

Pseudonym	**Gender**	**Age Range**	**Years Teaching**	**Years at PA**	**Content**
April	Female	21 - 30	6 – 10	1 - 5	ELA
Cathy	Female	41 - 50	6 – 10	1 - 5	Social Studies
Connie	Female	Over 51	21 or more	1 - 5	Tutorial
Eric	Male	31 - 40	16 – 20	16 - 20	Science
Evelyn	Female	41 - 50	21 or more	1 - 5	Math
Gail	Female	Over 51	16 – 20	6 - 10	Tutorial
Natalie	Female	Over 51	21 or more	16 - 20	Literature
Peter	Male	41 - 50	16 - 20	16 - 20	Head of Middle School/ Drama
Rachel	Female	31 - 40	6 – 10	1 - 5	ELA
Sarah	Female	Over 51	21 or more	6 - 10	Academic Dean

ranged in age from 21 to over 50 years old. There was one teacher aged 21-30; two teachers between 31-40 years of age; three aged 41-50 years old; and four teachers over the age of 51. Most teachers had been at the school for less than ten years. Five teachers had been at the school for 1-5 years; two teachers had worked at the school for 6-10 years; and three teachers had been at the school for 16-20 years. Two of the study participants held administrative roles, two were tutorial teachers, and six were content area teachers.

Data Collection

This descriptive research study consisted of both quantitative and qualitative data. The quantitative data included a teacher value belief survey and classroom observations. Participants were asked to complete the *Value Beliefs of Technology Integration* (VBTI) to explore teachers' beliefs and perceptions related to technology use for learning, the impact of one-to-one devices on student progress, and implications for students with dyslexia. Classroom observations provided quantitative and qualitative data by noting class activities, resources, and comments regarding technology use during instruction. Additional qualitative data was gathered to add rich descriptive information to the research data and provide greater understanding of teachers' beliefs and perceived barriers as they related to technology use (Mertens, 1998). Qualitative data included individual interviews and observer notes from observations. Collectively, the quantitative and qualitative data provided an overview of teachers' value beliefs and perceived barriers of technology use, insight into one-to-one device integration in the curriculum, and an understanding of the impact of technology on students with dyslexia (Creswell & Creswell, 2018). Data was collected concurrently while results were converged during the analysis stage. Table 3.5 shows how the type of each data collection method was aligned with research questions.

Table 3.5 *Research Questions and Data Sources*

Research Question	Data Collection Methods
RQ 1. What are the teachers' value beliefs about one-to-one devices for students with dyslexia?	
RQ 1a. What are the teachers' value belief about the importance of technology for students with dyslexia?	Survey Individual Interviews Classroom Observations
RQ 1b. How does teachers' value beliefs change after the one-to-one initiative was implemented?	Survey Individual Interviews
RQ 2. How does the value a teacher hold toward the use of devices with students with dyslexia affect their integration of one-to-one devices in the classroom?	Survey Individual Interviews Classroom Observations
RQ 3. How did teachers integrate devices during the instruction of students with dyslexia?	Survey Individual Interview Classroom Observations

Note. The above table connects research questions with the forms of data which were used as part of the triangulation process.

Quantitative Data

Survey. Teachers who participated in the research completed the VBTI survey at the beginning of the data collection period as a quantitative means to measure teacher value beliefs, self-efficacy, and perceived barriers on the role of technology in education. The VBTI was created using a variety of research sources including Inan and Lowther (2010), ISTE (2022), and Battelle for Kids (2019) as well as the *Teacher Technology Questionnaire* (TTQ) (Lowther & Ross, 2000; Sterbinsky & Ross, 2003). The VBTI contained three constructs which were a part of the TTQ (Lowther & Ross, 2000). These constructs included: role of technology for teaching/learning, self-efficacy, and barriers. These constructs were chosen as each impacts technology integration (Inan & Lowther, 2010; Lowther et al., 2008). An alignment table

showing the connection between constructs, sources, and VBTI questions is provided in Appendix B.

On the VBTI, participating teachers rated their level of agreement using a 5-point Likert scale as strongly disagree, disagree, neutral, agree, and strongly agree. There were 14 statements regarding teacher value beliefs, self-efficacy, and perceived barriers of technology use for instruction. Ten of the statements looked at different aspects of technology use for the teaching and learning process with students. Two statements related to teachers' self-efficacy, and two statements related to barriers of technology integration. Sample questions of the VBTI included, "I believe technology is an important tool in the teaching-learning process.", "I believe technology can serve as assistive devices for learning for students with disabilities.", and "I believe I am able to select technology tools which best align with the curriculum standards." An analysis of construct areas and specific survey questions are provided in Table 3.6. A copy of the VBTI can be found in Appendix C.

Table 3.6 *Construct Alignment of VBTI*

Construct	Question
Role of Technology for Teaching/Learning	• I believe technology is an important tool in the teaching-learning process. • I believe the use of devices in the classroom prepares students for future application of technology. • I believe one-to-one devices positively impact the learning environment. • I believe one-to-one devices can be used effectively to build academic skills. • I believe technology can serve as assistive devices for learning for students with disabilities.

Construct	Question
	• I believe technology assists students in learning complex concepts. • I believe students are more motivated to learn when using one-to-one devices. • I believe one-to-one devices can promote higher-level thinking in students. • I believe one-to-one devices enable students to be more creative during the learning process. • I believe one-to-one devices enable students to collaborate with peers.
Self-efficacy	• I believe I have the technology skills needed to utilize one-to-one devices effectively in my teaching. 1. I believe I have the technology skills needed to utilize one-to-one devices effectively in my teaching.
Barriers	• I believe I was provided with sufficient training to effectively use my technology resources for instruction. • I believe I have access to resources and personnel to support technology integration.

Note. This table connects specific questions of the VBTI with constructs of technology integration.

Due to the small sample size of participants, the reliability of the survey could not be calculated. However, the VBTI was validated by two former school administrators. Both administrators had extensive experience in teaching and supervision in K-12 environments. Both held terminal degrees in education and had served on numerous accreditation teams. One of the administrators taught doctoral students in the department of education at an area university and supervised student teachers. The other administrator was teaching middle school science classes and assisted in teacher evaluations. Neither administrator had a direct connection to the research

location. The two administrators were asked to review and provide feedback on the questions for the VBTI. Once revisions had been made and approved by both administrators, the VBTI was converted to a Google Form.

Classroom observations. Each classroom observation was conducted virtually and recorded on Zoom. While I observed each class, I took observational notes and marked a checklist I had developed, the *Technology Observation Tool* (TOT), see Appendix D. The TOT was developed based on the study's research questions and the School Observation Measurement (SOM) (Ross, Smith, Lowther, & Alberg, n.d.), which was out of circulation. The TOT consisted of a series of check boxes with space for field notes and observations. The form was broken into two broad categories to capture technology usage by teachers and students. The teacher section of the form was further divided into classroom procedures, instructional tools, and instructional strategies. The student section of the TOT was divided into classroom procedures, accessibility, grouping, technology usage, and technology purpose. Collectively, the information gathered on the TOT provided information on what and how a teacher integrated technology into the classroom as well as how and for what purpose students interacted with technology.

The TOT was validated in the same manner and by the same individuals as the VBTI. Two former school administrators were asked to review the TOT for accuracy and completeness of items. Both administrators had extensive experience in teaching and supervision in K-12 environments. Both held terminal degrees in education and has served on numerous accreditation teams. One of the administrators taught doctoral students in the department of education at an area university and supervised student teachers. Neither administrator had a direct connection to the research location. The two administrators were asked to review and provide feedback on the questions for the TOT. Once revisions had been made and approved by both administrators, the

TOT was saved as a Word document. I used a printed copy of the form to mark items and take field notes during each observation.

During the observations, I requested the teacher set up a camera in an area of the room which minimized class interference. Although the students are used to visitors being present in the room, I did not want to interfere or influence the flow of instruction. I noted how teachers were using technology, how often and to what extent devices are integrated into the class period, and the type of student activities. The information gathered on the TOT form was used as frequency counts for quantitative data.

Sometimes following the observation, I was able to conduct the participant's interview. When that was the case, I asked any questions I had about the lesson objectives, use of devices, and/or perspectives. Any comments made by the teacher were added to field notes for later review.

Qualitative Data

Individual interviews. I invited all of the study precipitants to be included in individual interviews in order to gather further insight into teachers' value beliefs, perceived barriers, and ways in which one-to-one devices were integrated into instruction. Individual interviews served as a tool to gain further insight into the classroom observations especially when observations had already occurred. In addition, the individual interview provided a venue for open comments. Scheduling of interviews was flexible in order to best accommodate the participants. Due to the COVID-19 pandemic, all individual interviews were conducted and recorded on Zoom. I corresponded with the study participants by email and requested times which would best suit their schedule. Once we had agreed on a day and time, I sent the participant a link to Zoom. Each

Table 3.7 *Individual Interview Questions Aligned with Research Questions*

Interview Question	RQ1a	RQ1b	RQ2	RQ3
In general, what role do you believe technology plays in the teaching and learning process?	X			
What role do you believe technology plays in the teaching and learning process for students with dyslexia in particular?	X			
How had you used technology in your classroom prior to the one-to-one initiative? Can you provide some examples	X		X	
In what ways would you say your use of technology for instruction changed as a result of one-to-one devices?	X	X	X	
What impact, if any, did the transition to online instruction due to COVID-19 last spring have on your perception of one-to-one devices?		X		
If I were to step into your class, how would I see students using one-to-one devices?			X	X
How have you integrated one-to-one devices into classroom instruction?				X
What are some learning activities or instructional strategies you have tried since the one-to-one initiative began? Can you explain their impact?			X	X
Have you tried any new or novel activities due to the availability of technology? If so, what has that been and what has been the response of students?				X
In what ways would you say one-to-one devices have supported learning for the dyslexic student?			X	
How do you feel one-to-one devices impact academic achievement for those with dyslexia?	X			
How do you feel about dyslexic students using one-to-one devices as assistive technology?	X			
What are some ways your students have used one-to-one devices as assistive technology?	X			X
How would you describe the impact of one-to-one devices on the learning environment and student engagement?	X		X	
What technology tool or resource would you want to incorporate into your instruction in the future, and why?	X		X	

interview was allotted 60 minutes, although the teachers were informed that interviews would last 30-45 minutes. I was able to conduct eight interviews. During each interview, I took brief notes on a printed copy of the interview questions. Having the paper in front of me helped to ensure I asked each participant the same questions and allowed me take notes.

The Individual Interview Questions were semi-structured in nature which allowed me to ask clarifying questions as needed. Some of the questions on the interview form related to teachers' value beliefs before and after the one-to-one initiative. Retrospective interviews have been found to be to be consistent over time while perhaps minimizing negative perspectives and emotions (Cohen, Kasen, Bifulco, Andrews, & Gordon, 2005; Van Boven, White, & Huber, 2009). Table 3.7 displays the alignment of the interview questions with the research questions. The Individual Interview Questions can be found in Appendix E.

Classroom observations. Classroom observation notes were used as qualitative data. Observations included careful recordings of what was seen and heard within events and activities in a given setting (Mertler, 2017). In addition to the specified items on the TOT form, observations about conversations and interactions within the classroom in the form of field notes added valuable qualitative data (Mertens, 1998; Mertler, 2017). Each observation was also conducted and recorded using Zoom. I made brief comments on a printed copy of the TOT and noted what was happening in the classroom when technology was being used. Careful attention was given to not record the observer's thoughts or assumptions during the observation period. Instead, if there was a question, space on the observation form was used to write my comments and clarification was sought during an individual interview. After the classroom observation, comments, notes, and observation audio files were transcribed and analyzed. The addition of

qualitative data during the classroom observation served to provide rich narrative and further enhance the understanding of how teachers were incorporating technology during instruction.

Data Analysis

When using multiple data sources, the qualitative data elements enhance the understanding of the quantitative statistics (Creswell & Creswell, 2018). The quantitative data included the descriptive statistics from the VBTI and the frequency data from classroom observations. The qualitative data consisted of individual interviews and classroom observation field notes which were analyzed using inductive analysis to develop themes. Research questions, with corresponding data sources and data analysis procedures, are aligned and displayed in Table 3.8.

Table 3.8 *Research Questions, Methods of Inquiry, and Data Analysis*

Research Questions	Data Sources	Data Analysis
RQ 1. What are the teachers' value beliefs about one-to-one devices for students with dyslexia?		
RQ 1a. What are the teachers' value belief about the importance of technology for students with dyslexia?	Survey Interview Observations	Descriptive statistics Inductive analysis
RQ 1b. How does teachers' value beliefs change after the one-to-one initiative was implemented?	Interviews	Inductive analysis
RQ 2. How does the value a teacher hold toward the use of devices with students with dyslexia affect their integration of one-to-one devices in the classroom?	Survey Interview Observations	Descriptive statistics Inductive analysis
RQ 3. How do teachers integrate devices during the instruction of students with dyslexia?	Survey Interview Observations	Inductive analysis

Procedures and Timeline

This study was conducted over a ten-week period. During the first week, I informed the prospective participants about the nature of the study via a Zoom meeting. In Week 2 - 3, I sent out consent forms for participation. During weeks 4-5, I distributed and collected the VBTI. Once I had collected the survey data, I emailed participants requesting their consent for interviews and observations. During weeks 6-10, I was able to conduct individual interviews and classroom observations. A summary of the timeline for the study is included in Table 3.9.

Table 3.9 *Timeline for Data Collection*

Timeframe	Researcher's Role	Participant's Role
Week 1	Present overview of study	Attend overview presentation
Week 2 - 3	Distribute and collect consent forms	Complete and submit consent form
Week 4 – 5	Distribute VBTI survey	Complete and submit VBTI survey
Week 6 – 10	Conduct classroom observations	Agree to observations
	Conduct individual interviews	Participate in individual interviews

Note. The Timeline for Data Collection outlines the tasks and actions taken by the researcher and the participants during the data collection stages of the research study.

Week 1

In week 1, an overview of the study was presented to the middle school teachers during one of their regularly scheduled faculty meetings. Due to COVID-19 protocols in place at the time, I met with the faculty via Zoom. This session was recorded and made available to the teachers after the meeting. During the presentation, I explained my background and role, the purpose of the study, the research questions, the nature of a descriptive study, and the intended outcome and use of the results. Teachers were assured verbally of the confidential nature of their responses and the assurance of anonymity during and after the study. An approximation of the time commitment needed from the teachers was outlined in the overview letter. This time

included all participants completing the VBTI survey. In addition, I requested volunteers for semi-structured interviews and classroom observations.

Week 2 - 3

After the overview presentation to the faculty, an electronic copy of the Informed Consent Letter (Appendix A) along with a link to the recorded Zoom session were emailed to the head of middle school to distribute to all of the middle school teachers. The email also contained a link to a Google Form notifying me of their interest so I could email a consent letter directly to them. Teachers were asked to return the Informed Consent Letter directly to me by the following week. An email reminder was sent the following week to the head of middle school asking him to remind teachers of the study during the next faculty meeting. By the end of two weeks, ten individuals had agreed to participate in the study.

Week 4 - 5

During week 4, those teachers who had consented to participate were sent an email thanking them for their participation and reminding them of the confidentiality of their responses. In the email was a link to a Google Form version the VBTI survey for completion. Teachers were asked to return the completed VBTI survey one week after it was sent to them. An email reminder was sent out to those who have not returned the survey one week later. All ten participants submitted the VBTI survey.

Week 6 - 10

Classroom observations and individual interviews took place after the surveys had been returned. Each was scheduled with individual teachers to best suit their schedule. As an outsider, I worked to accommodate the teachers' schedules and be respectful of their time. Due to COVID-19 protocols, all observations and interviews were conducted and recorded on Zoom.

Recordings were later transcribed using an online service, Otter.ai (2022). In order to ensure anonymity, pseudonyms were used for individual names during the transcription process.

Classroom observations. During classroom observations, I asked the teacher to set up the camera in a location where I could see some of what was happening in the classroom but not distract the students. Even though the faculty and students were used to visitors entering the classrooms, as an outside researcher, I wanted to minimize impacting class activities. Using the TOT form (Appendix D), I recorded the types of instructional activities teachers used over the course of a lesson. In addition, observational notes of comments and interactions between students and teachers related to technology were noted and used to add rich details. Each observation lasted the entire class period. Once the class ended, I thanked the students and teacher for allowing me to visit.

Individual interviews. Individual interviews were also conducted and recorded on Zoom and scheduled based on what fit the participant's schedule. After building rapport and thanking the participant for agreeing to an individual interview, I reviewed the purpose of the study as well as the confidential nature of any information gathered and anonymity of comments, even during data analysis and reporting. I then asked a series of semi-structured questions of each participant. I took brief notes on a printed copy of the Individual Interview Questions, listed in Appendix E. Along the way, I asked clarifying questions as needed in order to ensure I understood and could accurately represent the thoughts and ideas of the teacher. This clarification process served as a way to member check and maintain trustworthiness of the data. Once all of the interview questions had been asked, I asked if the teacher would like to add any further comments. At the end of the interview, I thanked the participant for their time and again reiterated the confidential nature of the data and assurance of anonymity.

Rigor and Trustworthiness

This descriptive research study underwent several process refinements to ensure the reliability, validity, rigor, and trustworthiness of the findings. Mertler (2017) defines rigor as, "the quality, validity, accuracy, and credibility of research and its findings" (p. 25). The quantitative data was analyzed using descriptive statistical calculations with narrative discussion about the validity of the VBTI and frequency counts from classroom observations. Qualitative data was validated through peer debriefing, member checking, rich descriptions, and triangulation to strengthen the rigor and trustworthiness of the study conclusions (Creswell & Creswell, 2018; Mertler, 2017; Mills, 2000). The combination of quantitative and qualitative data aided in greater understanding of the study's context and state of technology integration than either data source alone (Johnson & Onwuegbuzie, 2004).

The findings from qualitative data can be more subjective in nature than quantitative data especially when the researcher is considered an outsider (Dwyer & Buckle, 2009). In order to safeguard the reliability and validity of the qualitative analysis and conclusions, this study utilized peer debriefing, member checking, rich descriptions, and triangulation. These methods aided in ensuring that I had described the value beliefs and perceived barriers of the teachers accurately.

Peer debriefing. Guba (1981) describes peer debriefing as a process which allows the researcher to test insights and themes with a peer or colleague. It also allows peers to ask probing questions which can either clarify ideas or cause the researcher to think critically about their findings. Throughout the course of the study, I asked the head of middle school to act as a peer for debriefing. He interacted with teachers and observed classrooms on a regular basis and had a good understanding of the instructional practices of the school. In addition, I met almost weekly

with my faculty advisor, Dr. William Morris, to assist in the coding and theme development process. He was able to give valuable insight and ask probing questions for further exploration (Mills, 2000). In addition to meeting with my faculty advisor online, we communicated through a shared document using a running record agenda to share updates, progress, and insights.

Member checking. The use of member checking also aided in establishing the trustworthiness of the data and findings. Member checking allows for research participants to review the overall findings prior to final publication to other stakeholders (Guba, 1981). Member checking served to ensure I clearly represented the participants' ideas and values accurately (Mertler, 2017). I created flow charts containing assertions, categories, and sample codes following the coding process (Creswell & Creswell, 2018). I then emailed the participants informing them of where I was in the process of data analysis and asked for feedback on the assertions I had made or any discrepancies that were noted. Visual representation of the codes and assertions were presented during the review process to show the connection and hierarchy between assertions, categories, and codes (Mertler, 2017). Member checking by the participants validated final assertions and themes of the study.

Rich descriptions. Since this was a descriptive study, the use of rich, context specific descriptions from the participants were a necessary element. Clear explanations of the setting, observations, and comments from the participants helped to explain what was happening at the school and provided a realistic picture to the readers of the study (Creswell & Creswell, 2018). The rich descriptions allow others to fully understand the study's setting and determine how the present study might be generalized to their context (Gay et al., 2009; Twinning, Heller, Nussbaum, & Tsai, 2016). Rich, detailed descriptions of the setting, participants, and one-to-one

device usage are spread throughout this paper and used to support themes during the data analysis phase.

Triangulation. The final method for ensuring rigor and trustworthiness was through triangulation of data. Mertler (2017) states, "This [Triangulation] is an appropriate design in situations where the practitioner-researcher values both types of data equally and treats them as such." (p. 107). Triangulation involves using multiple data sources, data methods, and perspectives to analyze and draw conclusions from the study (Creswell & Creswell, 2018; Guba, 1981; Mertler, 2017). The multiple data sources for this study included descriptive statistical scores from the VBTI survey and coded themes from the individual interviews and observational notes. The multiple perspectives came from peer debriefing and member checking. The use of multiple data sources and perspectives lessened the effect of any one data source and lent itself to a more complete understanding of the study (Gay, et al., 2009).

Plan for Sharing and Communicating

Since not all teachers in grades 5 - 8 volunteered to be a participant in the study, the first group to share the research findings with would be the active participants in the study. The research participants are the primary stakeholders in this study, so their input lends credibility to the study results (Mertler, 2017). Results of surveys and insights from individual interviews and classroom observation notes will be reported to the participants for their review, insights, and recommendations. Sharing the study's conclusions leads to further discussion and professional growth (Manfra & Bullock, 2014; Mertler, 2017).

The next group to share the study's findings with is the full middle school. This group of teachers are also using one-to-one devices with the middle school students. This presentation can occur during a regularly scheduled faculty meeting using a narrated power point presentation.

Sharing the findings would shed light on what their immediate peers believe about the use of technology with students with dyslexia. The rich descriptions and direct quotes can assist in understanding how others are integrating technology into their instruction. Since peers often learn from each other and can influencing value beliefs (Bandura, 1977; Ertmer, 2005; Kopcha, 2012), sharing the study's data and results can provide additional comments and insights into the use of devices by teachers of students with dyslexia.

The presentation would then be presented to other local stakeholders which includes teachers from the lower school, coordinators, administrative staff, and the head of school (Mertler, 2017). As school members, they too have a vested interest in the educational process of the middle school students. They also have OG training and special knowledge of students with dyslexia. In addition, as an OG training location, ensuring the application of OG principles in connection with one-to-one device implementation is important to the school's mission. For the teachers of younger students at PA, their understanding of the value beliefs of the middle school teachers and the ways in which one-to-one devices are being implemented may result in increased technology integration at the earlier grades as well. Sharing the study's findings can also lead to discussion and professional growth for all of the school's teachers.

Since I believe that the results of this descriptive research could benefit other schools, I will seek to present the findings at conferences, especially ones which focus on special education and dyslexia. While this descriptive research is small in scale and limited in generalization to other sites, sharing the study's finding will provide personal growth for me as well as promote professional discussion, reflection, and brainstorming with other administrators and teachers (Manfra & Bullock, 2014; Mertler, 2017). Those professionals could then share ideas about ways one-to-one devices could be used in their schools. In order to maintain confidentiality of

individual participants, only collective data or a general reference to ‘a teacher’ or grade level will be shared in both the local and regional context; however, the school’s name and location will be shared at a conference, pending permission from the administration, since Pinewood Academy is already recognized as a training center for teachers of students with dyslexia.

CHAPTER 4

ANALYSIS AND FINDINGS

The purpose of this research is to describe the value beliefs and perceived barriers following the implementation of a one-to-one device initiative in grades 5 - 8 at a school for students with dyslexia. Using both quantitative and qualitative data, this research study sought to answer the following questions:

1. What are the teachers' value beliefs about one-to-one devices for students with dyslexia?

    1a. What are the teachers' value belief about the importance of technology for students with dyslexia?

    1b. How does teachers' value beliefs change after the one-to-one initiative was implemented?

3. How does the value a teacher holds toward the use of devices with students with dyslexia affect their integration of one-to-one devices in the classroom?
4. How do teachers integrate devices during the instruction of students with dyslexia?

This study had ten participants. All of the participants agreed to answer survey questions, seven agreed to participate in classroom observations, and eight agreed to semi-structured interviews. This chapter will share the results of the (1) quantitative data analysis and findings and (2) the qualitative findings and interpretation.

Quantitative Data Analysis and Findings

Quantitative data were collected using a survey and observation checklist. I created the survey using constructs of the TTQ and research from Inan and Lowther (2010) and Lowther et al. (2012). I modified the SOM to collect frequency counts of technology usage on the TOT. All of the study participants (n = 10) completed the VBTI survey which had been sent to participants electronically. The survey consisted of 14 5-point Likert-type scale items. The other piece of quantitative data came from seven observations. Each observation lasted 50-minutes During observations, which were conducted and recorded on Zoom, I completed the TOT. The TOT noted the types and ways teachers and students used technology during the lesson. Seven of the ten study participants agreed to an observation. Together, the VBTI and the TOT provided descriptive statistical data to be analyzed alongside the qualitative data. A summary of the types of quantitative data is shown in Table 4.1.

Table 4.1 *Summary of Quantitative Data Sources*

Types of Quantitative Data	**Number**
Surveys	10
Observations	7
Total	17

VBTI Survey Results

Descriptive statistics. The VBTI was completed by all of the study participants (n = 10) at the beginning of the study. The survey collected data on the role of technology for teaching and learning, self-efficacy, and barriers to technology implementation. A score of 1 indicated *strongly* disagree while a score of 5 denoted *strongly* agree. The results are reported in Table 4.2. The following descriptive statistics are noted: mean (M) and standard deviation (SD).

Overall, the teachers agreed that technology plays an important role in teaching and learning though they differ as to the degree (M = 3.92, SD = 0.93). While some teachers strongly agreed technology is beneficial in the education process, others strongly disagreed. The teachers also felt they had technology skills needed in order to integrate technology into their teaching based on self-efficacy ratings (M = 4.05, SD = 0.83). In the area of self-efficacy, teachers ranged in their confidence from *strongly agree* to *disagree*. The section on barriers had a higher mean score than self-efficacy but less variance (M = 4.20, SD = 0.67) which indicated a greater agreement among participants. Each one of the subsections is discussed further below.

Table 4.2 *Descriptive Statistics of the VBTI* (n = 10)

	M	***SD***
Role of Technology for Teaching/Learning	3.92	0.93
Self-efficacy	4.05	0.83
Barriers	4.20	0.67

Role of technology for teaching/learning. The subcategory of *role of technology for teaching/learning* consisted of 10 items. Table 4.3 shows the descriptive statistics (*M, SD)* for each item. This section had the lowest mean score compared to the other two categories and contained the highest variance of scores as well (M = 3.92, SD = 0.93). Mean scores within this subsection ranged from 3.10 to 4.80. Item 8, "I believe one-to-one devices can promote higher-level thinking in students" had a mean score of 3.10 and a standard deviation of 0.93, even though most of the teachers agreed technology played a beneficial role in the teaching and learning process (Mdn = 4). The other lowest scoring questions based on mean scores were items 7, "I believe students are more motivated to learn when using one-to-one devices," (M = 3.20, SD = 1.23) and item 9, "I believe one-

to-one devices enable students to be more creative during the learning process," (*M* = 3.20, *SD* = 0.92). Teachers differed though as to their agreement on how one-to-one devices impact motivation and creativity. Teachers expressed the strongest agreement on item 2, "I believe the use of devices in the classroom prepares students for future application of technology" (*M* = 4.80, *SD* = 0.42).

Table 4.3 *Descriptive Statistics for Role of Technology for Teaching/Learning* (*n* = 10)

Role of Technology for Teaching/Learning Items	***M***	***SD***
1. I believe technology is an important tool in the teaching-learning process.	4.00	1.25
2. I believe the use of devices in the classroom prepares students for future application of technology.	4.80	0.42
3. I believe one-to-one devices positively impact the learning environment.	4.00	0.94
4. I believe one-to-one devices can be used effectively to build academic skills.	4.20	0.92
5. I believe technology can serve as assistive devices for learning for students with disabilities.	4.70	0.48
6. I believe technology assists students in learning complex concepts.	3.70	1.16
7. I believe students are more motivated to learn when using one-to-one devices.	3.20	1.23
8. I believe one-to-one devices can promote higher-level thinking in students.	3.10	1.20
9. I believe one-to-one devices enable students to be more creative during the learning process.	3.20	0.92
10. I believe one-to-one devices enable students to collaborate with peers.	4.30	0.82

Self-efficacy. Two items on the VBTI sought information about teachers' self-efficacy. Table 4.4 shows the questions and responses for this subsection. Both questions in this category were similar in their mean scores. Overall teachers felt they had the

technology skills needed to effectively integrate one-to-one devices in their instruction (*M* = 4.00, *SD* = 0.67). However, not all teachers felt as confident in selecting technology to meet curriculum standards based on responses to Item 12 (*M* = 4.10, *SD* = 0.99). Overall, teachers agreed they had the self-efficacy skills needed to integrate one-to-one devices in their teaching.

Table 4.4 *Descriptive Statistics for Self-Efficacy* (*n* = 10)

Self-Efficacy Items	***M***	***SD***
11. I believe I have the technology skills needed to utilize one-to-one devices effectively in my teaching.	4.00	0.67
12. I believe I am able to select technology tools which best align with the curriculum standards.	4.10	0.99

Barriers. Two items on the VBTI assessed barriers which could impede technology integration. Table 4.5 shows the questions and responses for this subsection. This subsection had the highest agreement and least variance compared to the other two subcategories on the VBTI survey (*M* = 4.20, *SD* = 0.67). Item 13, "I believe I was provided with sufficient training to effectively use my technology resources for instruction" had a mean score of 3.70 (*M* = 3.70, *SD* = 0.67) while Item 14, "I believe I

Table 4.5 *Descriptive Statistics for Barriers* (*n* = 10)

Barriers Items	***M***	***SD***
13. I believe I was provided with sufficient training to effectively use my technology resources for instruction.	3.70	0.67
14. I believe I have access to resources and personnel to support technology integration.	4.70	0.67

was provided with sufficient training to effectively use my technology resources for instruction" had a mean score of 4.70 (M = 4.70, SD = 0.67). Teachers were not in agreement as to the training they received to integrate technology effectively. However, they do have access to resources and personnel for support when integrating technology.

Technology Observation Tool

The TOT was completed at the time of each observation. Since observations were conducted and recorded on Zoom, each video was reviewed a second time, and the initial observation checklists were reviewed for accuracy. There were a few revisions made to the original checklist to better reflect what actually happened in the classroom. I added a grouping of *hybrid class* and additional instructional tools such as *document camera* and *mobile device* to reflect what was seen during observations instead of just listing them as Other. In addition, I reviewed each recorded observation and made edits to previously marked items on the TOT if needed. For instance, on one observation form I had marked student grouping as independent and pair grouping but had not marked whole group for when the teacher was providing whole class instruction. Once all observation checklists had been reviewed, frequency counts of each item were recorded on a blank form. The final observation checklist results are presented in Table 4.6.

During classroom observations, I noticed teachers and students using various technology tools for a variety of purposes. Using the TOT checklist, I was able to count the number of instructional tools, types of instructional strategies, groupings of students, and purposes of usage. The most frequently used instructional tool was a laptop which was used by all seven teachers. Teachers also used Apple TVs to project content for students to view. One teacher used a document camera in the same manner as an overhead projector. Another teacher used the Apple TV to show a video which would

Table 4.6 *Technology Integration Tool Frequencies*

Type of Use		Frequency
Teacher Usage		
Classroom Procedures:	Attendance	0
	Assignment Submission	0
	Communication	1
Instructional Tool:	Desktop	1
	Laptop	6
	Projector/Apple TV	5
	Interactive whiteboard	0
	A/V conference – Google Meet	4
	Document camera	1
	Mobile device	1
	Mic	1
	Document	3
	Presentation/Slides	4
	Video	2
	Web 2.0	2
Instructional strategy:	Direct instruction	6
	Project based learning	0
	Cooperative learning	2
Student Usage		
Classroom Procedures:	Recording assignments	1
	Digital notebook	0
	Communication	0
Accessibility:	Text-to-speech	1
	Speech-to-text	1
	Highlighting tool	2
	Dictionary/Thesaurus	0
	Magnifier	0
	Other - spellcheck	1
Grouping:	Independent	5
	Pair	2
	Small group	1
	Whole class	5
	Hybrid group	1
Technology usage:	Reading	2
	Writing	5
	Audio recording	0
	Math	0
	Presentation/slides	0
	Video recording	0
Technology purpose	Drill/Practice	3
	Collaboration	2

Type of Use	Frequency
Assessment	2
Research	0
Creative	1
Unknown	3

serve as background information for a later assignment. One teacher wore a mic to amplify his voice while teaching. There were four instances of teachers using Google Documents and four times when Slides were used as an instructional tool. Two teachers used Web 2.0 apps. One teacher also used his phone during an observation since his laptop was used to project the lesson slides.

The primary instructional strategy observed in the classes was direct instruction. Most of the time teachers gave instruction to the full class or students worked independently. Collaborative learning took place in three classes, with two teachers having students work in pairs and one of those classes also had students work in small groups. Four of the classes also had students join the classroom virtually. In one of those classes, the teacher created a hybrid group using a one-to-one device to project the virtual student in the group. One of the observations was during a tutorial session in which the teacher was working one-on-one with a student. The tutorial setting, as well as the majority of classroom instruction, focused on direct instruction.

Students used technology to complete assignments, demonstrate learning, and record homework. In all but one instance, students used their Chromebooks to complete assignments. The one-to-one devices were used to complete a quiz and practice skills using Web 2.0 applications in English and tutorial. In other classes, students accessed documents and slides to primarily practice writing skills. During one ELA class, students used speech-to-text as an assistive technology tool to assist in the writing process. In one

class, students also accessed reading material. There were three occasions when students used devices to work collaboratively with others. Twice students used devices for drill and practice to develop automaticity of skills. In one class students were engaged in more of a creative, student-centered activity by writing original scripts. The only time a student used a cell phone was to take a picture of his homework since he had forgotten his paper agenda.

Qualitative Data Findings and Interpretations

This descriptive study collected qualitative data using interviews and classroom observations. Using inductive analysis, I analyzed eight semi-structured interviews and six of the seven classroom observations which took place over a span of six weeks. One of the observations was not analyzed for qualitative data since the audio file from the recording was not saved due to technical difficulties. This section will provide (a) a background on the qualitative data and (b) the methods of analysis.

Background of the Qualitative Data

After participants had completed and returned the VBTI survey, I emailed each individual and requested a day and time to conduct a semi-structured interview and/or an observation. Due to the COVID-19 protocols in the place by the school, all sessions were conducted virtually and recorded on Zoom. The interviews and observations occurred during a five-week window. Interviews lasted between 30-45 minutes. I had a printed copy of the questions in front of me and took notes during each interview. Each classroom observation lasted 45-50 minutes. In addition to recording the session on Zoom, I completed a TOT checklist as well as wrote anecdotal notes about the lesson based on what I could see. For some of the participants, I was able to conduct their interview following their observation and clarified any questions I had from the

observation. These comments were transcribed and included within the coding process. Table 4.7 lists the types and number for the qualitative data sources.

Table 4.7 *Summary of Qualitative Data Sources*

Types of Qualitative Data	**Number**
Interviews	8
Observations	7
Total	15

Methods of Analysis

The audio files from the interviews and observations were transcribed using Otter.ai (2021), an online transcription service. Pseudonyms were assigned to each individual at the onset of the study and used as identifiers with the transcriptions to maintain confidentially of the participants. The transcripts were then downloaded to a Microsoft Word document.

Before beginning the coding process, each transcript was divided into columns by converting the text to a table and segmenting the transcript by dividing the text into rows by sentences rather than separating text by speaker. This method was to help ensure a line by line, inductive analysis occurred (Saldaña, 2021). Once the table had been created it was divided into three columns. The column on the left side of the transcript was used to record analytical memos, while the column on the right was for codes. I then checked the accuracy of the transcripts by comparing them to the audio files, making corrections as needed. Any unintelligible text was noted within the transcript.

First cycle coding. While I was editing each transcript for accuracy, I began coding lines by reflecting on what the participant was saying or doing in a line-by-line manner, generating codes based on the context rather than a predetermined list (Creswell & Creswell, 2018). Codes were short phrases or words to express the meaning of the

speaker. I read through each transcript using an initial coding process. Initial coding breaks content down by ideas and actions (Charmaz, 2005; Mertens, 1998) is useful when coding interviews (Saldaña, 2021). This line-by-line method allowed me to reflect on individual elements of data before reflecting on the data as a whole. I first reviewed and coded each interview, then went through the transcripts from the observations in the same manner. During the first round of level 1 coding, I had 2,248 codes. Even though I had a large number of codes, I repeated the process a second time going more in-depth to ensure I grasped the participants' meaning, especially since I was operating as an outsider. During the second round of initial coding, I also coded *in vivo*, or direct comments, from the participants to capture their exact words and meanings (Ryan & Bernard, 2000). The second round of level 1 codes resulted in 3,138 codes. The total number of codes for each round of first level coding is shown in Table 4.8.

Table 4.8 *Coding Process*

Cycles		**Number of Codes**
Cycle 1 - Codes	Round 1- Initial coding	2248
	Round 2 – Initial and *in vivo* coding	3138
	Round 3 – Refine language	1117
	Round 4 – Refine language	754
Cycle 2 - Categories	Round 1 – Sort by type	6
	Round 2 – Sort by categories	31
	Round 3 – Refine categories	29
Cycle 3 -Themes	Round 1 – Merge categories for themes	4
	Round 2 – Refine language of themes	4

Since I did not keep a master list of codes as I read each transcript, I needed to refine my codes and combine those with similar meaning. During round 3 of the cycle 1 coding process, I copied the codes from each transcript into an Excel sheet. I then began refining the language in Excel, referring to the transcript to ensure the speaker's meaning was conveyed. During this process, I worked closely with my dissertation chair to as a

means of peer debriefing to ensure the process and meanings I was generating fit the data. We met almost weekly. In addition, I updated a shared document with my progress, attaching spreadsheets and explaining my process. Adjustments were made based on feedback from my advisor. This process helped me to narrow down codes yet still maintain the meaning of the participants. Refinement of the codes for round 3 resulted in 1,117 unique codes. See Figure 4.1 refinement process for round 3 with a comparison of the transcript with codes from rounds 1, 2, and 3.

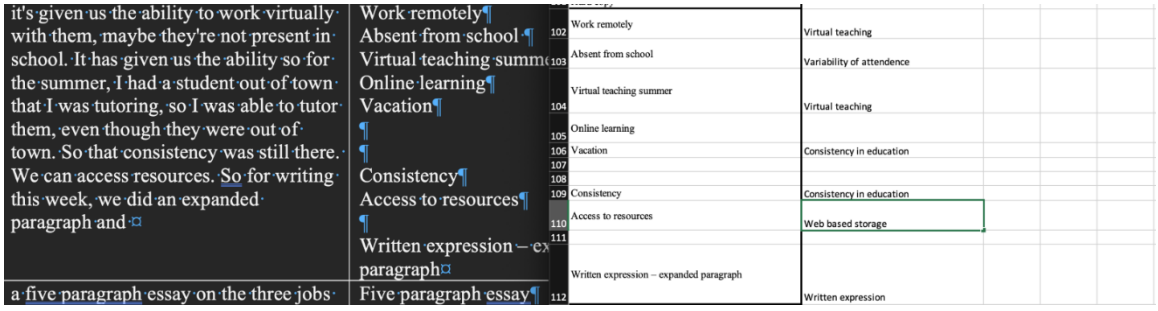


Figure 4.1. An example of how the original transcript and initial codes were refined during cycle 1 round 3.

For the next round of refining the language of the codes, I created a combined list of codes from round 3 and put them in alphabetical order. This step clustered all of the *in vivo* codes at the top. I set those aside and printed the remaining codes in three columns so I could lay out pages and make handwritten notes during this part of the refining process. Figure 4.2 shows an example of the round 4 of code refinement.

Once I had edited the language on paper, the corrections were reflected on the Excel sheet. Since I still had a large number of codes, I filtered the list of refined codes using various key words such as *handwritten* and *engage* in order to find codes with similar wording. This allowed me to easily scan similar items and determine whether to combine them or leave them separate in order to maintain their intended meaning. This

round 4 of refinement process resulted in 754 unique codes. Table 4.8 shows the cycles of codes along with the corresponding number of codes following each round.

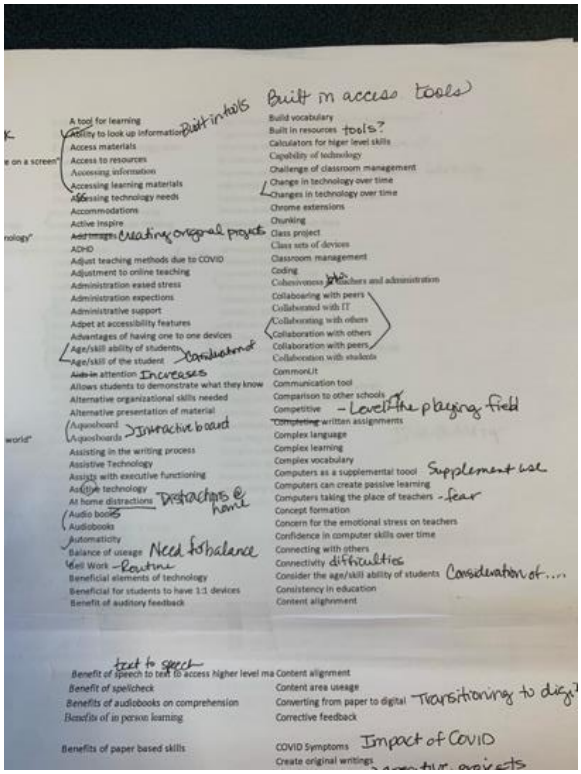


Figure 4.2 An example of the round 4 of the coding process for cycle 1. Items that were similar were grouped together or reworded.

Second cycle coding. In the second round of coding, I carefully reviewed the initial codes that remained after the final round of refinement. Based on my knowledge and the meanings of the codes, I began sorting the codes by types. One initial group was *in vivo*. *In vivo* codes are used to portray the exact language of the participant and were all clearly marked with quotation marks (Ryan & Bernard, 2000; Saldaña, 2021). I then began reading down the list and deciding whether the code fit a concept, description, value, emotion, or process. I sorted the codes by types and grouped them into columns. There were a few I changed, but for the most part the codes remained in the type initially noted. One exception were the codes in the process column. Saldaña (2021) notes that

process codes are gerunds and useful in qualitative studies depicting change. While it was evident that Pinewood Academy had gone through a process of not having one-to-one devices to having one-to-one devices, I decided the codes were more reflective of items noted during observations rather than defining or explaining a process. Therefore, each process code was reassigned to other categories with the majority of them, such as *monitoring student progress* and *collecting data*, moving to the descriptive type. Each type of code was then assigned a different color. I felt this would be helpful once I began creating categories and later finding themes. Figure 4.3 shows the types of codes noted in the data.

Concept	Descriptive	In Vivo	Emotion	Value
Accommodation	3D hologram display	"a little bit more challenging"	Amazement	A tool for learning
Adjust teaching methods due to COVID	3D printing software	"a little more challenging when you're on a screen"	Bizarre	Advantages of having one to one devices
Adjustment to online teaching	Ability to differentiate instruction	"a lot of grace"	Bored	Aids in learning retention
Adjustments due to one to one	Access to devices	"a really bizarre event"	Challenge of classroom management	Allows students to demonstrate what they know
Administrative expections	Access to resources	"afraid"	Concern for the emotional stress on teachers	Beneficial curriculum change
Administrative challenges	Accessibility application	"Ah ha moment"	Confusion	Beneficial elements of technology
Administrative data collection/analysis	Active Inspire	"All in one tool"	Difficult to comprehend	Beneficial for students to have one to one devices
Administrative decisions	Added reponsibilities for online instruction	"Almost had a breakdown"	Embarrassed	Benefit of accessibility features
Administrative goals	Adept at accessibility features	"amazingly well"	Empathy	Benefit of assistive technology
Administrative support	ADHD	"back to normal"	Enjoyment	Benefit of auditory feedback
Assessing technology needs	Administrative duties	"big role"	Exhausted	Benefit of built in tools
Availability of financial resources	Alternative organizational skills needed	"But I love being able to use my technology"	Feeling fortunate	Benefit of music
Beneficial applications	Alternative presentation of material	"Crazy"		Benefit of physical proximity
Builds automaticity of skills	Application of learning	"dabbling"	Felt weird	Benefit of simultaneously using documents
Classroom management	Assessment tools	"danger to that part of our goal"		Benefit of speech to text
Collaboration with IT	Assessments	"digital teacher"	Frustrated	Benefit of spellcheck
Collaboration with others	Audiobooks	"dynamic use"	Impressed with student work	Benefit of teaching students using various methods
Collaboration with peers	Availability of different resources	"essential"	Overwhelmed	Benefit of technology to decrease exhaustion
Collaboration with students	Benefits those with auditory processing weaknesses	"exponentially better"	Sense of accomplishment	Benefit of text to speech
Communicating with others	Built in accessibility features	"fear"	Stress of homework	Benefit of text to speech to access higher level material
Communication tool	Built in resource tools	"Forced"	Stress of hybrid teaching	Benefits of accessibility tools
Comparison to other schools	Calculators for higer level skills	"gracious"	Stress of online teaching	Benefits of audiobooks on comprehension
Computers make a heavy focus on writing possible	Capability of technology	"helpful"	Stress of teaching	Benefits of editing software
Consistency in education	Changes in technology over time	"high fliers"	Stress of teaching to assessments	Benefits of handwriting assignments
Continuity of education	Chunking	"How far behind our kids were"	Stress of transitioning to virtual teaching	Benefits of in person learning
Cost of eduction	Class sets of devices	"Huge fear"	Struggles	Benefits of interactive boards
Curriculuar decisions due to COVID	Coding	"huge improvement"	Uncertainty	Benefits of one to one for accessibility tools
Curriculum adoption	Competion as motivation		Worried about COVID	Benefits of one to one for equal acess
Curriculum adoption before COVID	Complex language skills	"I do love that"		Benefits of paper based skills
Curriculum driven vs Need driven	Complex learning	"I don't think anyone felt adept"		Benefits outweigh the difficulties
Data driven decisions	Computer use policy	"I like technology"		Cannot replicate some in-person activities
Decentralized interaction	Concept formation	"incredible"		Cohesiveness between teachers and administration
Dependence on technology	Connectivity issues	"it keeps up with the fast pace of the world"		Computers can create passive learning
Developing social skills	Considerations for online learning	"it workded"		Computers taking the place of teachers
Difference in emotional, physical, and mental strain	Constantly using a computer	"it's certainly not the be all end all"		Connecting with others
Difference in processing speeds	Content alignment	"Its not in the best interst of the dyslexic kid"		Consideration of age/skill ability of students
Difference in skill sets	Converting paper to digital	"Just line them up"		Dependent on teacher preference
Difference in teaching paradigms	Corrective feedback	"keeping things fresh"		Dependent on the severity of needs
Differences in fluency	Create original work	"learned and done so much"		Desires an interactive board
Differentiated instruction	Creative projects	"less reluctant"		
Difficulties due to social distancing	Creative thinking	"love"		Difficulties navigating online classroom
Difficulties with handwriting	Critical thinking	"loving it"		Difficulties with students responsible for devices

Figure 4.3. The final Excel sheet showing refined round 1 cycle 2 codes sorted by types. The colors were added after sorting had been completed.

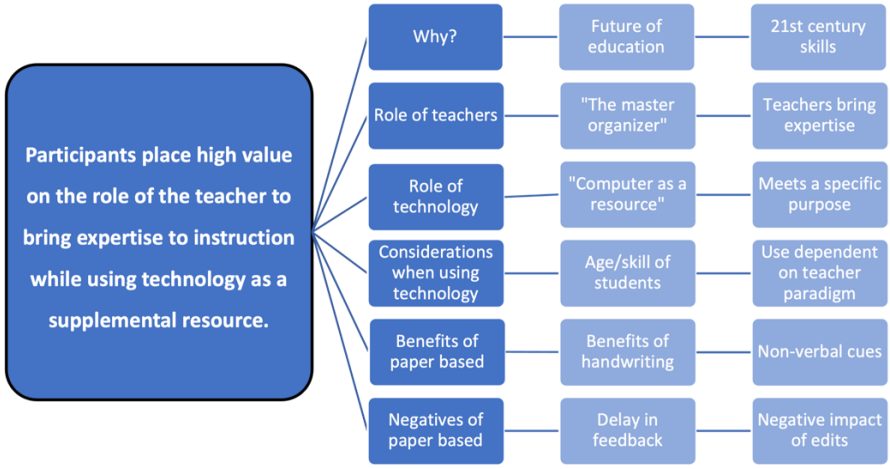
Third cycle coding. After the initial codes were sorted by type, I was ready to begin organizing them into logical groupings using pattern coding. Saldaña (2021) states that pattern coding is beneficial for creating meaningful groupings, especially when there are large amounts of data. Pattern coding is also beneficial when noting repeated comments or elements among the data (Fetterman, 1998). I used two Excel spread sheets

placed side by side for this process. I read each code, then cut and pasted it into similar groupings on the new Excel sheet. If a code did not fit an existing group, I started a new group. Once I had several codes grouped together, I gave the grouping a category name to reflect its content. For any code in which I could not easily connect to the participant's meaning, I referred to the original transcript. This was particularly true for the *in vivo* codes since the meaning of words such as "forced" or "less reluctant" were unclear without connection to the original context. By the end of the process, I had some codes which I felt still did not fit into a category. Those I labeled *unassigned*. Next, I printed the category spreadsheet so I could review and edit the data as needed.

While I reviewed the categories, I focused on alignment within groups as well as names given to the categories. For instance, the category *nature of dyslexics* became *characteristics of dyslexia*. The category *traditional teaching elements* was combined with *instructional strategies*. I then went through each code in the *unassigned* category, analyzed its meaning, and assigned it to existing categories. During this process of revision, I realized that the categories of *positive perspectives of tech* and *negative perspectives of tech* contained clusters of items which could be grouped together to better reflect their meanings. For instance, *negative perspectives of tech* was broken down into three additional categories of *concerns for students using devices, concerns of digital instruction*, and *negative perspectives of one-to-one*. Once I was satisfied with the categories, I was able to consider themes.

Fourth cycle coding. Once the categories had been established, I began to cluster them in order to find themes and assertions. Themes and assertions are used to explain relationships and summarize data (Ryan & Bernard, 2000). Again using Excel, I copied the revised categories and corresponding codes onto a new sheet, transposing

them into rows. This allowed me to begin sorting and grouping categories together more easily. Using a process of inductive analysis, I noted the importance the participants placed on the role of the teacher while indicating that technology was a resource. Next, I noted the negative emotional impact of dyslexia contrasted with the positive emotional impact of assistive technology, so those related items were grouped together. Next, I grouped categories together which showed the transition to one-to-one devices. This group also included the transition to online teaching due to COVID-19. Once those three groupings were made, I was able to again use inductive analysis to place the remaining categories. Once I had grouped all of the categories, I wrote rough drafts of the assertions. The assertions were revised several times before finalization. Figure 4.4 shows the resulting themes with associated categories and samples of codes. Each theme and its corresponding categories will be described in the next section.



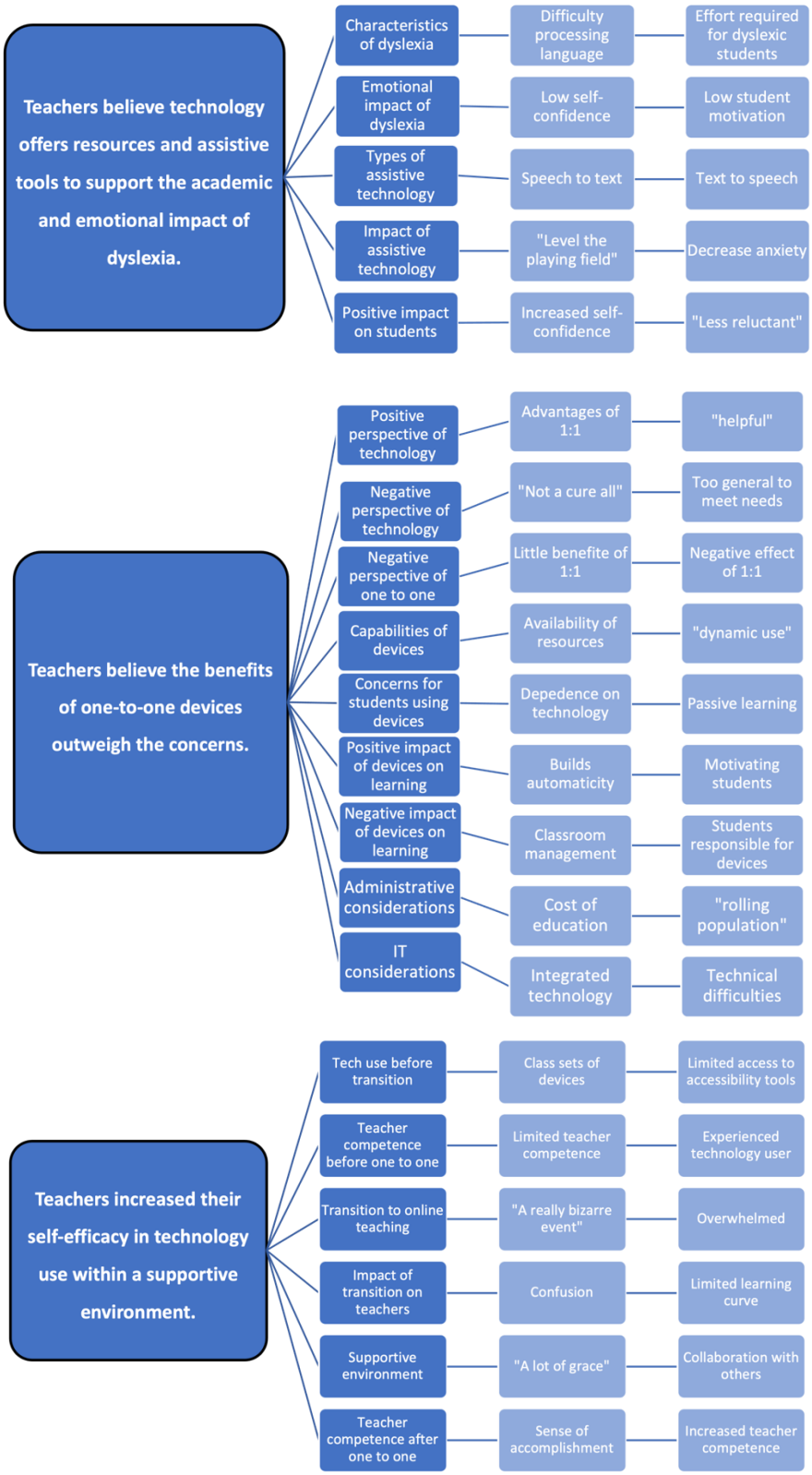


Figure 4.4. Final assertions with supporting categories and codes.

Presentation of Findings

This descriptive study yielded four assertions which were derived using inductive analysis:

1. Participants place high value on the role of the teacher to bring expertise to instruction while using technology as a supplemental resource.

2. Teachers believe technology offers resources and assistive tools to support the academic and emotional impact of dyslexia.

3. Teachers believe the benefits of one-to-one devices outweigh the concerns.

4. Teachers increase their self-efficacy in technology use within a supportive environment.

Each assertion was consolidated as a theme. Each theme is discussed in detail in this section. All participant names are referred to using pseudonyms in order to maintain confidentiality (Creswell & Creswell, 2018; Mertler, 2017). Rich descriptive details, as well as direct quotes, are used in order to reflect the participants' meaning and values (Creswell & Creswell, 2018; Mills, 2000). Each assertion with its corresponding categories and sample codes are displayed in Figure 4.4. In addition, themes are connected to assertions and categories in Table 4.9.

Table 4.9 *Themes, Assertions, Categories from Qualitative Data*

Theme	Assertion	Categories
Impact of assistive technology	Teachers believe technology offers resources and assistive tools to support the academic and emotional impact of dyslexia.	• Characteristics of dyslexia • Emotional impact of dyslexia • Types of assistive technology

Theme	Assertion	• Categories
		• Impact of assistive technology • Positive impact on students
Impact of devices	Teachers believe the benefits of one-to-one devices outweigh the concerns.	• Positive perspective of technology • Negative perspective of technology • Negative perspective of one to one • Capabilities of devices • Concerns for students using devices • Positive impact of devices on learning • Negative impact of devices on learning • Administrative considerations • IT considerations
Increase in self-efficacy	Teachers increased their self-efficacy in technology use within a supportive environment.	• Tech use before transition • Teacher competence before one to one • Transition to online teaching • Impact of transition on teachers • Supportive environment • Teacher competence after one to one

Technology as a Supplement

From the interviews, it became apparent that the participants place a high value on the role of teachers to bring their expertise in regard to understanding the nature of students with dyslexia and instructional strategies to meet their needs. This theme is based on the assertion that participants placed high value on the role of the teacher to

bring expertise to instruction while using technology as a supplemental resource. Ertmer et al. (2012) described such use of technology as a "supplement to reinforce skills" (p. 430). The use of technology and one-to-one devices served as resources to meeting curriculum goals. Such use often results from an espoused belief in the value of technology versus an enacted belief to transform learning (Ertmer et al., 2012; Shifflet & Weilbacher, 2015; Virtue, Downes & Bishop, 2015). This theme contains the categories of (a) *role of the teacher*, (b) *role of technology*, (c) *why include technology*, (d) *considerations when using technology*, (e) *concerns of digital instruction*, (f) *benefits of paper-based*, and (g) *negatives of paper-based*.

Role of the teacher. Teachers in accredited schools must be highly qualified in pedagogy and learning strategies (SCISA, 2020;). The teachers at PA have additional certification in OG structured language instruction for reading and spelling (OGA, n.d). As such, teachers have the ability to assess student needs and develop curriculum and strategies to meet those needs. The teachers in this study held a teacher-centered paradigm which places emphasis on direct instruction in which teachers have the primary role in delivering instruction (Ertmer et al., 2012). Direct instruction is beneficial for students with dyslexia especially when learning foundational skills (Shaywitz et al., 2008; Stapleton & Stefaniak, 2018; Vellutino, Fletcher, Snowling, & Scanlon, 2016). This teaching method is more typical of teacher centered paradigms which tend to result in technology being used in teacher directed activities (Ottenbreit-Leftwich et al., 2018). For this theme, teachers have a higher role during the learning process than technology. One participant, Peter, referred to teachers as "the master organizer". He placed high value on the skills and abilities of teachers to tailor learning content and strategies for their students. Peter stated, "You're not communicating to students; you're

communicating to *your* students. And that's what the teacher has to bring in to integrate with technology." Teachers bring intentionality and understanding of students' academic and emotional needs to their instruction. Teachers were able engage in ongoing assessment of their students and adjust the lesson accordingly in order to meet a student's zone of proximal development (Brieger, Arghode, & McLean, 2020), unlike technology. Computers are not able to adjust their presentation of information based on student needs.

The role of the teacher is to use their knowledge of curriculum and instruction as well as their insight into students throughout the learning process. Peter said:

> Because I think the teacher has to bring those things to the table, you can't like, you can't go to Barnes and Noble and buy a third-grade workbook for your third grader, and just sit them down and do page one and then two, and then three, they're still they're still a …So that same thing carries over to the internet. You can't just get technology and march kids through it.

He later stated:

> I mean, there's all kinds of online learning programs that adults don't do because it's just information. There has to be purpose and intent and design to it. And I think that's the role of the teacher - is selecting the intent and design and purpose for an outcome.

The intentionality of instruction comes from a teacher, not only based on the curriculum, but the individual needs of the students. Many of the teachers mentioned they make decisions on curriculum based on their students' needs. Because of this, they choose not to use technology each day or in the same way for each student. Gail noted that she decided what and how much material to present to her students based on needs. She stated:

> So you could make the whole lesson up, but you could plan ahead as to how far you wanted to go with Google Slides. Or you could just stop it when you felt like they lost focus on what you were working on. Or if it's just not a good day, then you can change or switch to something else.

Several teachers also noted they focused on mastery of material rather than coverage of curriculum. They were intentional about how long students practiced skills before progressing.

Role of technology. While technology can be very beneficial in the teaching and learning process, teachers must decide when and how to best use it during instruction (Ertmer, 1999; Ertmer et al., 2012). The teacher has to make decisions as to whether and/or when technology is used during a lesson (Hutchinson & Woodward, 2018). In this study, the participants on more than one occasion stressed their perception that technology was a resource and should be used as a supplemental tool during instruction. Sarah said, “Well, I think the role of technology is definitely a tool to learn, to further student and teachers’ learning. It's certainly not the be all end all.” In math class, Evelyn was supportive of using one-to-one devices, but it depended on the purpose. She did not feel that students should use calculators if the intent of the lesson was to learn long division. Instead, calculators were appropriate for more complex calculations once a student knew basic processes. In fact, in her interview, Evelyn mentioned several times that technology should be used as a supplemental tool, not as a replacement for the teacher. Since the participants in this study held more of a teacher-centered than a student-centered paradigm, the use of technology was primarily used to supplement instruction; therefore, the role of technology was given less emphasis than the role of teacher and was primarily used to supplement instruction.

The participants in this study also did not feel that technology played a primary role in learning as far as students were concerned. While Rachel spoke of the benefits of technology and one-to-one devices for students, she also stated that devices could be a "double-edged sword". Devices could be beneficial to many students, but others seemed to find added distractions when using them. Even for those students who benefited from assistive technology available on devices, Cathy noted, "But for a lot of the students, I wouldn't say it has a primary role; I would say it's more secondary. It's enhancement." She went on to say, "For most of my students, though, it really does fall into the secondary category like it …has a *value* to it, but it can also create a big distraction for them." As such, teachers needed to be aware of what role technology was playing for their students and ensure it was used appropriately.

Reason for including technology. While the participants in this study viewed the role of technology as secondary to that of a teacher and primarily a supplemental resource, they also expressed its importance and acknowledged its place in education. One of the ways the participants felt technology played a role in education was to prepare students for the future. Administrators and teachers have long seen the benefit of using technology in education to develop skills needed for the workforce and fast-paced society. (ISTE, 2022; Larson & Miller, 2011). Casner-Lotto and Benner (2006) presented the findings of over 400 companies which outlined the 21st century skills are needed in the workplace. Among others, these skills included critical thinking and creativity. Freeman et al. (2017) and the Department of Education (2017) have supported these findings resulting in schools integrating technology and the ubiquitous use one-to-one devices. Teachers in this study stated students needed to be prepared for future use of technology in order to keep pace with others. Gail said, "I think it [technology] keeps up

with the fast pace of the world that we live in, that the students have to …are immersed in" And since students are immersed in technology, there exists a need to equip them with technology skills such as collaboration, creativity, problem solving, and critical thinking (Battelle for Kids, 2019; ISTE, 2022). Computers and one-to-one devices can be effective tools in developing 21st-century skills, as they provide tools and access to knowledge for problem solving (Battelle for Kids, 2019; ISTE, 2022; U.S. DOE, 2016). In this study, participants recognized the role of technology in education and the need to teach technology skills in the classroom. Sarah said:

> But I would *hope* that we would embrace it in order to prepare our students and ourselves for the future, which is what education is all about so in order to prepare them. We must teach them about technology. We must show them how it works, and its role in our, in our workforce, in our personal lives… It's our *duty* to teach them that and to show them that so …to prepare ourselves in order to teach them that. So we have to be constant learners of technology in order to impart anything to these kids.

Others agreed with needing to be intentional about learning new skills. Both Gail and Evelyn agreed that teachers needed to be constant learners of technology, since it was always changing and in order to prepare students. Evelyn said, "So that in order to keep up with everyone else, it's important to learn these things because that's the way everything is headed whether you like it or not." Gail acknowledged that learning new technology skills could be more difficult for some teachers than others; however, she said it was necessary as a teacher. While PA primarily focuses on remediating reading and writing weaknesses, the participants expressed a responsibility to equip students with 21st-century technology skills.

Considerations of one-to-one use. Even when using devices as a supplemental resource, several factors determine the methods and extent of integration. Even when teachers have access to devices how they integrated them into the curriculum is largely based on their value beliefs and paradigms (An & Reigeluth, 2011; Chaaban & Moloney, 2016; Ertmer, 1999; Ertmer et al., 2012). In addition, teachers must make curricular decisions to determine when and how devices are used. Ottenbreit-Leftwich et al. (2010) and Heath (2017) found teachers need to understand how to connect their curriculum to technology. Considerations must also be made regarding the lesson intent and how to best achieve the instructional goals (Hutchinson & Woodward, 2018). Those considerations include (a) the paradigm of the teacher and (b) alignment with curriculum.

Teacher paradigm. The belief system, or paradigm, of a teacher plays a significant role in the integration of technology and is harder to change that perception (Ertmer, 1999; Ertmer et al., 2012). Based on teacher comments and observations, the administration and teachers at PA had a teacher-centered, rather than student-centered, paradigm. Their OG training, which places emphasis on structured, sequential lessons (Sheffield, 1991) and statements about the nature of students with dyslexia placed an emphasis on direct instruction. Ertmer et al. (2012) classifies direct instruction, in which the teacher has the primary role of disseminating information, as a teacher-centered paradigm. For students with learning disabilities, direct instruction has been found to effective in teaching reading (Shaywitz et al., 2008; Vellutino, Fletcher, Snowling, & Scanlon, 2016). For the teachers at PA, the training they learned in OG training had permeated throughout their instruction.

During most of the observations, I observed teachers at the front of the classroom leading discussions and lecturing. In two of the observations, the teachers integrated

technology into their instruction by showing videos, utilizing Web 2.0 tools, and navigating Google Classroom. Even in the tutorial session, which was centered around remediation, the teacher used direct instruction to teach morphemes and vocabulary, then provided opportunities for the student to practice the skill independently. In each of these settings, teachers used devices primarily to present information.

A few of the teachers used technology in a more student-centered manner. In two of the observations, teachers were having students work collaboratively on assignments. Collaboration is more of a student-centered activity in which students can exchange ideas during the learning process (ISTE,). In the science class, the teacher had students working in small groups, including one hybrid group, to complete a shared document. Students were engaged in conversation and explained their ideas to one another. In the drama class, students were working in pairs to write an original script. The groups had two documents to use as guides as they talked through their ideas and created a story line. Occasionally, the teacher would open the shared documents and offer feedback on the students' progress. The feedback was more in the way of offering suggestions or reminding students of steps they needed to take rather than providing direction to the plots or characters. In both instances, the teachers were having students use their devices in student-centered activities, indicating they themselves were developing a more student-centered paradigm.

Paper vs. digital. During instruction, teachers need to make decisions about which types of resources and tools students use in order to meet content objectives. Hutchinson and Woodward (2018) proposed using professional development to assist teachers in determining when and how technology is integrated into instruction. On the other hand, Ottenbreit-Leftwich et al. (2018) reported that some teachers seek to create a paperless

classroom. In this study, while many participants commented on the benefits of paper-based materials and used them in their classroom, others preferred digital ones. Since the participants in this study highly valued the role of the teacher while using devices as a supplement to their instruction, the integration of Chromebooks was dependent upon each teacher's self-efficacy and teaching paradigm. During two observations, the teachers used paper and digital resources equally. In other observations, one teacher used a document camera while her students wrote words and definitions on paper; however, in two other classes the students solely used their devices to complete work. Each teacher seemed to use technology based on their belief system and self-efficacy of computer skills. This category is broken down into (a) the benefits of paper-based assignments and (b) the negatives of paper-based assignments.

Benefits of paper-based. In this study, participants used paper-based materials for a variety of purposes. As a school, emphasis was placed on an organizational system which included a paper agenda and a 3-ring notebook system. Many teachers seemed to prefer paper-based materials over digital ones. One teacher noted that she had her students print out work they had typed to turn it in even though it had been completed digitally. Eric stated paper-based materials, including workbooks, were easier for students to navigate. During observations, there were several instances when teachers passed out paper-based activities. During the interviews, several teachers noted the benefit of handwriting. In OG training, emphasis is placed on the importance of handwriting, especially cursive writing (Gillingham & Stillman, 1997; Sheffield, 1991). Teachers in tutorial, especially when meeting face to face, had students handwrite assignments. Eric commented that research supports the use of handwriting. The use of paper-based resources stems from teacher paradigms, training, and perceived benefits.

Negatives of paper-based. While teachers feel that handwritten assignments and paper-based materials have merit, they also expressed several negative elements of paper-based activities. Several participants noted that edits are more difficult when assignments are done on paper. Teachers mentioned that when helping a student edit paper-based work, they would need to hover over them. With digital assignments, teachers could provide suggestions from afar and encourage students to use tools to self-edit their work. Students could make corrections on their own, especially when they used tools such as spell check and *Grammarly*. Handwritten edits also left corrective marks on a page which could seem permanent to a student and have a negative impact on their emotional health. Peter commented, "If you thought you had a final, polished copy on paper, and it's got all kinds of problems, it's really painful to correct it. It seems …seems permanent. Yet, the computer screen does not seem permanent. It's easy to fix." Digital edits did not leave lasting marks on a paper or child.

The teachers also noted that handwritten work could have negative impacts for students. Both Rachel and Peter mentioned that handwritten assignments can cause more physical fatigue than typing, especially for those with dysgraphia. The added fatigue often caused students to forget their train of thought or avoid writing due to muscle strain. Another way students struggled with paper-based materials was due to poor organizational skills. Students with dyslexia tend to have weak executive functioning skills (Alloway et al., 2014). Cathy and Sarah noted that students were more likely to misplace or lose paper-based assignments than when they are completed digitally. While some students preferred paper-based activities, teachers had to weigh the benefits and negatives of the type of format used for learning.

Future technology. At the end of each interview, I asked participants what technology they would like to incorporate into their teaching in the future. Teachers with a strong self-efficacy, or confidence in their skills (Bandura, 1977), wanted to learn and explore new tools. Research has shown that when teachers explore technology tools, they are more likely to incorporate them into their teaching (Alhassan, 2017; Heath, 2017). All but two of those interviewed stated a desire to learn or use a new technology. The types of technology teachers were interested in using corresponded to the expressed level of self-efficacy possessed by the teacher either during an interview or on the survey. All the technologies participants mentioned were meant to either increase student engagement or replicate in-person teaching experiences. Three teachers stated they desired an interactive board in order to get students out of their seats and engage them more in lessons. Sarah had noted in her interview that middle school students needed the opportunity to move more in the classroom. As the teachers were gaining confidence in their current use of devices under a primarily teacher-based paradigm, they were interested in involving students to a greater degree.

Two of the participants stated they wanted technology which could simulate in-person instruction. One teacher stated she wanted a document camera so she could more clearly see a student's handwriting during social-distance instruction or online sessions. Peter, a more experienced technology user with a higher self-efficacy, wanted a 3D hologram device which could project the teacher into a child's home. He stated, "If we could make the teacher's presence immediate projection in someone's home while they were quarantining, or like bringing human presence through technology in a more immediate way, that would cross a *huge* hurdle and a huge problem". His intention was to be able to simulate the physical presence of a teacher when students could not be at

school. Both participants, one with low self-efficacy and one with high, seemed to indicate the benefits of in-person instruction.

However, not all of the participants expressed a desire to learn or include new technologies at the time. Two teachers stated they did not want to learn any new technology. One participant seemed tired and still overwhelmed by the stress of the pandemic year and hybrid teaching. The stress of teaching during the COVID-19 pandemic had been expressed by several participants and supported by previous research (Singh, Steele, & Singh, 2021). The other participant felt she still needed to practice the skills she had been taught before adding new skills. This sentiment aligns with research stating that individuals will not add new skills without having sufficient self-efficacy to do so (Bandura, 1977). Teachers must feel equipped, both mentally and emotionally, before adding new technologies.

The desire to integrate technology into instruction is dependent on several factors. For the participants in this study, the desire to acquire new technology and skills coincided with their belief system and self-efficacy. Overall, the participants placed teachers at the center of instruction using technology to supplement learning. When they considered using devices, they took the needs of students and the objectives of the curriculum into consideration.

Impact of Assistive Technology

The second theme which emerged from the data was the impact assistive technology had on students with dyslexia. This theme came from the assertion that teachers believed technology offered resources and assistive tools to support the academic and emotional impact of dyslexia. This theme developed out of noting the passion and insight the participants in this study expressed for students with dyslexia and

its accompanying emotional impact. In this study, assistive technology is defined as includes "any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (Pub. L. No. 108-364). Several participants used words like *lifesaver, massive,* and *huge* to describe the impact of assistive technology. Text-to-speech can allow students to comprehend above level text (Mahoney & Hall, 2017; Ok & Rao, 2017; Young et al., 2019). Speech-to-text can minimize weak written expression and cognitive fatigue (Adam & Tatnall, 2017; Alloway et al., 2014; Shaywitz et al, 2008). By utilizing assistive technology, students gain confidence and take ownership for their learning (Adam & Tatnall, 2017; McKnight et al., 2016; Steiner, 2017). This theme consists of five categories which includes *characteristics of dyslexia*, *emotional characteristics of dyslexia*, *types of assistive technology*, *impact of assistive technology*, and *positive impact on students*. The following sections will describe (a) dyslexia and its emotional impact and (b) assistive technology and its emotional impact.

Dyslexia and its emotional impact. Dyslexia impacts language processing and can have an associated negative emotional impact on students (IDA, 2020). Since students with dyslexia often struggle with language, they often make more errors than their peers, negatively impacting their self-esteem. The difficulties with processing language are also evident in differences in processing speeds (Jeffries & Everatt, 2004). In this study, participants noted both the difficulty of processing language and differences in processing speeds and their impact on students. Gail stated:

> So a lot of times dyslexic children, because they move at a slower pace, or because they don't read as well, they miss out on things, especially extracurricular type things or extras that other students get to do.

Missing out on activities often leads to students with dyslexia feeling excluded from their peers. Cathy reiterated this point by noting that students were "constantly struggling to fit into a traditional environment and keep up with it." The difficulties experienced by students with dyslexia can result in discouragement.

Even within a school such as PA, where all of the students have dyslexia, the differences in pace were mentioned. Teachers noted that, while some students would take a full class period to complete an assignment, others would finish quickly. Those "highfliers", as Rachel called them, would be provided additional activities or assignments. Those students were encouraged to work on *IXL* in math, complete challenge reading assignments in *CommonLit* for English or explore coding in science using *Khan Academy*. The speed at which students finished assignments often determined what extension activities they could complete.

Those with dyslexia often work harder than their peers to complete the same assignments, leaving them mentally and physically fatigued (Alloway et al., 2014; Reiter et al., 2005). When discussing the amount of mental and physical effort that students with dyslexia must exert on an assignment, Peter explained:

> It's kind of like the equivalent of driving to grandma's house in a convertible or a minivan with air conditioning on while you're watching a movie. Like you both get to grandma's house, but someone shows up weather beaten and exhausted and sunburn, and the other one shows up relaxed. So that's the way I think about how dyslexics get work done…they can do it, but they show up exhausted.

Like Peter, other teachers commented on the ability of students with dyslexia to complete the same assignments as their peers but at a greater cost.

Collectively, the characteristics of dyslexia can have an emotional impact on students. Students with dyslexia often struggle with low self-esteem and feelings of inferiority (McNulty, 2003). The teachers at PA seemed especially aware and sensitive to the emotional impact dyslexia could have on students despite their cognitive abilities, which might be why they encouraged the use of assistive technology.

Assistive technology and its emotional impact. Assistive technology allows those with disabilities to access learning. In this study, assistive technology consists of tools and applications which allow students to access, organize, and present information (Adam & Tatnall, 2017; Shaywitz et al., 2008). Assistive technology can increase the rate at which students gather information as well as express their understanding. Peter commented, "Basically any fluency increase is a massive, massive gain for them." Several participants noted that assistive technology levels the playing field for students with dyslexia. By leveling the playing field, students were able to compete with their peers. Gail said, "I think it [assistive technology] helps them be … competitive with other students in the school system… So this [assistive technology] helps them keep pace and have the same opportunities that they might otherwise miss." Cathy made a similar comment when she stated, "When they learn about the [assistive technology] tools and how to use them, it…it keeps them right in line with …with their peers." Being able to compete with their peers helps to build students' self-confidence, which is often affected by dyslexia.

Of all the assistive technology tools available, participants in the study stated that students regularly used speech-to-text and text-to-speech to access learning materials.

Speech-to-text can benefit those with written expression weaknesses while text-to-speech supports those with poor reading and comprehension skills (Shaywitz et al., 2008). Nearly all teachers at PA mentioned the use of speech-to-text and text-to-speech in a positive manner during their interviews and encouraged their use with students. Connie mentioned that text-to-speech was a valuable tool for students to use so they could listen to their writing and self-edit. Eric noted that text-to-speech allowed students to access grade level texts, providing richer language and more advanced concepts than students would be able to read on their own. He said, "I think that's [text-to-speech] a really positive part of this deal." By being able to access materials, teachers found students were more engaged in class. Cathy said, "That's, that's *massive*, because it allows them to engage in my classroom, whereas before, they probably would have just tuned me out and shut me down and I wouldn't have been able to reach them at all." The speech-to-text and text-to-speech tools impacted not only the content, but the learning environment as well.

Other built-in tools such as spell check and grammar check assisted with students' written expression. Connie stated, "Spell check and grammar check really helps level the playing field." She has found students were more willing to write and had written longer paragraphs while using a combination of speech-to-text and editing tools. Connie noted that when students had to try numerous times to spell words correctly, they tended to lose their train of thought. Cathy also felt that spell check and speech-to-text were extremely beneficial. She said, "They really are almost academic lifesavers for some of these kids, and it has just an intense value." Because of the value teachers noticed from the use of devices, they have worked to teach students how to use assistive technology tools.

Teachers expressed the importance of students deciding for themselves which assistive technology tools best met their individual needs. Cathy was intentional about teaching a variety of tools to support learning, including assistive technology. She would then encourage students to try several different ones to see which benefited them the most. Dawson, Antonenko, Lane, and Zhu (2019) noted students should be exposed to a variety of assistive technology tools and explore how to use them. Students could then be given the choice of which they found most helpful. Other participants in the study commented they would give students the choice of when to use assistive technology as well as paper-based products. By providing student choice, teachers were encouraging student ownership of learning.

*Increased student self-esteem and confidence***.** One-to-one devices and technology can be used to increase students' self-esteem and confidence. McClahan et al. (2012) and Lipson (2017) found that students increased their self-esteem and confidence when they had more control over their learning and supportive tools to express their knowledge. Adam and Tatnall (2017) also found both self-esteem and self-efficacy improved after using devices. Students' self-esteem increased when they could collaborate and support teachers in the use of technology. In this study, Cathy noted that the students were very technologically savvy and able to troubleshoot problems she experienced. She stated, "They do as much instruction for us as their teachers as we do for them on their content." Rachel also noted that students were able to support her in the use of technology, including troubleshooting technical issues. Coupled with the confidence students gained academically from devices, they also had an increase in self-esteem by supporting others.

Impact of devices

Teachers described numerous benefits of one-to-one devices. One-to-one devices in this study means "the ubiquitous or mass presence of devices in school" (Selwyn et al., 2017) "in which all the students in a class, grade level, school, or district are provided computers for use throughout the school day and… at home" (Zheng et al., 2016). This theme emerged as positive and negative perspectives were expressed concerning one-to-one devices and their capabilities and is based on the assertion that teachers believe the benefits of one-to-one devices outweigh the concerns. Like other teachers, those in this study expressed the ease of use and benefits Chromebook tools offer (Evans, 2019; Kwon et al., 2019). Teachers also expressed the positive impacts of devices on learning which is supported by previous research (Sessions & Kang, 2016; Lowther et al., 2012; Zheng et al., 2016). However, they stated that devices can also create distractions in the classroom necessitating changes in classroom management strategies, something which other educators have noted as well (Harper & Milman, 2016). This theme contains nine categories which include *positive and negative perspectives on technology*, *capabilities of devices*, *negative perspectives of one-to-one*, *administrative and IT considerations*, and *positive and negative impacts of devices on learning*. The following sections offer explanations and support based on qualitative data.

Positive perspectives of technology. Overall, teachers held positive perceptions of technology. Perception, in this study, refers to how a person receives and interprets information from the outer world (Uzunboylu & Ozdamli, 2011). Perception is easier to change than beliefs and can be influenced by experiences (Ertmer, 1999; Ertmer, 2005; Inan & Lowther, 2010; Kwon et al., 2019). Teachers expressed favorable comments surrounding technology such as "I like technology," "it's helpful", and "super fun." Each

comment was connected to an element deemed beneficial by the participants such as differentiated instruction, continuity of education, and access to materials. Each area is described below.

Differentiation of instruction. The use of technology and one-to-one devices have been found to be effective tools in differentiating instruction (Harper & Milman, 2017). Technology offers more personalized learning, especially for those with learning needs (Hutchinson, 2012; McKnight, 2016). Several of the teachers in this study, both classroom and tutorial, mentioned the benefit of one-to-one devices in supporting individualized instruction and differentiated instruction. Even though all of the students at PA had dyslexia, they were all unique in their abilities and needs. Cathy said, "I cannot individualize lesson plans for every single student in my classroom, and, yet, almost every kid needs an individualized lesson plan whether they're dyslexic or not." To meet that need in math, Evelyn uses *IXL* to differentiate lessons for her students while Rachel uses *CommonLit* for reading passages. Tutorial teachers could also differentiate lessons to fit the skill and need of the students more easily with digital resources than they could with paper-based products. Both Connie and Gail mentioned they could edit master slides peer teachers had created in order to address the needs of their students. Digital resources and one-to-one devices had allowed teachers to differentiate instruction for their students.

***Continuity of education*.** In the spring of 2020, schooling was interrupted by a global pandemic due to the COVID-19 virus. In March 2020, the governor of SC declared on a Sunday evening that schools would shut down in an effort to curb the pandemic (Feit, Bustos, Monk, & Marchant, 2020, March 16). Pinewood Academy had two days to prepare for online learning. Especially during that period, and in the months which followed once face-to-face instruction resumed, one-to-one devices allowed

education to continue. Eric noted, “It made like last spring possible, right? Like without Google Classroom and Google Meet or Zoom? I don't know…” Even after the mandated school closures ended, student attendance has often been interrupted due to COVID-19 illnesses or exposure. This has resulted in schools, Pinewood Academy included, to offer virtual and in-person learning as options for students. Peter stated, “And unfortunately, it's just a …in terms of equity kids that are forced to be gone for two weeks, they can't lose two weeks of education. So we're… there's a middle ground of serving everybody, but then losing some of the interaction.” However, as Gail noted, having one-to-one devices has allowed for consistency in education despite COVID absences. While face-to-face instruction is preferred, one-to-one devices allow students to learn regardless of whether they are at home or school.

By having continuity of education through the use of one-to-one devices, teachers felt they were able to provide quality education for their students. Through hybrid teaching, students received math and tutorial OG instruction on a daily basis, first through Zoom, then through Google Meet. Each teacher created a Google Classroom to share resources and documents with their students. Once face-to-face instruction resumed, some students continued to join their classes through a hybrid format. Rachel said, “It was legit, regular class, and they didn’t fall behind and the teachers didn’t miss a beat.” Connie commented that her students were learning a lot, even throughout COVID. While those statements were based on perceived success in the classroom, Peter noted that until achievement results from the spring came back it would be hard to quantify students’ academic achievement. However, the school and teachers seemed to have found an instructional model using one-to-one devices for hybrid instruction to provide effective instruction for their students.

Access to materials. The shift to both virtual and face-to-face instruction made it necessary to have learning materials accessible online. Teachers had to ensure that whatever would be handed out or presented in class was available for all students regardless of their setting. In this study, the school opted to use Google Classroom and Google Meet as platforms for learning. Cathy stated, "And you never know, I mean, from day to day, it's constantly changing and so it [Google Classroom] allows a continuity to exist for me and my students." Access to learning materials is especially important for students who are attending classes virtually through Google Meet. Rachel noted she had a student who had been learning remotely all year. Google Classroom allowed the student to have access to handouts, notes, and assignments like her peers. Using online sites such as Google Classroom and Google Meet, students could easily access materials, check assignments, and join classes.

Impact on learning. Research has shown that one-to-one devices can have a positive impact on learning. The use of devices can enhance academic skills including math, reading, and written expression (Gherardi, 2017; Lowther et al., 2012; Suhr et al., 2010). This section will discuss how devices aid to (1) increase academic skills, (2) build automaticity, (3) provide for immediate feedback, (4) monitor progress, and (5) promote ownership of learning.

***Increase academic skills*.** Numerous programs and applications can be used with one-to-one devices to build literacy and writing skills. Computer based reading programs with built in feedback features have been found to increase reading comprehension skills (Bippert & Harmon, 2016). Participants within this study used *ReadTheory* and *CommonLit*, both Web 2.0 reading programs, with their students. The participants commented on the variety of high-interest passages both programs offered. The flexibility

of reading passages has been shown to appeal to both teachers and students (Bippert & Harmon, 2017). In addition, Web 2.0 reading programs allow teachers to differentiate material for their students (Bippert & Harmon, 2017; McKnight et al., 2016). Both Rachel and Connie noted that *CommonLit* allowed them to either assign individual passages to students based on ability or use the materials as part of class reading materials. Rachel also stated that students seemed to find the material interesting and would ask to read when done with other work. The flexibility and high interest of reading passages encouraged students to want to read.

Another way one-to-one devices had been beneficial in improving students' academic skills was in literacy and writing. Research has found that literacy and written expression can be positively impacted through the use of technology and applications (Sessions & Kang, 2016; Lowther et al., 2012; Zheng et al., 2016). The one-to-one devices and their built-in features, as well as Google Doc tools, were beneficial in developing students' writing abilities. Students used tools such as spell check, dictionary, and thesaurus to edit their work. They also used speech-to-text to get their thoughts down on paper and text-to-speech to listen to what has been written and self-edit. Connie explained how spell check had been beneficial in reducing the cognitive load during writing. Since students did not have exert as much mental energy determining how to spell words, they could continue getting their thoughts down on paper, allowing for more complex ideas and vocabulary to be expressed. Gail had noticed that students were using richer vocabulary when they could access tools such as the dictionary or thesaurus to incorporate better word choices in the paragraphs. The built-in tools of one-to-one devices enhanced students' written expression.

***Build automaticity*.** In this study, teachers noted one-to-one devices were used to develop the automaticity of skills, aid in learning retention, and assist in concept formation. Teachers used several apps for regular practice and development of automaticity of skills. Some of the apps mentioned were *Reflex Math*, *CommonLit*, *WordWall*, and *IXL*. The use of apps in tutorial and math class were intended to build automaticity and fluency. Fluency has been found to be closely linked to memory and recall (Morrison et al., 2013; Reiter, Tucha, & Lange, 2005). In her interview, Gail stated, "…we do activities for repetition, and for helping …getting, you know, move them toward concepts, so they're solid." Fluency is a core OG principle which is considered foundational for learning more complex material (Gillingham & Stillman, 1999).

Provide immediate feedback. Feedback is important for students, and the more immediate the feedback, the better students are able to make a connection between their performance and the expectation (Green & Johnson, 2010). In this study, teachers noted that technology and one-to-one devices offered more immediate feedback than they had been able to previously give students. Teachers noted that many applications such as *IXL* and *Quizizz* offer immediate feedback on student performance. Evelyn noted the benefit of receiving immediate feedback as well as explanations when her students used *IXL* for math practice. Rachel used a game-like Web 2.0 tool, *Quizizz* (for students to practice skills and get feedback on their performance. She then had students graph their performance so they could view their progress over time. Both teachers noted that immediate feedback was more meaningful to students and their future performance than delayed feedback from paper/pencil activities.

Another way teachers sought to provide immediate feedback on student performance was through shared documents. Shared documents allowed teachers to

quickly access student work and provide feedback. During Peter's observation, I noticed how he was able to work with individuals or pairs of students and give feedback on scripts they were writing. By looking at the shared document, Peter was able to ask questions, clarify ideas, and offer suggestions. He would often use the cursor to highlight specific parts as he gave his feedback, making it easier for students to locate the area he was addressing. Previously, such feedback on student writing would have required close proximity or a delay. Technology had allowed teachers to offer immediate feedback and monitor student progress.

Monitor progress. Monitoring student progress and giving guidance throughout the learning process was important for the participants. Shared documents offered a means of monitoring student progress. Teachers were able to determine whether or not students were understanding what was expected of them, if they were making sufficient progress towards completion, or whether or not work had been started. Connie, in discussing a writing assignment, said, "So I was able to go smoothly from one page to another page and see what they were each doing." Cathy stated:

> In some ways, it's created an opportunity for me to be able to see their work more readily. Like if they're in the process of actually doing an activity that's in Google Classroom, I can immediately access anything they're doing, which gives me that ability to comment on it, answer questions specific to them, and be able to see where they may even be going, you know, off the rails a little bit so that I can help push them back.

Rachel made a similar statement by saying she could easily view a student's work and provide immediate feedback before they went "down a rabbit hole." Shared documents allowed teachers to mediate student learning.

Promote ownership of learning. When students have their own devices, they are more likely to take ownership for their learning (Ertmer et al., 2012; Clariana, 2009; Gherardi, 2017). In this study, the availability of devices allowed for decentralized instruction to take place and for students to actively engage in the learning process. Peter mentioned that students could navigate through documents and videos at their own pace. In science, Eric noted, "They can see the relationships a lot better when they're the ones [manipulating variables] instead of just being taught that a warm-current warms up the air nearby. You know, for them to actually discover that on their own." By students having the opportunity to move through material at their own pace, they could spend time understanding and learning concepts at a deeper level.

Students were also willing to engage in academic learning of their own initiative (McKnight et al., 2016). Rachel noticed that students were asking to read on their own. She stated:

> And I've noticed, like some of the highfliers actually do …do a phenomenal job of motivating themselves to say, 'Hey, Miss Rachel assigned me this other assignment. I'm not going to sit here and be like, No, I already finished this one. I don't need to do anything else.' They actually are doing it because they're finding very engaging high interest reading on the *CommonLit* program.

Connie noted that when learning activities were game-like, students would ask to practice skills. Kronenberg (2012) found students were motivated by game-based computer programs. Connie said, "They can get the extra practice the kids need with them asking, 'Come on. Let me practice one more time'." Game-like activities and engaging material offered through technology resulted in increased learning for students.

There were times, though, when students needed to be encouraged or reminded to take ownership of their learning. For some students, including those with dyslexia, they could become too reliant on teachers and other adults for information. Gail stated at times students would ask the meaning of a word or a better word choice, and she reminded them they can "Google it." Gail said, "They just get caught in a pattern of asking us so it's a way we can move them away from being dependent on one person." Sarah reinforced the importance of students taking ownership of their learning. She said, "We want to be able to give them some knowledge and let them go with it and learn more, instead of looking for us to fill their vessel." To encourage students towards taking ownership of their learning, Evelyn gave an analogy of visiting a doctor:

> Because what they start off saying is, is well, what skill do I need most? And I'm like, 'No, you need to you have to be able to self-diagnose or self-assess because you're not going to always have an adult with you.' It's kind of like I told them, it's kind of like going to the doctor and saying, 'Okay, so what hurts on me? Hmm…' And the Doctor's going, 'Yeah, no, *you* tell me.' So that is a revelation to them.

Evelyn stated that once students realized they were the best ones to understand their thinking, they had taken more ownership for their learning. Ultimately, teachers wanted to move students away from dependence on others to having ownership for their learning.

Increase engagement. Engagement with learning materials involves motivation, attention, and processing of information (Bangert-Drowns & Pyke, 2002). The more engaged students are with material, the more likely they are to retain and recall information. In this study, participants noted the increase in engagement during both face-to-face instruction as well as virtual learning. One element which students have

found motivating are game-like activities. Game-based learning has been found to increase motivation, improve problem solving, and teach educational skills (Kapp, 2012). Both Gail and Connie, during their tutorial sessions with students, used game-like activities to reinforce phonemic principles students are learning. Both commented on the fact that students are more engaged when using digital activities, although they also mentioned the benefit of having a wide variety of practice activities available including paper-based resources. The teachers would also create their own sets of materials on *WordWall* or customize sets already available to supplement their lessons. The classroom teachers also used game-based Web 2.0 applications such as *Quizlet*, *Kahoot!*, and *Quizizz* to engage students in learning. During one observation, Rachel had students use *Quizizz* as a starter activity, then graph their results to monitor their progress over time. The teachers have found that students are more willing to participate in repetition when learning seems like a game.

There were numerous times when students and teachers used shared documents to engage in learning. During an observation, I watched as not only the teacher interacted with students through a shared document, but students were working together to create and edit at the same time. Rather than assigning one student as a scribe, each student could add their own content in a collaborative assignment. Even during tutorial sessions, Connie felt like students stayed more engaged using a shared Google Doc than they would with paper and pencil. Connie used a shared document to model how to write specific sentence types, then had the student write an original sentence following the same pattern. She said she did that recently with a student and shared his response, “But he [the student] thought it was really neat that we put both of our names on the document, and that he got to see it, and that we built it together. So that was much more motivating

and kept him much more engaged." Sometimes, a novel presentation of content will increase engagement.

Capabilities of devices. Devices now have built-in accessibility features or can easily access them using Web 2.0 applications. Prior to one-to-one devices at PA, *Learning Ally*, a speech-to-text software, was available only on limited computers due to cost. In addition, applications such as *Read&Write* and *Speechify* offer online text-to-speech options (Ok & Rao, 2017). All of the participants mentioned the frequent use of text-to-speech and speech-to-text by students. Several noted the benefit of having all devices equipped with accessibility tools. Connie said, "So I'm a huge fan of assistive technology." Cathy mentioned that she intentionally taught students how to use different tools so they could explore and decide which were beneficial to them. She and others noted that some students benefit more from assistive technology than others, and each student needed to determine for themselves which resource would be more beneficial to them in school.

Computers and applications offer easy to use tools to enhance learning (Kwon et al., 2019). In this study, participants commented on the availability of resources on Chromebooks students could use to enhance learning. Tools such as a built-in dictionary, word prediction, and thesaurus in Google Docs were found to aid students in the writing process. Several participants noted the ease with which they and students could define words, expand their vocabulary, and research topics without having to go outside of their devices. Gail encouraged her students to use the built-in dictionary and thesaurus when working with students on writing. With some initial instruction, students were then able to use the tools on their own.

Negative perspectives of technology. Some participants expressed negative perspectives of technology. As with any initiative, negative perspectives of technology need to be considered in order for a one-to-one program to be effective. Negative perspectives, if not addressed, can hamper one-to-one initiatives and limit their effectiveness (Zheng et al., 2016). One negative perspective of the participants is the lack of intentionality technology and software possess. Intentionality is an important element of OG principles (Stallings, 1991). For teachers with OG training, intentionality is highly valuable. The participants noted the need for intentionality in the use of technology to meet an intended outcome.

When used too much, technology can also hinder social interaction and communication. One of the OG principles, which is foundational in the teachers' training, is communication (Gillingham & Stillman, 1999). The focus on communication is intended to help students develop skills to effectively communicate with others. As a school, Pinewood Academy places a high importance in fostering communication skills in their students. Peter noted that the continual use of devices was a "danger to that [oral communication] part of our goal." The administration and faculty recognized the need for social interactions for middle school students, especially those with dyslexia, during the period of the COVID-19 pandemic which created additional stress for middle school students (Crosby, Howell, & Thomas, 2020). Social interactions provide opportunities to develop language and cognitive development (Yilmaz, 2011). Rachel said she tried to not overuse devices; instead, she sought ways to incorporate meaningful conversations into lessons. The participants expressed the need to find the balance of developing communication skills while using devices.

In order to address the isolation which can impact digital learning especially during the COVID-19 pandemic, the school made the decision to utilize hybrid learning. Hybrid learning provides face-to-face instruction while accessing the class virtually (Singh, Steele, & Singh, 2021). When students were out due to COVID illness or exposure, they used Google Meet to join their class and interact with their classmates. During two observations, I watched as teachers engaged with students during hybrid lessons. They were able to include the virtual students by asking them questions and including them in small group activities. Eric turned the monitor in which the virtual student was displayed towards the other two students in a small group. I could see the two girls in the class talk with the virtual student. The hybrid model seemed to lessen the isolation online education presented.

Concerns for student use. While technology could be beneficial for learning, teachers in this study also mentioned a concern of students relying too much on devices. At times, student could become over-reliant on technology and become passive learners. Blikstad-Balas and Davies (2017) and Aslan (2016) noted the concerns surrounding over-reliance on computers by both teachers and parents. Baylor and Richie (2002) noted that students can become passive learners by letting the computer do their work. Teachers in this study also mentioned this concern. Cathy stated, “It makes them lazy. They basically have kind of reached a point where they're willing to let the device do things for them that they should be working on themselves.” She went on to say that students will even question why they should have to do something a computer can do for them. Sarah mentioned that students can even begin to rely on assistive technology too much instead of practicing their literacy skills. Teachers needed to encourage students to develop and utilize literacy and memory skills instead of relying too much on technology.

Negative impact on learning. While one-to-one devices could have a positive impact on learning, they could also negatively impact the learning environment. The use of devices can result in disengagement with students inappropriately using technology or messaging others (Harper & Milman, 2016). One of the biggest concerns noted by nearly all participants was the distraction devices posed for students. Teachers mentioned that students were often on websites or videos when they should have been completing assignments. Sarah mentioned that students would sometimes have multiple tabs open, be chatting with friends, or playing a game during class. Rachel commented that students with dyslexia might even be more distractible using devices than other students. Cathy said that while some students are conscientious in their use of devices, others see it as "an extra play toy." Because of distraction of devices, Cathy said, "So it's constantly finding the balance of how do we get them what they need in the best way possible, without giving them opportunity to also be sidelined by all the distractions that technology can provide." Since each student had a device where previously there were class sets of devices to use, Eric wondered whether or not distractions had increased since the one-to-one initiative began. Whether it had to do with the nature of students with dyslexia or of middle school students in general, one-to-one devices posed additional distractions in the classroom.

The added distractions of one-to-one devices necessitated that teachers be diligent in their classroom management skills. Classroom management and monitoring of student work requires alternative strategies in a digital classroom (Selwyn et al., 2017). In this study, while those working with students in one-to-one or small group settings did not notice a change in the distraction caused by devices, classroom teachers and administrators had to increase their efforts to monitor student engagement. The school

had put discipline procedures in place and used monitoring software to try to curb misuse of devices, but teachers were the ones primarily responsible for classroom management. Both Sarah and Rachel noted that teachers had to "step up their game" and be extra diligent when devices were in use. During observations, I noticed that students would sometimes get on their devices even when the rest of the class did not, but it was unclear as to whether or not their use was connected to instruction. In two of the classrooms where this occurred, the teachers were circulating around the room and could view what sites students were using. However, in three other classroom observations, the teachers were at the front of the room unable to see what students were doing. Alternative classroom monitoring strategies were needed when students have one-to-one devices.

Considerations for administration and IT. Much in the way of successfully implementing a one-to-one device initiative came from decisions made by the administration and IT department. The availability of resources and infrastructure support are seen as first order barriers and can support or impede technology integration (Ertmer, 1999; Ertmer et al., 2012). Administration and IT must make financial decisions which impact the types of technology and devices which will be purchased and how best to integrate them for use in the classroom (U.S. DOE, 2017). In this study, the administration decided to purchase Chromebooks for its one-to-one initiative. Chromebooks have been found to be cost-effective for schools deciding to move to one-to-one devices (Zheng et al., 2016). During the initial COVID-19 pandemic shutdown of schools, PA students used a variety of devices. If they did not have a device available at home to use, the school provided one for them. This led to a variety of types of devices and platforms. However, for the fall of 2020, the school provided Chromebooks for each student as part of their one-to-one initiative. Cathy noted that having an integrated system

had been very helpful, even in terms of students being able to follow along with her when working on documents or assignments. The planning the administration and IT department were able to make for an integrated technology system was seen as beneficial.

In addition to resources, administration and IT need to ensure teachers and students have access to strong internet and Wi-Fi connections. Considered a first order barrier (Ertmer, 1997), several studies have shown that a stable infrastructure is needed for successful technology integration (Bippert & Harmon, 2017; Harper & Milman, 2016; Keane & Keane, 2017). Even though PA is housed in a new, spacious building, it seemed to lack the infrastructure needed to support the additional devices since the one-to-one initiative was implemented. Several teachers noted difficulties with connectivity during interviews, and since all interviews and observations were conducted via Zoom, I also noticed delays in audio and video reception. During one interview, the participant moved locations to get better reception. During another interview, the participant switched over to his phone for a better connection. While teachers did not indicate that poor connectivity hindered classroom activities, the need for a stronger infrastructure to effectively use one-to-one devices seemed evident.

Increase in Self-Efficacy

This theme included the categories of *technology use before transition*, *teacher competence before one-to-one*, *transitioning to online teaching*, *impact of transition on teachers*, *supportive environment*, and *teacher competence after one-to-one*. In this study, self-efficacy refers to an individual's belief in their ability to perform a given task (Bandura, 1977).

Change in teacher self-efficacy. There is a strong correlation between self-efficacy and technology integration (Heath, 2017; Inan & Lowther, 2010). The more

skilled a teacher believes themself to be, the more likely they are to integrate various types of technology into their instruction. In this study, four participants indicated that they felt comfortable using technology on a regular basis prior to the one-to-one initiative; two specifically mentioned that they did not have a learning curve transitioning to one-to-one devices or online learning. This strong self-efficacy was in part due to the fact that those teachers had access to devices on a regular basis prior to the one-to-one initiative. Others had limited self-efficacy prior to the COVID-19 shutdown and the one-to-one initiative. Many of these teachers shared computer carts or used technology on a limited basis. The lack of access and daily use factored into their lower self-efficacy.

The COVID-19 school shutdown resulted in stress among the teachers, regardless of their initial self-efficacy. The stress the participants of this study experienced was similar to others during the COVID-19 pandemic (Singh, Steele, & Singh, 2021). Several participants commented on how difficult the transition to online learning was during this time. Eric, who had a high self-efficacy prior to the pandemic, said, "It was *so bad* [emphasis added]." Others who had less technology skills were just as, if not more, overwhelmed. Evelyn summed up what many were experiencing:

> I had to learn Google Classroom. I knew very little about it, just for my own boys. But I really had to ..they [administration] were like…I… you need to make your own Google Classroom. And I was like, What? … And I almost had like a breakdown because I, first of all moving to online and then I got everything all set up and …and then had to change kind of the way that we did things because I now needed to go through Google Classroom so had to almost start all the way over about four weeks into virtual so yeah, it was definitely a… I feel adept at it now.

Again, speaking about the transition to online instruction due to the pandemic, Evelyn stated:

> And I was afraid to come home and do it because I just didn't know what was going to go wrong with the technology. So I went into school for… for, like six to eight weeks, like gained confidence enough to come home.

The teachers seemed to recall their experiences and anxiety due to the transition to online instruction quite vividly.

Over time, once teachers had time to practice using Google Classroom and digital resources, the self-efficacy of teachers strengthened. As Evelyn mentioned after recalling the stress of the transition to online teaching, most teachers felt adept at using technology and one-to-one devices. The teachers went from relying on others' slides and documents to editing and creating their own. One teacher stated she needed to continue practicing the tools she had, implying she was not ready to learn any new applications. However, Cathy mentioned she had begun self-exploration of tools to use in the classroom. Gail, a seasoned teacher, expressed the need to keep learning even if was a bit hard because education and technology kept changing. While she seemed to indicate that learning to integrate technology had been challenging, she understood its value. The increase in self-efficacy among the participants grew out of continued practice and exposure to one-to-one devices.

Supportive environment. Teachers rely on the support of others when adopting new technology. The support and collaboration from administration, IT, peers, and even students have been found to aid in technology adoption and integration (Ertmer, 1999; Kopcha, 2010; Ottenbreit-Leftwich et al., 2018). The participants in this study expressed

strong support from the administration and peers during the transition to online learning and the one-to-one initiative.

Administration. It is the administration which helps set the vision and structure for an integrated technology program (Ertmer, 1999; Keane & Keane, 2017; Ottenbreit-Leftwich et al., 2018). Pinewood Academy was set to begin a one-to-one initiative in the fall of 2020. The administration had made decisions about devices, resources, curriculum, and training which was to occur prior to the initiative. However, the COVID-19 pandemic necessitated that schools in South Carolina close suddenly, giving PA two days to transition to not only online instruction but also one-to-one devices. Santamaría, Mondragon, Santxo, and Ozamiz-Etxebarria (2021) found that teachers of all age levels exhibited moderate stress due to the school closures necessitated by the COVID-19 pandemic. An additional stress for this study's participants was the fact that the majority of the teachers had never used or frequently used Google Classroom or Google Meet. However, what made the transition possible for the teachers was the support they felt from administration. Evelyn, who earlier had expressed feeling overwhelmed transitioning to online learning, stated, "And like, and they were very gracious. It was very much like, okay, we're all in this together. We don't know either. Let's work together; we'll bounce ideas off people." Later in the interview she stated, "So yes, I felt *very* supported. And at least if they couldn't help, I felt like they were behind me and with me and supportive and understanding, sympathetic and empathetic." That same sentiment was expressed by others as they recalled how leadership offered materials and training.

The administration was able to offer support even while moving towards more technology integration. In her interview, Sarah stated:

> But I think, because …you could always say, well, we're in a pandemic, you know, there was a lot of grace, for things that were you know, weren't going the way we wanted or our frustrations, or, you know, we had a lot, it actually, in a way kind of brought many of our staff members together, because we could all commiserate together and on your struggles, you know, but yet, it forced everybody to use the platform, which may not have taken place without that being forced through a pandemic.

Even after the mandatory school closure, the administration set procedures in place due to the fluctuation in attendance due to COVID-19 quarantines. Teachers still needed to utilize the platforms and devices into their instruction.

Peers. The support from peers can also aid in integrating technology and changing paradigms (Ertmer, 1999; Heath, 2017; Tilton & Hartnett, 2016). In this study, teachers felt supported by their peers. They worked together to find solutions and share resources. At the onset of the COVID-19 shutdown, Sarah and Connie created many resources and shared them with staff members. Those who benefited from the shared resources sounded almost relieved by the support. Since many of the teachers had limited technology experience, having the support from others was extremely beneficial, especially initially. Over time, as teachers gained skills and increased in self-efficacy, they were able to modify and customize shared resources to fit the needs of their students. Teachers continued to exchange curricular ideas and resources as evidenced through interviews, indicating a continued reliance on peers for support.

Chapter Summary

In this study, both quantitative and qualitative data were collected in order to describe technology integration following a one-to-one device initiative. Quantitative

data included survey results from the VBTI and observational frequencies collected on the TOT. Qualitative data was collected using semi-structured interviews and classroom observations. Four assertions emerged from the data, including (1) Participants place high value on the role of the teacher to bring expertise to instruction while using technology as a supplemental resource, (2) Teachers believe technology offers resources and assistive tools to support the academic and emotional impact of dyslexia, (3) Teachers believe the benefits of one-to-one devices outweigh the concerns, and (4) Teachers increased their self-efficacy in technology use within a supportive environment. The cumulative data helped me understand how teachers at PA perceive and technology in their setting.

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND LIMITATIONS

The purpose of this descriptive research study was to examine and explain the value beliefs and perceived barriers of one-to-one devices and how they were being used with middle school students with dyslexia. Ten middle school teachers agreed to participate in the study. Each participant completed the VBTI survey which served as quantitative data. Seven teachers agreed to classroom observations which served as quantitative and qualitative data. Eight participants took part in individual interviews as an additional qualitative data source. Using a convergent parallel design, the survey, observations, and interviews were analyzed to answer the following research questions: 1). What are the teachers' beliefs about one-to-one devices for students with dyslexia? 1a.) What are the teachers' value belief about the importance of technology for students with dyslexia? 1b). How did the value beliefs related to the importance of technology integration in the learning process change after the one-to-one initiative was implemented? 3). How does the value a teacher hold toward the use of devices with students with dyslexia affect their integration of one-to-one devices in the classroom? and 4). How did teachers integrate devices during the instruction of students with dyslexia? This chapter will cover (a) a discussion of the study's findings, (b) implications and recommendations, and (c) limitations.

Discussion

To answer each of the research questions, analysis of quantitative and qualitative data occurred. These data sources, along with comparisons to existing research, were used to explain teachers' value beliefs and perceived barriers about the integration of one-to-one devices for students with dyslexia. This section contains a discussion of the three research questions.

Research question 1: What are the teachers' value beliefs about one-to-one devices for students with dyslexia?

Research question 1a. What are the teachers' value belief about the importance of technology for students with dyslexia? Teachers implemented one-to-one devices in their instruction based on their value beliefs. In this study, value beliefs are beliefs and or assumptions about students and learning (Kagan, 1992) which directly impact a teacher's use of instructional practices (Richardson, 1996), including technology integration (Ryba & Brown, 2000). At the center of value beliefs are the beliefs on the nature of students and how they learn. In this study, all the students were characterized with a learning disability, specifically dyslexia, which affects how they process oral, written, and spoken language defined as dyslexia. Dyslexia is a reading disability not otherwise attributed to below average intelligence, cognitive impairment, or lack of education, but which impacts the ability to process language and affects executive functioning skills (IDA, 2020; Shaywitz et al., 2008). Students with dyslexia have difficulty decoding and comprehending written text, expressing themselves in written and spoken contexts, and understanding the oral meanings of messages. However, they vary individually as to how and what extent language processing impacts their learning. Many

of the participants in this study expressed the characteristics and learning implications which impact students with dyslexia. Value beliefs are also related to perceptions about the teaching and learning process. This belief is often connected to the training and background of the teacher (Ertmer et al., 2012). The teachers in this study had specialized training in multisensory, explicit instruction based on the principles of OG designed to address the language processing weaknesses of those with dyslexia (Gillingham & Stillman, 1997). OG principles include systematic, sequential, and logical dissemination of information in order to build fluency, comprehension, and communication skills. These same principles were intertwined into all instruction and curriculum at PA, including technology integration. As a result, technology integration was primarily teacher-centered and connected to direct instruction.

***Role of technology*.** Based on the results of the VBTI survey, the teachers at PA placed a high value on technology in the teaching and learning process. Of the three subcategories on the survey, overall teachers felt least strongly on the *role of technology for teaching/learning* ($M = 3.92$, $SD = 0.93$). This subsection consisted of 10 items. The responses varied as to whether the participants strongly disagreed or strongly agreed on elements related to the integration of technology such as creative thinking, higher-order thinking skills, motivation, collaboration, future technology use, and accessibility tools. On the item, "I believe technology is an important tool in the teaching-learning process" ($M = 4.00$, $SD = 1.25$), teachers' responses ranged from disagree to strongly agree. This question, as well as many statements made by the research participants during interviews, lead to the theme focused on the importance of teachers in the learning process while using technology as a supplemental resource. While immediate feedback provided by

technology could be beneficial to students while learning (Ertmer & Newby, 2013; Green & Johnson, 2010), it was not specific enough in determining how best to meet students' needs and organize learning material. Peter noted this importance when he stated that teachers are "the master organizer," able to effectively communicate to their students based on experience and knowledge. Such expertise came from the teacher who was able to understand individual needs and mediate learning.

The emphasis on the primary role of the teacher over the role of technology or students was contrary to most literature related to technology integration. Ertmer (1997) stated that a primary barrier to technology integration was teacher directed activities. Likewise, Ertmer et al. (2012) and Ottenbreit-Leftwich et al. (2010) found that effective technology integration led to a constructivist paradigm which integrated 21st century skills such as collaboration and creativity. However, little in the way of research exists which specifically addresses how teachers of students with learning disabilities, dyslexia in particular, integrate technology into instruction. It may be that students without learning disabilities have a greater propensity for self-directed, discovery-based learning compared to their peers with dyslexia.

***Preparation for the future*.** Technology provides tools and resources to prepare students with 21st century skills (Adam & Tatnall; Lowther et al., 2012; Project Tomorrow, 2019). Based on the survey results and interview comments, the participants agreed technology prepared students for the future. Skills needed for the future include computer literacy, collaboration, creativity, and problem solving which can be used in schools and careers (Battelle for Kids, 2019; Conway & Amberson, 2011; ISTE, 2022; Larson & Miller, 2011; Lipson, 2017). The use of devices for collaborative activities can

build higher-order thinking skills and foster communication (Baylor & Richie, 2002). Technology centered activities can further support cooperation and mimic real-world application of concepts (Harper & Millman, 2016).

The participants agreed or strongly agreed that the use of devices in the classroom aided in preparing students for future technology application. Based on responses on the VBTI survey, teachers had the highest level of agreement on the question, "I believe the use of devices in the classroom prepares students for future application of technology" (M = 4.80, SD = 0.42). Comments made by the participants during interviews further supported the idea that technology use prepared students for future work-related skills. Both Evelyn and Gail stated the necessity of equipping students with technology skills as it is inevitable such skills will be needed in the future. Sarah stressed the duty teachers had in utilizing and demonstrating for students how to use technology. As a school leader, she hoped others would "embrace it in order to prepare our students and ourselves for the future." The teachers at PA expressed the need to prepare students well for their future.

***Assistive tool for learning*.** Technology, especially one-to-one devices, offer learning tools which assist students in accessing learning material. In this study, assistive technology included tools and applications which allowed for the access, organization, and presentation of information (Adam & Tatnall, 2017; Shaywitz et al., 2008). Tools such as speech-to-text and text-to-speech supported those with poor reading and written expression by assisting students in accessing higher level text and effectively communicating ideas. As Tilton and Hartnett (2016) stated, technology aids in "leveling the playing field." Several teachers in the study used the same phrase when asked about

the role of devices as an assistive technology tool. Other teachers spoke about the ability of technology to make students more competitive with their peers while lessening mental and physical fatigue. Overall, teachers had a strong value belief related to one-to-one devices as an assistive technology tool.

One of the major themes from the qualitative data was teachers' belief that technology offered resources and assistive tools which supported the academic and emotional impact of dyslexia. On the VBTI survey question, "I believe technology can serve as assistive devices for learning for students with disabilities" (M = 4.70, SD = 0.48), teachers had the highest-level agreement, followed by the need to use technology to prepare students for the future. This belief was expressed numerous times throughout the interviews. When speaking on this topic, teachers tended to make strong statements or give emphasis to the role technology played as an assistive tool. Participants used adjectives such as *massive, lifesavers,* and *huge* when referring to the benefit of assistive technology tools.

Peter spoke about the benefits of assistive technology in relieving the physical and mental fatigue of students with dyslexia. He said:

> It's kind of like the equivalent of driving to grandma's house in a convertible or a minivan with air conditioning on while you're watching a movie. Like you both get to grandma's house, but someone shows up weather beaten and exhausted and sunburn, and the other one shows up relaxed. So that's the way I think about how dyslexics get work done…they can do it, but they show up exhausted.

Many of the teachers reiterated the benefits of devices and accessibility tools to support student learning and provide ways for students to experience success.

Nearly all of the teachers mentioned the benefit of one-to-one devices' built-in accessibility tools, especially speech-to-text and text-to-speech. Prior to the one-to-one initiative, speech-to-text software was limited based on site licenses and only loaded onto some devices. The limited availability meant that not all students could use the accessibility tools when they were needed. However, the built-in accessibility tools of devices, as well as those available through Google Docs, meant all students could utilize them as needed. Speech-to-text allowed students to express what they wanted to communicate by lessoning the cognitive load of recalling the spelling of words. Peter noted that speech-to-text allowed students to increase their writing fluency, resulting in great gains for students. Speech-to-text, as an accessibility tool, allowed students to clearly communicate in written form without the cognitive and physical fatigue of handwritten text.

The participants also mentioned the benefits of text-to-speech. Students were able to use *LearningAlly*, *Read&Write*, and built-in features in the science curriculum for text-to-speech options. Eric noted that text-to-speech allowed his students to read grade level texts which contained richer vocabulary and more complex concepts than texts the students would have been able to read on their own. Gail noted that when students used text-to-speech to listen to their own writing, they were better able to self-edit their work than when they read their paragraphs on their own. The use of text-to-speech benefited the reading and writing process for students.

***Increased ownership of learning*.** Numerous participants noted that students were willing to take ownership for their learning since having one-to-one devices. Ertmer et al. (2012), Conway and Amberson (2011), and McKnight et al (2016) found students tend to

take more ownership for their learning when then have their own devices. In particular, students made decisions about (a) selecting assistive technology tools, (b) began to self-monitor their understanding, and (c) used devices to practice weak academic skills.

Selecting assistive technology tools. Part of developing autonomy involved helping students gain an increased awareness of what tools and technologies were most effective for their learning. The teachers in this study noted several times the importance of students learning multiple study strategies, both paper-based and digital, which were individually beneficial. In order for this to occur, students needed to be exposed to and explore a variety of assistive technology tools (Dawson et al., 2019). In this study, Cathy encouraged her students to understand which test taking strategies were beneficial to them. She mentioned they should consider whether they tested better with paper-pencil based tests or digitally. She also noted the availability of numerous apps to assist in taking a test. During her interview, Cathy stated that some students needed the assistive tools more than others, but she felt it was important to expose all of her students to them. She said, "But these kids in particular, they just they *need* extra advantages. They need different accommodations. And so being able to kind of rely on technology for aspects of that is huge." While Cathy seemed to strongly support the use of devices as an assistive technology tool, she overall disagreed that devices played an important role in the teaching and learning process based on her response on the VBTI.

Self-monitor their understanding. Along with understating what assistive technology tools best met their needs, teachers also encouraged students to self-assess their understanding of material. In her interview, Evelyn said she would use an analogy of students going to the doctor and asking what was wrong without being able to explain

what they were thinking or feeling. She told students that she did not know what they were thinking, but they did. She then taught students how to use *Khan Academy* and *IXL* to practice skills that were deficient. Gail mentioned that students were able to locate information on their own without needing to rely on others.

Practiced weak skills. Once students were cognizant of their understanding, many students practiced skills on their own. Evelyn noted that students would access *IXL* to learn targeted skills. In drama class Peter mentioned that students could navigate documents and videos at their own pace. In science class, Eric said students were able to manipulate variables within simulations and make discoveries on their own. Students in tutorial classes often asked to repeatedly practice skills. Connie noted that when the learning activities were game-like students were motivated to practice skills more than once, something which was not occurring when they used workbooks or paper-based materials. Rachel commented that students were asking to read selections within *CommonLit* because students found them to be engaging. The more practice students got the greater their understanding and automaticity became.

Increased self-confidence. As students gained independence and ownership for their learning, they also increased in their self-confidence. When students had access to tools which allowed them to take more ownership of their learning and gave them the ability to express their understanding, their self-esteem and confidence improved (Lipson, 2017; McClahan et al., 2012). In this study the participants noted an increase in self-esteem and self-efficacy when students used one-to-one devices. Students were able to demonstrate their understanding using assistive technology. They were also able to collaborate with each other and their teachers. Both Cathy and Rachel stated that many of

the students had been able to help them troubleshoot their technology needs. Rachel noted that one of her students had done well on a project using an app he had found. Eric stated that one of his students was able to do advanced coding to create a game. In each instance, technology was a factor in building students' self-confidence.

The participants in this study held a positive perspective on the use of one-to-one devices for students with dyslexia. They noted the advantages students gained using assistive technology and its impact on the emotional and physical impact of dyslexia. The participants noted that students' ownership of learning and self-confidence which had improved since the one-to-one initiative began.

Research question 1b: How does teachers' value beliefs change after the one-to-one initiative was implemented? Value beliefs related to one-to-one devices reflect the perceived importance of technology to positively impact learning and academics (Inan & Lowther, 2010; Ottenbreit-Leftwich et al., 2010). Ertmer et. al. (2012) found that teacher beliefs play a critical role in technology integration. Value beliefs are shaped by both perceptions and self-efficacy and impacted by barriers. In order to answer this question, participants were asked during the interview to explain how their beliefs about technology had changed after the one-to-one initiative. Such questions are retrospective, asking participants to recall a past event and value. Retrospective interviews have been found to be reliable (Cohen et al., 2005). Retrospection can often provide a more positive perspective than would have been expressed at the time of the event (Van Boven et al., 2009). Since the one-to-one program was impacted by the COVID-19 pandemic and resultant shift in educational delivery, understanding both the present and past value beliefs of teachers aids in providing context for decisions about device integration. The

changes in the participants' perception and confidence as it related to technology are discussed below.

Change in perception. Changes in value beliefs often occur due to changes in perceptions. Value beliefs are more deeply rooted than perceptions and take longer to change (Ertmer, 1999). Perceptions, though, are more easily influenced and affected by external factors such as resources, infrastructure, and support (Ertmer, et al., 2012; Francom, 2020; Kopcha, 2010). In this study, perspectives refer to how a person receives and interprets information from the outer world (Uzunboylu & Ozdamli, 2011). The perceptions of teachers were impacted by (a) the COVID-19 pandemic, (b) the availability of resources, (c) the impact on student ownership for learning, and (d) the increase in availability of accessibility tools for students.

Necessary due to pandemic. For the teachers at Pinewood Academy, the one-to-one initiative occurred suddenly due to the COVID-19 pandemic and the closing of South Carolina schools in the spring of 2020. While the one-to-one initiative was originally planned to occur in the fall of 2020, administrators had to quickly implement one-to-one device use and hybrid teaching with little time for training and preparation. Like other schools and teachers, the sudden shift in learning platforms caused a great deal of stress among the faculty and students (Singh, Steele, & Singh, 2021). Due to limited preparation, some teachers continued to go to the school to conduct virtual lessons with their students. Evelyn said she went to the school to conduct her lessons in order to get support from peers and administrators since she did not feel confident in her technology skills if something went wrong. Not only did the administrators and teachers feel unprepared, but Evelyn also commented that the shift to virtual learning highlighted the

fact that students lacked necessary technology skills. Gail commented that initially she was not a strong supporter of the one-to-one initiative, but she qualified this statement by saying the change took place so quickly due to COVID-19 school closures. The limited preparation made her feel unprepared. However, over time and with support from administration and her peers, she acknowledged the benefit of one-to-one devices. The changes in perspectives from both participants was in keeping with research showing the impact supportive administration and peers have on technology integration (Inan & Lowther, 2010: Keane & Keane, 2017; Ottenbreit et al, 2018). At this site, participants found support from others which made a positive impact on perceptions.

Variety of resources. Teachers found many online and Web 2.0 resources which were beneficial for their instruction. During the interviews, teachers mentioned several applications they had incorporated into their lessons, especially those that all students, regardless of attendance, could access. Programs such as *ReadTheory* and *CommonLit* had been integrated into ELA, math was utilizing *IXL*, tutorial teachers were using *WordWall* and *InVocabulary*, and science adopted an online curriculum, *AmplifyScience*. The tutorial teachers, who had not previously used technology in their sessions, expressed the benefit of having a variety of formats and resources for students to use. One tutorial teacher mentioned the game-like format of some tools was very appealing to students.

Ownership of learning. Teachers noted that when given more choices as to the type of resource used to practice targeted skills, students took more ownership of their learning. Rachel noted that students were asking to read on their own because the reading selections were interesting. Connie stated that students were asking to practice skills numerous times due to the game-like activities found on Web 2.0 sites like *WordWall*.

Students were also encouraged to select and use the assistive technology tools which were most beneficial to them. Teachers noted the increase in student choice had a positive effect on students' self-esteem as they increased their academic skills as well as to share their technology skills and what they were learning with others. These outcomes were similar to what McKnight et al. (2016) and Kronenberg (2012) found. When given the opportunity and presented with engaging tools, students tend to want to take ownership for their learning.

Accessibility tools for students. Perhaps one of the greatest benefits of one-to-one devices noted by nearly all participants was the ability for each student to have access to accessibility tools when they were needed. Accessibility tools such as speech-to-text and text-to-speech are especially beneficial to those with dyslexia as it allows them to access learning materials and express themselves in written form (Shaywitz et. al, 2008). Adam and Tatnall (2017) found that accessibility tools helped to "level the playing field" for students with learning disabilities. The participants made the same or similar comments when asked about accessibility tools for students with dyslexia. According to the responses to the item, "I believe technology can serve as assistive devices for learning for students with disabilities" ($M = 4.70$, $SD = 0.48$), participants placed the highest value and had the greatest level of agreement on students' use of devices as an assistive tool. Prior to the one-to-one initiative, speech-to-text software was loaded onto a limited number of devices due to cost. While some students would have access to the tools, others had to either wait or do without them. Peter stated that before the initiative those without a class set of devices "had to scramble and sort of barter for who got to use the devices." Since the initiative, Eric commented that the ability of all students to utilize

text-to-speech or speech-to-text when they needed it was perhaps the greatest benefit to one-to-one devices.

Change in self-efficacy. Self-efficacy effects how and to what extent teachers integrate technology into instruction (Heath, 2017; Inan & Lowther, 2010). Several factors impact self-efficacy including training, extended use, and self-exploration. Alhassan (2017) found that as teachers explored and used new technologies, they were more likely to integrate them into instruction. Since many participants had to share devices prior to the one-to-one initiative, they had less opportunity to investigate ways to include technology into their instruction. Prior to the initiative, technology use in the classroom was mixed. Some teachers, like Peter and Eric, used devices on a regular basis partly due to the fact they had a set of devices in their classrooms. Other teachers such as Evelyn and the tutorial teachers were not integrating technology into their teaching. One teacher noted she had begun exploring different types of ways to integrate technology on her own prior to the COVID-19 shutdown. She stated she was glad she had learned some tools on her own. The mixture of technology usage affected the participant's perceived self-efficacy.

One of the themes which emerged from the qualitative data was the increase in teachers' self-efficacy following the one-to-one initiative. In large part, the increase in confidence was due to the supportive environment created by administrators and peers. This coincided with how the participants responded to the survey question, "I believe I have access to resources and personnel to support technology integration." (M = 4.70, SD = 0.67). Eight of the ten participants strongly agreed they had the support they needed to integrate technology in their instruction. One participant was neutral on this question,

and one agreed. When commenting on the transition to virtual learning, the teachers stated numerous times that they felt supported by their administration and peers even though the transition was stressful.

By the spring of 2021, once teachers had time to practice new stills and integrate one-to-one devices, their self-efficacy had increased. Teachers expressed a sense of accomplishment. Evelyn stated that she had learned a lot but was not yet ready to pursue further strategies until she had an opportunity to fully utilize the skills she had. Cathy stated she now researched new tools to use in her instruction. From the interviews, only one teacher still expressed limited self-efficacy, but she seemed intent on continuing to learn new skills since it was important to students.

Change in value belief. Changes in value beliefs take time (Ertmer, 2005). It was unclear as to what degree the value beliefs of the teachers changed due to the one-to-one initiative. Certainly, teachers felt strongly about the role of technology in the teaching and learning process. Like other educators (U.S. DOE, 2017; Selwyn, Nemorin, Bulfin, & Johnson, 2017), they agreed that technology was a skill students needed for the future, and they expressed the importance of teaching technology skills to their students. However, unlike Ertmer (2005) and Ottenbriet-Leftwich et al. (2010), the participants in this study did not appear to develop a constructivist paradigm as many of their peers have done. Instead, the teachers at PA maintained a teacher-centered paradigm while integrating technology as a supplemental resource. At the onset of this study, the problem of practice was identified as the fact that teachers were using devices as a substitute for other teacher-directed activities such as taking online reading quizzes, building fluency, and writing papers. Based on interviews and observations, those were still primarily the

ways teachers were integrating devices. It could be their training, which was situated in direct, sequential instruction, influenced how and to what extent devices were integrated into instruction. It is also possible that further training in student-centered strategies for integrating technology into the content areas was needed.

Research question 2: How does the value a teacher hold toward the use of devices with students with dyslexia affect their integration of one-to-one devices in the classroom?

Administrative and teacher decisions are involved in technology integration. Many administrators understand the importance of technology use and believe personalized learning through the use of technology is important (Projects in Education, 2018; Project Tomorrow, 2017). Because of this, administrators seek ways to provide teachers and students with technology resources. The use of Chromebooks has increased as schools seek ways to provide ubiquitous access to technology (Evans, 2019; Penuel, 2006). At this school, the one-to-one initiative was primarily an administrative decision. Some decisions, such as the type of devices and platforms, were made by the administration and IT department. However, the ways in which one-to-one devices were utilized within the curriculum were made by teachers. Research shows that teachers integrate technology and devices based on their teaching paradigm, ability to overcome barriers, level of self-efficacy skills, and understanding of how to utilize devices within their curriculum (Ertmer et al., 2012; Inan & Lowther, 2010; Ottenbreit-Leftwich et al., 2018; Zheng et al., 2016). Technology use increased across classrooms and was used with greater frequency than in the past. Many teachers expressed enthusiasm at the level of engagement seen in students since using devices. This research question addressed

how (a) the administration assisted in one-to-one device integration and (b) how teachers implemented devices in their instruction.

Administrative directed integration. The implementation of the one-to-one device program was an initiative of the school. Some of the protocols and use policies were set by the administration and IT department in order for there to be cohesion between teachers and students. The school devised an integrated technology plan which included providing each student with a Chromebook. Chromebooks are often chosen for one-to-one initiatives due to their relative low cost as well as ease of use (Evans, 2019). While students used a variety of devices during the COVID-19 shutdown, Cathy noted that the integrated system made it easier for students to navigate documents and ensured they could access assignments. Evelyn had also stated that she was pleased with the school's integrated technology plan. By providing students with Chromebooks, the lack of access barrier was eliminated.

The school made the decision to be a Google based school. Teachers posted assignments in Google Classroom for students to access whether they are at school or home. This consistency was necessary due to rolling attendance issues as a result of COVID-19. Peter, who had the dual role of classroom teacher and head of middle school, stated that the use of Google Classroom was necessary in order for there to be equity in accessing materials. He admitted it seemed like students were on their devices all day, but he stressed the importance of being able to access assignments and resources from any location.

When students were absent from school, they joined their class via Google Meet to receive hybrid instruction. Several times throughout the interviews the participants

mentioned the importance of the role of the teacher and face-to-face instruction. In order to simulate face-to-face instruction as well as foster communication skills, PA implemented hybrid instruction for those students who needed to be absent due to COVID-19. Hybrid instruction provided both in-person and virtual learning in a synchronous environment (Singh, Steele, & Singh, 2021). During the interviews, several teachers noted the importance of having students orally communicate with each other. A few of the teachers, particularly those who worked in one-on-one settings, mentioned the importance of being able to read body language. The use of hybrid instruction allowed students at home to not only be connected to their teacher but also their classmates. During one observation, the teacher displayed the virtual student on a laptop in order for her to join a small group to complete an assignment.

Teacher directed integration. Teachers made decisions on a daily basis as to if and how they integrated technology into their instruction. Since the onset of the one-to-one initiative, more teachers were integrating devices on a regular basis using a wider array of applications. Initially, the school was using *Learning Ally, IXL, WordWall* and *Read Naturally*. Teachers now used a greater variety of Web 2.0 applications to assess reading, engage students, and build fluency. In this study, teachers used devices for student centered and teacher centered activities. This section is divided into (a) high-level integration and (b) low-level integration.

High-level integration. As teachers gained confidence in using devices, they were more likely to have students engage in high-level integration. High-level activities are designed to increase student achievement (Williams & Larwin, 2016) by having students more actively engaged in the learning process. Student-centered activities can include

collaboration, exploration, and creative application of concepts (Ertmer et al., 2012; Lowther et al., 2008; Williams & Larwin, 2016). When students are engaged in collaborative learning, they interact socially and utilize higher-order thinking skills. One-to-one devices allowed both students and teachers to collaborate simultaneously. The assignments and projects they completed could then be shared with others. (Lawson & Miller, 2011).

There were several instances in which the teachers in this study had students working collaboratively. In Drama, students worked in pairs to create an original script including scenes. Using a teacher created template as a guide, students were able to select their topic, characters, and action which accompanied scripted lines. Once completed, the students would then act out their plays for others. During my class observation, the teacher asked three of the students to read me their scripts. One student seemed quite comfortable presenting in front of others while the other two students were nervous. Oral presentations were another way to build students' communication skills and receive feedback from others.

Cathy integrated one-to-one devices in her class by having students work on a group project. During her literature class, Cathy explained how a hybrid group worked together by meeting daily via Google Meet. Students were able to share ideas and documents with each other. Their project involved a written portion as well as constructing a model. For the student who was joining the class virtually, the teacher sent materials home. Once the projects were done, students were able to show and explain their creations with each other. Cathy said the students really enjoyed the project, and she was pleased with how well they were able to work together despite the hybrid setting.

Sarah described a way in which students were creating and sharing videos of happenings around the school. The sixth graders produced "Today's Hoorays" by gathering pictures, short videos, and interviews from various students and teachers. Their teacher had taught them how to edit the videos using various tools. The students' productions are then shared with others on Wednesdays. Sarah noted that the videos were a way to celebrate others and stay connected, which had been especially important since the impact of COVID-19.

Low-level integration. It is not uncommon, especially for teachers with low self-efficacy, to use technology to replace teacher directed activities. Low-level technology integration includes drill and practice and independent student work (U.S. DOE, 2003). Ertmer (2005) stated that low-level integration occurs because teachers hold the belief that they should be the primary source of information and instruction. One of the major themes from the qualitative data showed the participants held a high view in role of the teacher as primarily responsible for instruction. Peter referred to teachers as "the master organizer" of instruction in meeting the needs of their students. Gail stated that she was able to adjust lessons based on student needs, responses, and body language in order to tailor lessons to a students' zone of proximal development. In addition, the OG training that all PA teachers received places an emphasis on direct instruction which is sequential and intentional. These principles were included in all areas of instruction.

Tool for learning. The use of one-to-one devices can assist in improving academic skills including literacy, reading, and mathematics (Lowther et al., 2012; Zheng eta al., 2016). The teachers in this study overall agreed that one-to-one devices can positively impact academic performance based on their response to the question, "I

believe one-to-one devices can be used effectively to build academic skills" (M = 4.20, SD = 0.92) on the VBTI survey. Studies have found devices can enhance reading, math, and written expression (Lowther et. al., 2012; Suhr et al., 2010). In addition, Bippert and Harmon (2017) found teachers and students liked the flexibility of reading selections offered by Web 2.0 tools. The use of one-to-one devices can also improve math skills. Clariana (2009) found that students made significant gains in math achievement and took ownership of learning while using one-to-one devices. The participants in this study expressed the positive impact one-to-one devices had on students' reading, math, and written expression skills.

Reading. In this study, the literature and tutorial teachers stated *CommonLit* and *ReadTheory* offered engaging stories which could be assigned individually or to a group of students. Both programs provided comprehension questions and feedback on students' responses which could be used to guide future instruction. Connie and Rachel stated they liked to be able to differentiate passages based on individual student needs and interests. In addition, Rachel said students found the material interesting and were taking initiative in completing assignments. During an observation, April assigned a passage from *CommonLit* for her students to read then used it for a writing activity. The students seemed familiar with the program and did not need guidance navigating the site.

Although drill and practice activities are considered a low-level skill (Ertmer et al., 2012), repetition which leads to automaticity is an important element of OG instruction. According to Gillingham & Stillman (1999) fluency in recall aids in comprehension. In addition, fluency aids in planning and organization (Reiter, Tucha, & Lange, 2005). Several teachers used web-based activities such as *WordWall*, *Quizizz*, and

Kahoot! to reinforce and assess the curriculum being taught. Gail noted in her interview that she often customized activities on *WordWall* for students to practice specific skills she was teaching both for reading and spelling. During her observation, Gail, an OG tutor, used *WordWall* with her student to practice words containing the -ph spelling. She accessed the word set then allowed the student to select the activity she wanted to use to practice the skill. Connie, another OG tutor, said she used *WordWall* in a similar manner. She noted that students enjoyed the game-like elements within the program and often asked to practice skills more than once. Connie said before one-to-one devices, students were not asking to practice skills when they were in a workbook format. Instead, the game-like practice was enjoyable and increased student engagement.

Math. Those teaching math also used online programs to practice math facts and concepts. Based on her response on the survey, Evelyn strongly agreed that one-to-one devices could be used to build academic skills. During her interview, she mentioned *ReflexMath*, *IXL*, and *Khan Academy* as programs she used on a regular basis. Evelyn stated that *ReflexMath* had been an important resource for her students in learning basic math facts. She felt that particular program had been more beneficial than other methods students had used in the past. In regard to learning and practicing various skills, Evelyn stated she taught her students how to use *IXL* and *Khan Academy*. In math, Evelyn found the built-in videos and practice items of *IXL* to be especially beneficial for students as she sought ways to encourage student ownership of learning. She felt it was important for students to be able to self-assess and take ownership of their learning. She encouraged her students to navigate both programs so they could practice skills they thought they needed to improve.

Written expression. Participants in this study noted several ways one-to-one devices supported written expression. One aspect participants strongly supported was the use of one-to-one devices as an assistive technology tool. Shaywitz et al. (2008) stated assistive technology could aid in organizing, writing, and presenting content. Speech-to-text and spell check decreased the cognitive load which would otherwise occur when students were handwriting paragraphs. Connie stated that students seemed more willing to write since using one-to-one devices. Cathy also commented on the benefit of built-in tools such as spell check and grammar check. She said, "They really are almost academic lifesavers for some of these kids, and it has just an intense value." The writing tools, along with applications such as *Grammarly,* allowed students to edit content on their own and take more ownership for their work.

Another useful element teachers mentioned to improve students' written expression was the ability to monitor student work through shared documents. By having students complete writing assignments using Google Docs or Google Slides, teachers would quickly monitor student progress and give feedback. Both Cathy and Connie mentioned being able to easily gauge student understanding and provide input by scanning documents via Google Classroom. Peter and April provided their students with templates for written assignments. The templates were colored coded and formatted so students knew what portions needed to be completed. This added structure supported the weak executive functioning ability many students with dyslexia experience (Jeffries & Everatt, 2004; Reiter et al., 2005). The ability to monitor work and provide structure for writing supported students' written expression.

Student engagement. The use of devices led to an increase in student engagement as well as more distractions in the classroom. On the VBTI survey, participants felt one-to-one devices could positively impact the learning environment (*M* = 4.00, *SD* = 0.94) but they did not necessarily feel that technology motivated students to learn (*M* = 3.20, *SD* = 1.23). In fact, when asked during interviews about the impact of devices on the learning environment and student engagement, participants were likely to speak about the distractions of devices rather than their enhancements on learning. The participants noted that classroom management strategies needed to change to closely monitor how students were using devices during instruction. Selwyn et al. (2017) noted that classroom management strategies are different in a digital classroom. While the school had put disciplinary procedures into place to curb students' misuse of technology, teachers had to alter their strategies according to Sarah and Rachel. However, during observations, most teachers still taught from the front to the room, unable to see or monitor student work.

Where participants did agree with the research on technology and the use of one-to-one devices was the impact on increased student engagement through high-interest, interactive tools. Game-like sites such as *WordWall*, *Quizlet*, *Kahoot!*, and *Quizizz* provided ways for students to practice academic skills. Game-based learning increased motivation (Kapp, 2021; Kronenberg, 2012). Students not only enjoyed the games, but would often request to play them for additional practice, something which had not occurred with paper-based activities. In addition, students were interested in reading on their own due to the high interest content from *CommonLit* and *ReadTheory*. When the content was interesting and motivating, student engagement increased.

Higher-order thinking and creative skills. The participations of this study were less likely to endorse the use of one-to-one devices for developing complex learning, higher-order thinking, and creativity. Unlike others who have found that technology can aid in building higher-order reasoning skills (Baylor & Richie, 2002), the participants had a lower value belief in this area than on others related to the role of technology in the teaching and learning process. On the VBTI question, "I believe one-to-one devices can promote higher-level thinking in students", teachers' beliefs varied greatly (M = 3.10, SD = 1.20). While most of the teachers were either neutral or agreed to this statement, one teacher strongly disagreed, and one strongly agreed. Similarly, on the question, "I believe technology assists students in learning complex concepts" (M = 3.70, SD = 1.16), teachers were likely to agree in using one-to-one devices for higher level learning. Eric found that the simulations available in the science curriculum allowed students to explore some concepts with greater complexity than would have been possible for him to simulate in the classroom. However, he was careful to explain at times he had to guide students' thinking in order for them to fully grasp concepts. In her interview, Rachel noted that when she perceived students were having difficulty comprehending complex concepts, she would look for additional videos and materials to support learning.

When used within a student-centered, constructivist paradigm, one-to-one devices can be used for creative applications during learning activities (Ertmer et al., 2012; Ottenbreit-Leftwich et al., 2010). However, teachers in this study did not necessarily support these findings based on their responses to the question, "I believe one-to-one devices enable students to be more creative during the learning process" (M = 3.20, SD = 0.92). Teachers scores fell within the disagree to agree range. This belief may be due to

how teachers were currently having students use devices in the classroom. In one class observation, students were using shared documents to create original scripts. While the teacher offered guidance, students were able to create scenes, plots, and dialogue following a structured format. However, in other observations, students were either using devices for drill and practice or not using them at all. In order for teachers to integrate technology to include higher level skills, they need training and professional development (An & Reigeluth, 2011; Ertmer, 2005). It might be that the participants had not had training in student-centered, collaborative strategies to foster such integration.

Teachers made decisions about how devices were integrated into learning activities. In this study while some teachers implemented student-centered activities, the majority of technology integration supplemented instruction or replaced teacher-directed activities. Some of the replacement was intentional and in keeping with the teachers' training. It was also possible that methods and materials which substituted teacher-centered techniques was the result of not understanding higher integration strategies.

Research question 3: How do teachers integrate devices during instruction?

Overall, the participants in this study agreed that devices play an important role in the teaching and learning process. Individual participants differed as to the degree of agreement or disagreement concerning the various aspects devices can impact in the learning environment. They also differed at times as to whether or not they actually included devices into their teaching practice compared to their beliefs. I was able to conduct a total of eight observations. Seven of the observations were of classroom teachers; one observation was of a tutorial teacher working one-on-one with a student. I had told the participants that I was interested in learning how they and their students used

technology in the classroom and did not specifically ask for a lesson centered on devices since I wanted to observe what might normally occur in their classroom. This research question was answered by comparing what was observed in the different settings with the quantitative and qualitative data from the survey and interviews. This section is divided into (a) enacted beliefs and (b) espoused beliefs.

Enacted beliefs. Enacted beliefs are beliefs which are actually put into practice (Ertmer et al., 2012). Within the scope of technology integration, teachers enact beliefs when their teaching strategies include high-level, collaborative student-centered activities (Ertmer et al., 2012; Lowther et al., 2008; Williams & Larwin, 2016). Student-centered activities encourage problem solving, organizing, and presenting solutions often within authentic contexts, all of which are important 21st century skills (Lawson & Miller, 2011). Two of the participants had lessons which demonstrated enacted beliefs. These two participants both stated they had high self-efficacy and used devices on a regular basis before the one-to-one initiative.

Peter was the head of middle school as well as drama teacher. On the VBTI survey, he responded that he agreed technology played an important role in the teaching and learning process (M = 4.40, SD = 0.84). He also reported he felt equipped and had the self-efficacy skills needed to align technology tools with instruction (M = 4.50, SD = 0.71). During my observation of his class, he had students working in pairs to write an original script which would later be performed in front of peers. All of the students were working on their devices for the whole class and used shared documents to write their script. Peter had created a color-coded template to assist students in their planning and writing. In his interview, he stated the template had built-in chunking. He seemed to

understand that students with dyslexia can struggle with their language and executive functioning skills (Mahoney & Hall, 2017; Shaywitz et. al., 2008) so he had framed the template around that knowledge. His belief about the role of technology was integrated with his belief about the nature of students with dyslexia. He was able to provide structure for his students yet also gave them the opportunity to collaborate. While his students worked within their shared documents, he would access their writing and offer feedback. He used the cursor to highlight text and draw their attention to specific areas they needed to address. Towards the end of the observation, he asked three students to read their scripts aloud to me. By having students give an oral presentation, he was reinforcing the importance of communication skills as well as authentic audiences.

Eric taught science and had been using his online curriculum prior to the one-on-one initiative. On the subsection concerning the role of technology on the teaching and learning process he overall agreed devices had a positive role (M = 3.80, SD = 1.23), and he felt adept at using devices to align with his content (M = 4.50, SD = 0.71). During the lesson I observed, he used direct instruction broken up with periods of independent and small group work. Students completed both paper-based and computer-based assignments. During direct instruction, Eric shared his slide presentation on an Apple TV. Students used their devices to log into *AmplifyScience* and accessed a worksheet to answer questions about the text. Eric asked the students to analyze weather related data independently then broke the students into groups to share and compare their answers. He created a hybrid group by displaying the virtual student on a device set between two in-class students. I noticed during the observation he was careful to circulate around the room so he could monitor students' screens. On the survey, he had disagreed that devices

motivated students during the learning process. During the interview, he had stated that at times students were distracted by devices. Eric seemed to maneuver his presentation, direct instruction, and monitor the class with ease.

Espoused beliefs. Espoused beliefs are those which are held by an individual but not enacted upon. With technology integration, espoused beliefs tend to lead to low-levels of technology integration (An & Reigeluth, 2011; Ottenbreit-Leftwich et al, 2010). Low-level integration includes activities such as word processing, drill and practice, watching videos, and conducting research (Ertmer et al., 2012; Dole et al., 2016). While each of these activities may help to demonstrate mastery of curricular objectives, they are not necessarily utilizing higher-order thinking skills. Much of what was observed in the classrooms consisted of low-level activities which at times simply replaced a paper and pencil-based activity.

April, an ELA teacher, used the Web 2.0 reading program, *CommonLit,* to serve as a writing prompt for her students. Based on her responses on the VBTI, April strongly agreed on the value of technology in the teaching learning process ($M = 5.00$, $SD = 0.00$). She also strongly agreed that she had the technology skills and ability to align resources with her curriculum ($M = 5.00$, $SD = 0.00$). Following general instructions, her students accessed their reading selection online and then began writing a paragraph using a shared teacher-created template. The template helped to ensure MLA formatting as well as provide structure for the paragraph. Similar to the template that Peter had created for his class, April used colors to draw attention to sections which needed to be completed. She also seemed to understand the need for students with dyslexia to have additional structure and cueing during the writing process. April had stated on her survey that she strongly

agreed in the benefit of assistive technology for students with dyslexia. This was evidenced by the fact that students knew they could use tools as needed. A few of the students used both text-to-speech and speech-to-text as they completed their assignment. April circulated throughout the room monitoring students' progress and assisting as needed. It seemed evident that April and her students felt comfortable using one-to-one devices and online resources.

Rachel was neutral on her view of technology for the teaching and learning process (M = 3.20, SD = 1.14) as well as in her skills to implement technology within her content (M = 3.00, SD =0.00). She integrated technology in her instruction and seemed comfortable interacting with the two students who had joined the class through Google Meet. Rachel began her lesson with students using *Quizizz* as a quick bell work assessment. Students then used a paper graph to record their score. Rachel transitioned the lesson by showing pictures of two students, one of whom was homeless, then a video on an Apple TV. She used those two items as prompts for an upcoming story and service project the students would participate in. Other than at the beginning of the class, students were not intentionally on their devices. While a few students did take out their Chromebooks later in the class period, it was not clear how students were using them.

Cathy was also rather neutral in her view of technology. Her responses within the role of technology subset ranged from disagree to agree (M = 2.90, SD = 0.74). However, she felt she had the technology skills needed to select and utilize one-to-one devices in her teaching (M = 4.00, SD = 0.00). During the observation, students had their devices out for most of the class period. Some students were actively taking notes while others seemed to primarily listen as Cathy reviewed some study skills strategies before

transitioning into social studies contact. She had displayed the slides she created for the lesson on an Apple TV for students to see. Since the student screens were not facing the camera, I was unable to know whether students were taking notes or being distracted by their device.

There was only one class observation I conducted in which the students were not intentionally using their devices. Natalie was an ELA teacher who did not feel that she had the self-efficacy skills needed to integrate technology effectively in her classroom (M = 2.50, SD = 0.71). She also did not place high value on the role of technology in the teaching process (M = 3.30, SD = 1.16). During the class observation, Natalie was presenting vocabulary words and definitions that the students would need to know. She used a document camera to project her handwritten notes onto the Apple TV. Students then used their paper and pen to copy what she had written. Since I was unable to have a follow up interview with Natalie, I was not certain whether her intent was to model how to record notes or if she was uncomfortable using the technology and devices she had in her classroom.

I was able to observe one tutorial session. In the tutorial session, the teacher was working with one student. To demonstrate a virtual lesson, the teacher conducted the full lesson using devices with the student seated across from her. Gail's role was primarily to remediate reading and writing skills using OG methods. Prior to the one-to-one initiative, she stated in her interview that she had not used technology. While she did not feel she had received the training she needed to best utilize devices (score of 3), overall, she felt she had the skills needed to use them effectively (M = 4.00, SD = 0.00). Gail shared a set of Google slides with the student. Together they went through reading and later writing

words with the phoneme focus. Gail used her cursor to highlight text as she asked questions, giving the student two forms of input. Multisensory instruction is a vital component of OG (Gillingham & Stillman, 1999) and Gail had found a way to replicate what would be done in person. Towards the end of the lesson, Gail allowed the student to choose how to practice the phoneme skill using *WordWall*. Although limited, Gail had expressed in her interview that it was a way to give students a choice. The student seemed to enjoy the game-like practice.

During classroom observations, I noticed some teachers were not integrating one-to-one devices. Certainly, the nature of the lesson and objectives can determine when and how technology is integrated (Hutchinson, 2012). It was also possible that some teachers were not fully integrating devices because they were not certain how to be do so in their content area. On the VBTI survey, teachers responded that they agreed with the question, "I believe I am able to select technology tools which best align with the curriculum standards" ($M = 4.10$, $SD = 0.99$). While four teachers strongly agreed with this statement, one teacher was neutral, and another disagreed. This discrepancy could account for the differences in enacted and espoused beliefs.

Implications and Recommendations

This descriptive study focused on middle school teachers at a school for students with dyslexia. The findings from the quantitative and qualitative data were meant to reflect the opinions, values, and experiences of the study's participants. Therefore, the findings of this study were meant to benefit the participating teachers and school without necessarily be generalizable to other settings, including those which serve students with dyslexia. For me personally, the descriptive research process allowed me to better

understand the role of an outside observer and the need to fully analyze a setting in order to understand its values and processes. For the school, the findings of this study offer recommendations and guidance in the integration of one-to-one devices. This section is divided into (a) recommendations for the school, (b) personal implications, and (c) future implications.

Recommendations

The purpose of this descriptive study was to describe how teachers of middle school students with dyslexia implemented technology following a one-to-one device initiative. This study used quantitative and qualitative data collected from ten participants. The quantitative data included survey results and frequency counts on the types of technology used in lessons. Qualitative data was obtained from interviews and observations. Collectively, the data provided rich, descriptive details on how teachers were, and were not, using devices during instruction. The following recommendations are intended to assist teachers in effectively integrating one-to-one devices in order to prepare students for future technology use.

Minimize barriers. Barriers can exist both externally and internally. Exterior barriers include resources, infrastructure, and time (Ertmer, 1997). When barriers exist, they limit the ways and manner in which technology can be integrated into instruction. At PA, two external barriers seemed to exist for the participants. These barriers included (a) infrastructure and (b) time.

Infrastructure. While one-to-one devices for students solve the issue of availability of resources for students, barriers such as infrastructure can limit the use of devices (Keane & Keane, 2017; Kwon et al., 2019). Bippert and Harmon (2017) found

that unreliable internet connection was a factor in whether teachers utilized devices in their instruction. While Pinewood Academy had a rather new building, the infrastructure was not sufficient for the number of devices being used on a daily basis. During the course of my interviews and observations, there were numerous times when there were sound delays and lagging videos. One teacher had to move from her office to a more open area in order to get a better connection. Another teacher used his cell phone for our interview because he said the connection in the building was weak. The interruption in connections could make playing videos, conducting conference sessions, and simultaneously editing documents difficult. Having a strong infrastructure would help to alleviate a first order barrier.

Time. Teachers need time in order to effectively plan activities which integrate one-to-one devices. The lack of planning time has been noted as a primary barrier to technology integration (An & Reigeluth, 2011; Ertmer, 1999). An and Reigeluth (2011) found teachers were willing to investigate and explore new technologies when provided the needed time, and Alhassan (2017) found teachers are more likely to use technology during instruction once they become familiar with them. During the interviews, two of the participants stated they were willing to learn and explore new technologies. One participant specifically said that she considered it a personal challenge to learn more ways to incorporate devices into her instruction. However, when asked about future technologies they wanted to include, one teacher mentioned she was not ready to learn any new tools. She felt she had learned so much in the past year that she still needed time in order to use them effectively. Since administration sets schedules, they could provide

teachers with additional planning time designated to technology integration. Such support would encourage further one-to-one device use during instruction.

Instruction which includes collaboration and creative projects also requires time. Cathy had been very pleased with the outcome of the group project her students had been able to complete using devices within a hybrid group setting. But she stated that she did not have any projects planned for the future and could not recall other similar projects her students had done in the past. It could be she did not have adequate time to plan larger projects which would provide students with opportunities to collaborate, create, and problem solve together, all 21st century skills.

Support professional development. Pinewood Academy was very fortunate to have several people on staff who could provide professional development. They also had a positive environment in which teachers felt supported by their administration and peers. This support could be used to foster professional development. Overall teachers agreed they were provided the skills needed to use their technology resources (M = 3.70, SD = 0.67) and select tools which aligned with the curriculum standards (M = 4.10, SD = 0.99), but two individuals in the study either were unsure or disagreed with those items. Prolonged professional development could strengthen the effectiveness of technology use by (a) incorporating 21st century skills, (b) sharing experiences, and (c) connecting technology resources to content.

Incorporate 21st century skills. Both in the survey results and interview statements, the participants expressed a desire to equip students with skills they would need for the future. Such skills are more than simply using a computer but should involve reading, writing, and problem-solving within authentic contexts (Battelle for Kids, 2019;

ISTE, 2022; US DOE, 2017). While the participants in this study expressed a desire to prepare students for the future, they did not feel that one-to-one devices influenced higher-order thinking skills (M = 3.10, SD = 1.20) or creativity (M = 3.20, SD = 0.94). This is contrary to what others such as Ertmer et al. (2012), Casner-Lotto and Benner (2006) and US DOE (2016) have found. By exposing teachers to 21st century skills and providing examples of ways to apply the standards within their content areas, teachers would be more likely to effectively implement devices and create learning opportunities towards this goal.

Share experiences. The teachers at Pinewood Academy already supported each other and shared resources such as lessons and practice materials. Several teachers stated during interviews that these resources were particularly helpful as they transitioned to hybrid teaching. As an extension, opportunities can be given for teachers to share how they are integrating devices into their instruction. Bandura (1977) found that perceptions can be influenced through the vicarious experiences of others. These experiences can be shared formally or informally and could lead to communities of practice to support each other in technology integration (Ertmer, 2005; Kopcha, 2012). By sharing ways teachers integrate devices in their lessons, others may discover ways to better utilize devices in their classroom.

***Extended, content-based training*.** Changing teacher paradigms takes time, sometimes up to five years (Ertmer et al., 2012). In addition, technology is ever evolving and changing. Because of this, professional development should be ongoing in order to build teachers' self-efficacy skills (Kwon et al., 2019; Zheng et al., 2016). In addition, An and Reigeluth, (2011) found teachers desired professional development that was targeted

to their content area. Since PA is a small school, visiting local schools or attending technology conferences such as ISTE and AECT may provide ways to obtain content specific training. Time for professional development can also be set aside over the course of the year to address technical skills as well as share effective strategies which include one-to-one devices. By providing extended professional development, the administration will be reinforcing their vision of the one-to-one initiative while also supporting teachers in its implementation.

Personal Implications

This descriptive study had implications not only for the school but also for me as a leader and researcher. Through this study, I gained great insight into the descriptive research process, the impact on mixed data sources, and an understanding of how my role as an outsider impacts others. This section includes (a) reflections on the descriptive study process, (b) the impact of mixed data sources, and (c) an understanding of the role of an outsider.

Reflection on descriptive study process. The purpose of a descriptive study is to understand and communicate the nature and events of a particular group of people (Gay et al., 2009; Mertens, 1998). In this case, while I was familiar with the school and many of its faculty members, I did not understand their value beliefs and perceived barriers as they related to technology and one-to-one devices. Instead, especially as an outsider, I had to immerse myself and understand their setting by spending a great deal of time reading and notating the transcripts which came from interviews and observations. I did not just code elements related to technology. I wanted to get a sense of the school as a whole and understand the participants' values related to students with dyslexia.

Admittedly, such in-depth coding resulted in an almost overwhelming number of codes. However, once I had developed assertions and themes, I felt I knew the participants and could accurately reflect their values.

One element I had not expected to find as deeply rooted, although not necessarily surprising, was how the participants integrated technology into their instruction based on their understanding of the nature of students with dyslexia and their OG training. In my previous school setting, as well as through training and workshops I had attended, teachers did not provide as much structure for students when integrating technology. For instance, I had not seen other teachers create color coded templates to cue students during a writing assignment. Nor had I considered the benefit of mediating student writing through the use of shared documents like the teachers in this study had done. While I had used assistive technology to support students with dyslexia, I had not considered the positive emotional impact assistive technology could have on them. Looking through a different lens helped me to consider other ways I could support the executive functioning of students with dyslexia and those with other learning differences.

Reflection on mixed methods sources. This study utilized both quantitative and qualitative data in order to describe the use of one-to-one devices. Using mixed methods data overcame the weakness of either data type and provided a greater understanding than either data source could have provided alone (Creswell & Creswell, 2018). I was able to gain great insight into the value beliefs and perceived barriers of the participants by analyzing the survey results, observations, and interviews collectively. When I was trying to analyze the value beliefs, I found merging all three sources not only for the group of participants but also individuals allowed for a deeper understanding of how and why

teachers used devices as they did. The use of qualitative data provided rich descriptions which assisted in interpreting the quantitative scores of participants' survey results. The mixed methods data was especially beneficial since I was an outsider attempting to understand the culture and experiences of the study participants.

Future Implications

This descriptive study attempted to explain the events and individuals at a particular time and within a particular setting (Gay et al., 2009). However, changes in circumstances, barriers, and training can change perspectives (Ertmer, 1999; Ertmer, 2005; Ottenbreit-Leftwich et al., 2010). Because perceptions can alter value beliefs, an ongoing assessment of teachers' perceptions as well as technology usage would provide insight into the progression of one-to-one device integration. Even since the time of data collection for this study took place, the value beliefs of the teachers may have changed. Future studies within the school could focus on evolving value beliefs related to technology.

This study focused on how teachers of students with dyslexia used one-to-one devices in the classroom. While schools which specialize in teaching this population of students are limited, further research on ways teachers of students with dyslexia integrate one-to-one devices would add to the current study and limited existing research. Other studies could examine ways to support the executive functioning of students both with and without dyslexia. Finally, future research could investigate how teachers' training impacts technology integration.

Limitations

As with any research study, there are limitations which impact the study's findings. This study was conducted during a period of time impacted by COVID-19 protocols. The participants were teaching during a period of higher-than-normal stress. They had to adjust to ever changing protocols and attendance issues which could have impacted how and to what extent they were learning and using technology. In addition, I was unable to conduct face-to-face interviews and observations. Instead, I met with teachers and observed classes through Zoom. This limited my ability to observe body language and view the full class during instruction. There were also numerous times where delays in audio and video transmission either interrupted conversations or made it difficult to understand what a participant said. The virtual setting may have resulted in limited qualitative data. The implications of COVID-19 likely impacted the participants and data collection.

Another limitation would be that for this study I used a researcher created survey versus a published survey which had established reliability. Since I had a small sample size for this study, I was unable to establish the reliability of the VBTI survey. Using a different survey with the same constructs may have resulted in slightly different results.

This study was conducted at a school which specializes in students with dyslexia. Half of the middle school teachers agreed to participate in the study. Other teachers within the school might have responded differently on the survey or used one-to-one devices in other ways. In addition, I only conducted one observation per teacher without requesting how they integrated devices. Observations on other days as well as different

guidelines may have resulted in different findings. It is also possible that other teachers with different populations might have responded differently to the survey or interviews.

REFERENCES

Adam, T., & Tatnall, A. (2017). The value of using ICT in the education of school students with learning difficulties. *Education and Information Technologies, 22*(6), 2711–2726.

Academy of Orton-Gillingham Practitioners and Educators (AOGPE). (2018a). *Resources: OG Approach Principles.* Retrieved from https://www.ortonacademy.org/resources/og-approach-principles/

Academy of Orton-Gillingham Practitioners and Educators (AOGPE). (2018b). *Training and certification: Orton-Gillingham Practitioner Certification.* Retrieved from https://www.ortonacademy.org/training-certification/individual-certification/

Academy of Orton-Gillingham Practitioners and Educators. (2018c). *Accreditation: AOGPE Accredited Instructional Programs in Schools.* Retrieved from https://www.ortonacademy.org/accreditation/dyslexia-in-schools/

AECT. (2012). AECT standards, 2012 version. *Association for Educational Communications and Technology.* Retrieved from www.aect.org/docs/AECTstandards2012.pdf

Agee, J. (2009). Developing qualitative research questions: A reflective process. *International Journal of Qualitative Studies in Education, 22*(4), 431–447. doi:10.1080/09518390902736512

Alhassan, R. (2017). Exploring the relationship between web 2.0 tools self-efficacy and teachers' use of these tools in their teaching. *Journal of Education and Learning, 6*(4), 217–228. doi:10.5539/jel.v6n4p217

Alloway, T. P., Wootan, S., & Deane, P. (2014). Investigating working memory and sustained attention in dyslexic adults. *International Journal of Education Research, 67*(2014), 11–17. doi:10.1016/j.ijer.2014.04.001

American Psychiatric Association (APA). (2013). Specific learning disorders. In *Diagnostic and statistical manual of mental disorders* (5th ed.). doi:10.1176/appi.books.9780890425596.dsm05

Amplify Education, Inc. (2022). *AmplifyScience.* [computer software]. Retrieved from https://amplify.com/programs/amplify-science/

An, Y. J., & Reigeluth, C. (2011). Creating technology-enhanced, learner-centered classrooms: K–12 teachers' beliefs, perceptions, barriers, and support needs. *Journal of Digital Learning in Teacher Education, 28*(2), 54–62. doi:10.1080/21532974.2011.10784681

Anderson, T. (Ed.). (2011). *The theory and practice of online learning*. Edmonton, AB: AU Press.

Anderson, S. E., & Putman, R. S. (2019). Special education teachers' experience, confidence, beliefs, and knowledge about integrating technology. *Journal of Special Education Technology*, *35*(1), 37–50. doi:10.1177/0162643419836409

Applefield, J. M., Huber, R., & Moallem, M. (2001). Constructivism in practice and theory: Toward a better understanding. *The High School Journal*, *84*(2), 35–53. Retrieved from http://www.jstor.org/stable/40364404

Aslan, S. (2016). Investigating "The coolest school in America": How technology is used in a learner-centered school. *Education Technology Research and Development, 64*, 1107–1133. doi: 10.1007/s11423-016-9450-9

Assistive Technology for Individuals with Disabilities, 29 U.S.C. § 3001 (2004)

AT3 Center. (2016). AT Act Information. *National Assistive Technology Act Technical Assistance Training (AT3) Center.* Retrieved from https://www.at3center.net/repository/atactinformation

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215. doi:10.1007/978-3-319-75361

Bangert-Drowns, R. L., & Pyke, C. (2002). Teacher ratings of student engagement with educational software: An exploratory study. *Educational Technology Research and Development, 50*(2), 23–37. doi: 10.1007/BF02504992

Battelle for Kids. (2019). *Framework for 21st Century Learning*. Retrieved from http://static.battelleforkids.org/documents/p21/P21_Framework_Brief.pdf

Baylor, A. L. & Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms? *Computers & Education, 39*(4), 395–414. Retrieved from www.elsevier.com/locate/compedu

Bebell, D., & Kay, R. (2010). One to one computing: A summary of the quantitative results from the Berkshire wireless learning initiative. *Journal of Technology, Learning, and Assessment, 9*(2). doi:10.1556/ComEc.10.2009.1.10

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *Clearing House, 83*(2), 39–43. doi: 10.0.4.56/00098650903505415

Bippert, K. (2019). Perceptions of technology, curriculum, and reading strategies in one middle school intervention program. *Research in Middle Level Education, 42*(3), 1–22. doi:10.1080/19404476.2019.1565600

Bippert, K., & Harmon, J. (2017). Middle school teachers' perceptions of computer-assisted reading intervention programs. *Reading Psychology, 38*(2), 203–230. doi:10.1080/02702711.2016.1245691

Blikstad-Balas, M., & Davies, C. (2017). Assessing the educational value of one-to-one devices: Have we been asking the right questions? *Oxford Review of Education, 43*(3), 311–331. doi: 10.1080/03054985.2017.1305045

Brieger, E., Arghode, V., & McLean, G. (2020). Connecting theory and practice: Reviewing six learning theories to inform online instruction. *European Journal of Training and Development, 44*(4–5), 321–339. doi:10.1108/EJTD-07-2019-0116

Brown, J., Bryan, J., & Brown, T. (2005). Twenty-first century literacy and technology in k-8 classrooms. *Innovate Journal of Online Education, 1*(3), 5.

Carreon, A., Smith, S. J., & Rowland, A. (2020). Augmented reality: Creating and implementing digital classroom supports. *Journal of Special Education Technology, 35*(2), 109–115. doi:10.1177/0162643419882423

Casner-Lotto, J., & Benner, M.W. (2006). *Are they really ready to work? Employers' perspectives on the knowledge and applied skills of new entrants to the 21st century U.S. workforce*. Retrieved from https://files.eric.ed.gov/fulltext/ED519465.pdf

Chaaban, Y., & Moloney, R. (2016). An exploratory study of the factors associated with literacy teachers' integration of technology: A study of Lebanese schools. *Journal of Digital Learning in Teacher Education, 32*(4), 128–139. doi:10.1080/21532974.2016.1205461

Clariana, R. (2009). Ubiquitous wireless laptops in upper elementary mathematics. *Journal of Computers in Mathematics and Science Teaching, 28*(1), 5–21. Retrieved from ttps://www.learntechlib.org/p/27026

Crosby, S., Howell, P., & Thomas, S. (2020). Teaching through collective trauma in the era of COVID-19: Trauma-informed practices for middle level learners. *Middle Grades Review, 6*(2), 1–6.

Cohen, P., Kasen, S., Bifulco, A., Andrews, H., & Gordon, K. (2005). The accuracy of adult narrative reports of developmental trajectories. *International Journal of Behavioral Development*, *29*(5), 345–355. doi:10.1080/01650250500147709

Collins, K. M. T., Onwuegbuzie, A. J., & Sutton, I. L. (2006). A model incorporating the rationale and purpose for conducting mixed-methods research in special education and beyond. *Learning Disabilities*, *4*(1), 67–100.

Conway, P. F., & Amberson, J. (2011). Laptops meet schools, one-one draw: M-learning for secondary students with literacy difficulties. *British Journal of Learning Support, 26*(4), 173–181. Retrieved from www.ncte.ie

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Thousand Oaks, CA: SAGE.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340.

Dawson, K., Antonenko, P., Lane, H., & Zhu, J. (2019). Assistive technologies to support students with dyslexia. *Teaching Exceptional Children, 51*(3), 226–239. doi: 10.1177/0040059918794027

Day, J. N., & Huefner, D. S. (2003). Assistive technology: Legal issues for students with disabilities and their schools. *Journal of Special Education Technology, 18*(2), 23–34. doi:10.1177/016264340301800202

Degirmenci, N., Baglama, B., & Yucesoy, Y. (2020). The use of technology in dyslexia: An analysis of recent trends. *International Journal of Emerging Technologies in Learning, 15*(5), 30–39. doi:10.3991/IJET.V15I05.11921

Dole, S., Bloom, L., & Kowalske, K. (2016). Transforming pedagogy: Changing perspectives from teacher-centered to learner-centered. *Interdisciplinary Journal of Problem-Based Learning, 10*(1). doi:10.7771/1541-5015.1538

Donovan, L., Hartley, K., & Strudler, N. (2007). Teacher concerns during initial implementation of a one-to-one laptop initiative at the middle school level. *Journal of Research on Technology in Education, 39*(3), 263–286. Retrieved from www.iste.org

Downes, J. M., & Bishop, P. A. (2015). The intersection between 1:1 laptop implementation and the characteristics of effective middle level schools. *RMLE Online, 38*(7), 1–16. doi:10.1080/19404476.2015.11462120

Dwyer, S. C., & Buckle, J. L. (2009). The space between: On being an insider-outsider in qualitative research. *International Journal of Qualitative Methods, 8*(1), 54–63. doi:10.1.1.596.4039&rep=rep1&type=pdf

Ertmer, P. A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 1042– 1629.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology, Research, and Development, 53*(4), 25–39.

Ertmer, P. A., & Newby, T. J. (2013). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 26*(2), 43–71. doi:10.1002/piq.21143 43

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423–435. doi:10.1016/j.compedu.2012.02.001

Evans, J. (2019). *Digital learning: Peril or promise for our k-12 students*. Retrieved from Project Tomorrow website: https://tomorrow.org/Speakup/speakup2018-19-Digital-Learning-Peril-or-Promise-october2019.html

Feit, N., Bustos, J., Monk, J., & Marchant, B. (2020, March 16). Coronavirus in SC causes Gov. McMaster to close all public schools. *The State*. Retrieved from https://www.thestate.com/news/coronavirus/article241209451.html

Fontana, A., & Frey, J. (2000). The interview: From structured questions to negotiated text. In N. K. Denzin & Y. Lincoln (Eds.), *The handbook of qualitative research* (2nd ed., pp. 645–672). Thousand Oaks, CA: SAGE Publications, Inc.

Francom, G. M. (2020). Barriers to technology integration: A time-series survey study. *Journal of Research on Technology in Education*, *52*(1), 1–16. doi:10.1080/15391523.2019.1679055

Freeman, A., Adams Becker, S., Cummins, M., Davis, A., & Hall Giesinger, C. (2017). *NMC/CoSN horizon report: 2017 k-12edition*. Retrieved from https://cdn.nmc.org/media/2017-nmc-cosn-horizon-report-k12-EN.pdf

Gay, L., Mills, G., & Airasian, P. (2009*). Education research: Competencies for analysis and applications* (9th ed.). Upper Saddle River, NJ: Pearson.

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science (IJRES), 1*(2), 175–191. Retrieved from www.ijres.net

Gherardi, S. (2017). Digitized and decoupled: Teacher sensemaking around educational technology in a model 1:1 program. *Mid-Western Educational Researcher, 29*(2), 166–194.

Gherheș, V., Stoian, C. E., Fărcașiu, M. A., & Stanici, M. (2021). E-learning vs. face-to-face learning: Analyzing students' preferences and behaviors. *Sustainability, 13*(8), 1–15. doi: 10.3390/su13084381

Gillingham, A. & Stillman, B. (1999). *The Gillingham manual: Remedial training for students with specific disability in reading, spelling, and penmanship*. Cambridge, MA: EPS.

Grant, M. M., Ross, S. M., Wang, W., & Potter, A. (2005). Computers on wheels: An alternative to "each one has one." *British Journal of Educational Technology, 36*(6), 1017–1034.

Green, S. & Johnson, R. (2010). *Assessment is essential.* New York: McGraw Hill.

Guba, E. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communication and Technology, 29*(2), 75–91. Retrieved from

https://pdfs.semanticscholar.org/8d32/23ed3c76cc4066ec894b5aca51c4f4028b7e.pdf

Harper, B., & Milman, N. B. (2016). One-to-one technology in k-12 classrooms: A review of the literature from 2004 through 2014. *Journal of Research on Technology in Education, 48*(2), 129–142. doi:10.1080/15391523.2016.1146564

Heath, M. K. (2017). Teacher-initiated one-to-one technology initiatives: How teacher self-efficacy and beliefs help overcome barrier thresholds to implementation. *Computers in the Schools, 34*(1–2), 88–106. doi:10.1080/07380569.2017.1305879

Herr, K., & Anderson, G. (2005). *The action research dissertation: A guide for students and faculty*. Thousand Oaks, CA: Sage Publications, Inc.

Hew, K. F., & Brush, T. (2007). Integrating technology into k-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research & Development, 55*(3), 223–252. doi:10.1007/s11423-006-9022-5

Hsu, S. (2017). Developing and validating a scale for measuring changes in teachers' ICT integration proficiency over time. *Computers & Education, 111,* 18–30. doi:10.1016/j.compedu.2017.04.001

Hutchison, A. (2012). Literacy teachers' perceptions of professional development that increases integration of technology into literacy instruction. *Technology, Pedagogy and Education , 21*(1), 37–56. doi:10.1080/1475939X.2012.659894

Hutchison, A. C., & Woodward, L. (2018). Examining the technology integration planning cycle model of professional development to support teachers' instructional practices. *Teachers College Record, 120*(October), 1-44.

Individuals with Disabilities Education Improvement Act (IDEA), Amendments of 2004, 20 U.S.C. § 1400 et seq. (2004). Retrieved from http://www.ed.gov/policy/speced/leg/idea/idea.pdf

International Dyslexia Association. (2020a). *Dyslexia basics*. Retrieved from https://dyslexiaida.org/dyslexia-basics/

International Dyslexia Association. (2020b). *Working memory: The engine for learning*. Retrieved from https://dyslexiaida.org/working-memory-the-engine-for-learning/

International Society for Technology in Education (ISTE). (2022). *ISTE standards for students*. Retrieved from https://www.iste.org/standards/iste-standards-for-students

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in k-12 classrooms: A path model. *Educational Technology Research & Development, 58*(2), 137–154. doi:10.0.3.239/s11423-009-9132-y

Jeffries, S., & Everatt, J. (2004). Working memory: Its role in dyslexia and other specific learning difficulties. *Dyslexia, 10*(3), 196–214. doi:10.1002/dys.278

Johnson, R. & Onwuegbuzie, A. (2004). Mixed methods research: A research pradigm whose time has come. *American Educational Research Association, 33*(7), 14-26. https://www.jstor.org/stable/3700093

Kagan, D. (1992). Professional growth among preservice and beginning teachers. *Review of Educational Research, 62*,129–169

Kang, H. (2013). The prevention and handling of the missing data. *Korean Journal of Anesthesiology, 64*(5), 402. doi:10.4097/KJAE.2013.64.5.402

Kapp, K. (2012). *The gamification of learning and instruction.* San Francisco, CA: John Wiley & Sons, Inc.

Keane, T., & Keane, W. (2017). Achievements and challenges: Implementing a 1:1 program in a secondary school. *Education and Information Technologies*, *22*, 1025–1041. doi:10.1007/s10639-016-9470-4

Knoop-Van Campen, C. A. N., Segers, E., & Verhoeven, L. (2020). Effects of audio support on multimedia learning processes and outcomes in students with dyslexia. *Computers & Education, 150*(2020), 103858. doi:10.1016/j.compedu.2020.103858

Kopcha, T. J. (2010). A systems-based approach to technology integration using mentoring and communities of practice. *Educational Technology Research & Development, 58,* 175–190. doi:10.1007/s11423-008-9095-4

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education, 59*(4), 1109–1121. doi:10.1016/j.compedu.2012.05.014

Krahenbuhl, K. S. (2016). Student-centered education and constructivism: Challenges, concerns, and clarity for teachers. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 89*(3), 97–105. doi:10.1080/00098655.2016.1191311

Kronenberg, F. (2012). Selection criteria for commercial off-the-shelf (COTS) video games for language learning. *International Association for Language Learning Technology*, *42*(2), 52–78.

Kwon, K., Ottenbreit-Leftwich, A. T., Sari, A. R., Khlaif, Z., Zhu, M., Nadir, H., & Gok, F. (2019). Teachers' self-efficacy matters: Exploring the integration of mobile

computing device in middle schools. *TechTrends, 63*(6), 682–692. doi:10.1007/s11528-019-00402-5

Larson, L. C., & Miller, T. N. (2011). 21st century skills: prepare students for the future. *Kappa Delta Pi Record, 47*(3), 121–123.

Leech, N. L., & Onwuegbuzie, A. J. (2009). A typology of mixed methods research designs. *Quality and Quantity, 43*(2), 265–275. doi:10.1007/s11135-007-9105-3

Lipson, C. (2017). Integrating technology into literacy instruction for students with disabilities: Perspectives of teachers and students. (Doctoral dissertation). Retrieved from ProQuest LLC. (No. 10618034)

Loeb, S., Dynarski, S., McFarland, D., Morris, P., Reardon, S., & Reber, S. (2017). *Descriptive analysis in education: A guide for researchers*. Retrieved from U.S. Department of Education, Institute of Education Sciences. National Center for Education Evaluation and Regional Assistance. https://eric.ed.gov/?id=ED573325

Lowther, D. L., Inan, F. A., Ross, S. M., & Strahl, J. D. (2012). Do one-to-one initiatives bridge the way to 21st century knowledge and skills? *Journal of Educational Computing Research, 46*(1), 1–30. doi:10.2190/ec.46.1.a

Lowther, D. L., Inan, F. A., Strahl, D. J., & Ross, S. M. (2008). Does technology integration "work" when key barriers are removed? *Educational Media International, 45*(3), 195–213. doi:10.1080/09523980802284317

Lowther, D., & Ross, S. (2000). *Teacher technology questionnaire* (TTQ). Memphis, TN: Center for Educational Policy.

Lowther, D., Ross, S., & Morrison, G. (2003). When each one has one: The influence on teaching strategies and student achievement of using laptops in the classroom. *Education Technology Research and Development, 51*(3), 23–44.

Mahoney, J., & Hall, C. (2017). Using technology to differentiate and accommodate students with disabilities. *E-Learning and Digital Media*, *14*(5), 291–303. doi:10.1177/2042753017751517

Manfra, M. & Bullock, D. (2014). Action research for educational communications and technology. In J.M. Spector et al. (Eds.), *Handbook of research on educational communications and technology*. New York: Springer Science + Business Media.

McClanahan, B., Williams, K., Kennedy, E., & Tate, S. (2012). A breakthrough for Josh: How use of an iPad facilitated reading improvement. *TechTrends, 56*(3), 20–28. doi:10.1007/s11528-012-0572-6.pdf

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M. K., Franey, J. J., & Bassett, K. (2016). Teaching in a digital age: How educators use technology to improve student learning. *Journal of Research on Technology in Education, 48*(3), 194–211. doi: 10.1080/15391523.2016.1175856

McNulty, M. (2003). Dyslexia and the life course. *Journal of Learning Disabilities, 36*(4), 363-381.

Meiri, R., Levinson, O., & Horowitz-Kraus, T. (2019). Altered association between executive functions and reading and math fluency tasks in children with reading difficulties compared with typical readers. *Dyslexia, 25*(2019), 267-283. doi:10.1002/dys.1624

Merriam, S. B., Johnson-Bailey, J., Lee, M.Y., Kee, Y., Ntseane, G., & Muhamad, M. (2010). Power and positionality: Negotiating insider/outsider status within and across cultures. *International Journal of Lifelong Education, 20*(5), 405–416. doi:10.1080/02601370120490

Mertens, D. (1998). *Research methods in education and psychology: Integrating diversity with quantitative and qualitative approaches*. Thousand Oaks, CA: Sage Publications, Inc.

Mertler, C. (2017). *Action research: Improving schools and empowering educators.* Thousand Oaks, CA: Sage Publications, Inc.

Mills, G. (2000). *Action research: A guide for the teacher researcher*. New Jersey: Printice-Hall, Inc.

Mills, G. (2018). Understanding action research. In *Action research: A guide for the teacher researcher* (6th ed., pp. 1–31). New York: Pearson.

Morrison, G., Ross, S., Kalman, H., & Kemp, J. (2013). *Designing effective instruction*. Hoboken, NJ: Wiley.

Mucetti, R. (2017). From forty-to-one to one-to-one: Eliminating the digital divide and making equity actionable. *Educational Leadership and Administration: Teaching and Program Development, 28,* 28–36.

National Assessment of Educational Progress (NAEP). (2015). *The nation's report card: 2015 survey questionnaires results.* Retrieved from https://www.nationsreportcard.gov/sq_computer/

Ok, M., & Rao, K. (2017). Using a digital pen to support secondary students with learning disabilities. *Intervention in School and Clinic, 53*(1), 36–43. doi:10.1177/1053451217692567

Onwuegbuzie, A. J., & Leech, N. (2006). Linking research questions to mixed methods data analysis procedures. *The Qualitative Report, 11*(3), 474–498.

Ottenbreit-Leftwich, A. T., Glazewski, K. D., Newby, T. J., & Ertmer, P. A. (2010). Teacher value beliefs associated with using technology: Addressing professional and student needs. *Computers & Education, 55*(3), 1321–1335. doi:10.1016/j.compedu.2010.06.002

Ottenbreit-Leftwich, A., Yin-Chan Liao, J., Sadik, O., & Ertmer, P. (2018). Evolution of teachers' technology integration knowledge, beliefs, and practices: How can we support beginning teachers use of technology? *Journal of Research on Technology in Education, 50*(4), 282–304. doi:10.1080/15391523.2018.1487350

Otter.ai, Inc. (2022). *Otter.ai.* [computer software]. Retrieved from https://otter.ai/

Peavler, J. & Rooney, T. (2019). *Orton Gillingham: Teacher manual*. Indianapolis, IN: M.A. Rooney Foundation.

Peneul, W. R. (2006). Implementation and effects of one-to-one computing initiatives: A research synthesis. *Journal of Research on Technology in Education, 38*(3), 329–348.

Piaget, J. & Inhelder, B. (1969). *The psychology of the child*. New York: Basic Books, Inc.

Powell, R. R., & Powell, R. R. (2006). Evaluation research: An overview. *Library Trends, 55(*1), 102–120.

Project Tomorrow. (2017). *Trends in digital learning: Building teachers' capacity and competency to create new learning experiences for students*. Irvine, CA. Retrieved from http://images.email.blackboard.com

Project Tomorrow. (2018). *The new learning leader: The emerging role of the agile school principal as digital evangelist and instructional leader*. Irvine, CA. Retrieved from http://images.email.blackboard.com

Projects in Education. (2018). *School leaders and technology: Results from a national survey*. Bethesda, MD: Education Week Research Center. Retrieved from www.edweek.org/rc

Reiter, A., Tucha, O., & Lange, K. W. (2005). Executive functions in children with dyslexia. *Dyslexia, 11*(2), 116-131. doi:10.1002/dys.289

Richardson, V. (1996). The role of attitudes and beliefs in learning to teach. In J. Sikula (Ed.), *Handbook of research on teacher education* (pp. 102–119). New York: Simon & Schuster/Macmillan.

Ross, S. M., Smith, L. J., Alberg, M., & Lowther, D. (2004). Using classroom observation as a research and formative evaluation tool in educational reform: The school observation measure. In H. Waxman, R. Tharp, & R. Hilberg (Eds.), Observational Research in U.S. Classrooms: New Approaches for Understanding Cultural and Linguistic Diversity (pp. 144–173). Cambridge, NY: Cambridge University Press. doi:10.1017/CBO9780511616419.007

Ross, S. M., Smith, L. J., Lowther, D. L., & Alberg, M. (n.d.). *The school observation measure: Observer's manual*. Memphis, TN. Retrieved from http://edit.educ.ttu.edu/site/jcheon/manual/SOM_manual.pdf

Ruggiero, D., & Mong, C. J. (2015). The teacher technology integration experience: Practice and reflection in the classroom. *Journal of Information Technology Education: Research, 14*, 161–178.

Ryba, K., & Brown, M. E. (2000). How proficient IT teachers integrate computers into the curriculum. *Journal of Computing in Teacher Education, 16*(4), 6–11.

Saldaña, J. (2021). *The coding manual for qualitative researchers.* Thousand Oaks, CA: SAGE Publications Inc.

Saletta, M. (2018). Reading disabilities in adolescents and adults. *Language, Speech, and Hearing Services in Schools*, *49*(4), 787–797. doi:10.1044/2018_LSHSS-DYSLC-18-0005

Santamaría, M. D., Mondragon, N. I., Santxo, N. B., & Ozamiz-Etxebarria, N. (2021). Teacher stress, anxiety and depression at the beginning of the academic year during the COVID-19 pandemic. *Global Mental Health, 8*(14), 1–8. doi:10.1017/gmh.2021.14

Sayeski, K., Earle, G., Davis, R., & Calamari, J. (2018). Orton-Gillingham: Who, what, and how. *Teaching Exceptional Children*, *51*(3), 240–249. Retrieved from http://www.orton-gillingham.com/about-us/orton-gillingham/

Selwyn, N., Nemorin, S., Bulfin, S., & Johnson, N. F. (2017). Left to their own devices: The everyday realities of one-to-one classrooms. *Oxford Review of Education, 43*(3), 289–310. doi:10.1080/03054985.2017.1305047

Sessions, L., Kang, M. O., & Womack, S. (2016). The neglected "R": Improving writing instruction through iPad apps. *TechTrends*, *60*(3), 218–225. doi:10.1007/s11528-016-0041-8

Shapley, K. S., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2010). Evaluating the implementation fidelity of technology immersion and its relationship with student achievement. *Journal of Technology, Learning, and Assessment, 9*(4). Retrieved from http://www.jtla.org

Shaywitz, S. E., Morris, R., & Shaywitz, B. A. (2008). The education of dyslexic children from childhood to young adulthood. *Annual Review of Psychology, 59*(1), 451–475. doi:10.1146/annurev.psych.59.103006.093633

Sheffield, B. B. (1991). The structured flexibility of Orton-Gillingham. *Annals of Dyslexia, 41*, 41–54.

Shifflet, R., & Weilbacher, G. (2015). Teacher beliefs and their influence on technology use: A case study. *Contemporary Issues in Technology and Teacher Education, 15*(3), 368–394.

Singh, J., Steele, K., & Singh, L. (2021). Combining the best of online and face-to-face learning: Hybrid and blended learning approach for COVID-19, post vaccine, & post-pandemic world. *Journal of Educational Technology Systems, 50*(2), 140–171. doi:10.1177/00472395211047865

Smith, G. & Throne, S. (2007). *Differentiating instruction with technology in k-5 classrooms*. Washington, D.C.: International Society for Technology in Education

South Carolina Independent School Association (SCISA). (2020). *The South Carolina Independent School Association Accreditation Packet*. Retrieved from https://www.scisa.org/images/Complete_SCISA_Accreditation_Packet_Updated_June_2020.pdf

Stapleton, L., & Stefaniak, J. (2018). Cognitive constructivism: Revisiting Jerome Bruner's influence on instructional design practices. *TechTrends, 63*(1), 4–5. doi:10.1007/s11528-018-0356-8

Stebbings, J. A., & Kline, E. (2020). Academic and cognitive remediation for students with learning disabilities: A comparison between Orton Gillingham and NILD educational therapy. *International Journal for Research in Learning Disabilities, 4*(2), 15–34. doi:10.28987/ijrld.4.2.15

Steiner, A. (2017). *The impact of one to one laptop program on the self-efficacy of nine middle school students with specific learning disabilities*. (Doctoral dissertation). Retrieved from ProQuest LLC. (No 10617878)

Sterbinsky, A., & Ross, S. M. (2003). *School observation measure reliability study*. Memphis, TN: Center for Research in Educational Policy.

Suhr, K. A., Hernandez, D. A., Grimes, D., & Warschauer, M. (2010). Laptops and fourth-grade literacy: Assisting the jump over the fourth-grade slump. *The Journal of Technology, Learning, and Assessment, 9*(5), 1–45. Retrieved from www.jtla.org

Tamboer, P., Vorst, H., & Oort, F. (2014). Five describing factors of dyslexia. *Journal of Learning Disabilities, 49*(5), 466–483. doi:10.1177/0022219414558123

Tilton, J., & Hartnett, M. (2016). What are the influences on teacher mobile technology self-efficacy in secondary school classrooms? *Journal of Open, Flexible and Distance Learning, 20*(2), 79–93.

Twinning, P., Heller, R., Nussbaum, M., & Tsai, C. (2017). Some guidance on conducting and reporting qualitative studies. *Computers & Education, 106*, A1-A9. doi:10.1016/j.compedu.2016.12.002

U. S. Department of Education (DOE). (2003). *Federal funding for educational technology and how it is used in the classroom: A summary of findings from the integrated studies of educational technology.* (2003). Washington, DC. Retrieved from https://www2.ed.gov/rschstat/eval/tech/iset/summary2003.pdf

U.S. Department of Education (U.S. DOE). (2016). *Non- regulatory guidance: Student support and academic achievement grants*. Washington, D.C.: U.S. Department of Education, Office of Elementary and Secondary Education. Retrieved from https://www2.ed.gov/policy/elsec/leg/essa/essassaegrantguid10212016.pdf

U. S. Department of Education (U.S. DOE). (2017). *Reimagining the role of technology in education: 2017 national education technology plan update.* Washington, D. C.: U. S. Department of Education, Office of Educational Technology. Retrieved from http://tech.ed.gov

Uzunboylu, H. and Ozdamli, F. (2011). Teacher perception for m-learning: Scale development and teachers' perceptions. *Journal of Computer Assisted Learning*, *27*, 544-556. doi:10.1111/j.1365-2729.2011.00415.x

Van Boven, L., White, K., & Huber, M. (2009). Immediacy bias in emotion perception: Current emotions seem more intense than previous emotions. *Journal of Experimental Psychology: General*, *138*(3), 368–382. doi:10.1037/a0016074

Vellutino, F. R., Fletcher, J. M., Snowling, M. J., & Scanlon, D. M. (2016). Specific reading disability (dyslexia): What have we learned in the past four decades.

Journal of Child Psychology and Psychiatry, *45*(1), 2–40. doi:10.1046/j.0021-9630.2003.00305.x

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273–315. doi:10.1111/j.1540-5915.2008.00192.x

Virtue, D. C., Downes, J. M., & Bishop, P. A. (2015). The cornerstone practices of the middle school concept. *Research in Middle Level Education Online*, *38*(7), 1–16.

Wadsworth, B. (1971). *Piaget's theory of cognitive development*. New York: David McKay Company, Inc.

Williams, C. (2007). Research methods. *Journal of Business & Economic Research*, *5*(3), 65–72. doi:10.1017/9781108656184.003

Williams, N. L., & Larwin, K. H. (2016). Student achievement in Ohio high schools. *Journal of Research on Technology in Education*, *48*(3), 143–158. doi:10.1080/15391523.2016.1175857

Windschitl, M., & Sahl, K. (2002). Tracing teachers' use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics, and institutional culture. *American Educational Research Journal, 39*(1), 165–205. doi:10.3102/00028312039001165

Xie, J., Basham, J. D., Marino, M. T., & Rice, M. F. (2018). Reviewing research on mobile learning in k-12 educational settings: Implications for students with disabilities. *Journal of Special Education Technology, 33*(1), 27–39. doi:10.1177/0162643417732292

Yilmaz, K. (2011). The cognitive perspective on learning: Its theoretical underpinnings and implications for classroom practices. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *84*(5), 204–212. doi:10.1080/00098655.2011.568989

Young, M. C., Courtad, C. A., Douglas, K. H., & Chung, Y. C. (2019). The effects of text-to-speech on reading outcomes for secondary students with learning disabilities. *Journal of Special Education Technology*, *34*(2), 80–91. doi:10.1177/0162643418786047

Zheng, B., Warschauer, M., & Farkas, G. (2013). Digital writing and diversity: The effects of school laptop programs on literacy processes and outcomes. *Journal of Educational Computing Research*, *48*(3), 267–299. doi:10.2190/EC.48.3.a

Zheng, B., Warschauer, M., Lin, C.-H., & Chang, C. (2016). Learning in one-to-one laptop environments: A meta-analysis and research synthesis. *Review of Educational Research*, *86*(4), 1052–1084. doi:10.3102/0034654316628645

APPENDIX A

INFORMED CONSENT LETTER

Dear Pinewood Academy Middle School Teacher,

My name is Deborah Irwin. I am a doctoral candidate in the Educational Practices and Innovation Department of the College of Education at the University of South Carolina. I am conducting a descriptive research study as part of the requirements of my degree in Learning Design and Technologies and I would like to invite you to participate.

My study is descriptive in nature meaning I will not be implementing anything new at your school. Instead, my study will explore and explain the value belief of middle school teachers of dyslexic students concerning one-to-one devices and how those beliefs impact the use of technology during instruction. If you decide to participate, you will be asked to complete a short Likert-style survey. I will also seek seven teachers to participate in individual interviews and seven to consent to a classroom observation. Collectively, the information gathered over the Spring of 2021 will provide valuable information on how teachers with OG training have been using one-to-one devices.

In particular, you will be asked questions about your thoughts on technology and one-to-one devices for dyslexic students. You will also be given opportunities to share how one-to-one devices have impacted your curriculum and classroom. Individual interviews will be scheduled at a mutually agreed upon time and place and should last between 30-45 minutes. Classroom observations will also be scheduled ahead of time and last the length of the class period. Each session and observation will be audio recorded so that I can accurately transcribe what is discussed. The tapes will only be reviewed by members of my research committee and destroyed upon completion of the study.

Your participation is purely voluntary, and all study results will remain confidential. Any information gathered during the study will be kept on password protected devices or in a secure location. In addition, all individual identities will be kept anonymous, which means no one, not even the research team, will know what your answers or responses are. Instead, all participants will be assigned a pseudonym, and the final data analysis will describe the group rather than a person. You may also choose to withdraw from the study at any time without repercussions.

Obviously, since this is a small school, others at the school might know if you are participating. Because of this, I cannot promise that your participation or what you say will remain completely private, but I will ask that you and all other school members respect the privacy of everyone participating.

There is not any compensation for participating in the study. However, your participation helps to contribute to the body of knowledge about the value beliefs of teachers of dyslexic students and how one-to-one devices can impact instructional practices.

I will be happy to answer any questions you have about the study. You may contact me at 864-918-9582 or dirwin@email.sc.edu or my faculty advisor, Dr. William Morris, 803-777-3827 or morrisws@mailbox.sc.edu.

Thank you for your consideration. If you would like to participate in this study, please sign the bottom portion of this letter. When you are done, please return the letter to me in person or send an electronic copy to me.

I appreciate your time,

Deborah Irwin
Doctoral Student
University of South Carolina

I am willing to participate in the research project focused on teacher beliefs of one-to-one devices.

Printed Name: _____

Participant's Signature: _____ Date: _____

APPENDIX B

Construct/Questions for VBTI

Construct/Question	Source	VBTI Question
Role of Technology for Teaching/Learning		
"Teacher perception of their capabilities and skills required to integrate technology into their classroom instruction" (p. 141).	Inan & Lowther, 2010	I believe technology is an important tool in the teaching-learning process.
"Mastery of key subjects and 21st century themes is essential to student success."	Battelle for Kids, 2019	I believe the use of devices in the classroom prepares students for future application of technology.
"The integration of technology has positively impacted student learning and achievement."	TTQ	I believe one-to-one devices positively impact the learning environment.
"The integration of technology has positively impacted student learning and achievement."	TTQ	I believe one-to-one devices can be used effectively to build academic skills.
Use of assistive technology	Anderson & Putman, 2019; Shaywitz et al., 2008	I believe technology can serve as assistive devices for learning for students with disabilities.
"Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations."	ISTE, 2022	I believe technology assists students in learning complex concepts.

“Initiative and self-direction" “Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.”	Battelle for Kids, 2019; ISTE, 2022	I believe students are more motivated to learn when using one-to-one devices.
“Critical thinking and problem solving” “Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.”	Battelle for Kids, 2019; ISTE, 2022	I believe one-to-one devices can promote higher-level thinking in students.
“Creativity and innovation” “Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.”	Battelle for Kids, 2019; ISTE, 2022	I believe one-to-one devices enable students to be more creative during the learning process.
“Students use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.” “The use of computers has increased the level of student interaction and/or collaboration.”	ISTE, 2022; TTQ	I believe one-to-one devices enable students to collaborate with peers.
Self-Efficacy		

"My computer skills are adequate to conduct classes that have students using technology."	TTQ	I believe I have the technology skills needed to utilize one-to-one devices effectively in my teaching.
"I am able to align technology use with my district's standards-based curriculum."	TTQ	I believe I am able to select technology tools which best align with the curriculum standards.
Barriers		
"Teacher perception of their capabilities and skills required to integrate technology into their classroom instruction" (p. 141). "I have received adequate training to incorporate technology into my instruction."	Inan & Lowther, 2010; TTQ	I believe I was provided with sufficient training to effectively use my technology resources for instruction.
"Teachers' perception on adequacy of technical support, availability of resources, and assistance with computer software and troubleshooting" (p. 141). "I can readily obtain answers to technology related questions; Materials (e.g., software, printer supplies) for classroom use of computers are readily available."	Inan & Lowther, 2010; TTQ	I believe I have access to resources and personnel to support technology integration.

APPENDIX C

VALUE BELIEFS OF TECHNOLOGY INTEGRATION

Directions: Select the response which best describes your level of agreement.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I believe technology is an important tool in the teaching-learning process.					
I believe the use of devices in the classroom prepares students for future application of technology.					
I believe one-to-one devices positively impact the learning environment.					
I believe one-to-one devices can be used effectively to build academic skills.					
I believe technology can serve as assistive devices for learning for students with disabilities.					
I believe technology assists students in learning complex concepts.					
I believe students are more motivated to learn when using one-to-one devices.					
I believe one-to-one devices can promote					

higher-level thinking in students.					
I believe one-to-one devices enable students to be more creative during the learning process.					
I believe one-to-one devices enable students to collaborate with peers.					
I believe I have the technology skills needed to utilize one-to-one devices effectively in my teaching.					
I believe I am able to select technology tools which best align with the curriculum standards.					
I believe I was provided with sufficient training to effectively use my technology resources for instruction.					
I believe I have access to resources and personnel to support technology integration.					

APPENDIX D

TECHNOLOGY OBSERVATION TOOL

Teacher Name _____ Grade Level _____ Content Area _____
Date _____ Start Time _____ End Time _____
Directions: After completing the information above, mark the technology item(s) observed in each category within a single class visit.

Teacher Usage				Student Usage			
Classroom Procedures				Classroom Procedures			
	Attendance				Recording assignments		
	Assignment submission				Digital notebook		
	Communication				Communication		
	Desktop		Document		Text-to-speech		Dictionary/Thesaurus
	Laptop		Presentation/Slides		Speech-to-text		Magnifier
	Projector		Simulations		Highlighting tool		Other: _____
	Interactive whiteboard		Video				
	A/V conference		Web 2.0	Grouping			
	Mobile device				Independent		Small group
					Pair		Whole class
				Technology Usage			
	Direct Instruction				Writing		Presentation/slides

	Project based learning				Audio recording		Video recording
	Cooperative learning			Technology purpose			
					Drill/Practice		Research
					Collaboration		Creative
					Assessment		

APPENDIX E

INDIVIDUAL INTERVIEW QUESTIONS

- In general, what role do you believe technology plays in the teaching and learning process? RQ1a
- What role do you believe technology plays in the teaching and learning process for students with dyslexia in particular? RQ1a
- How had you used technology in your classroom prior to the one-to-one initiative? Can you provide some examples? R1a, RQ2
- In what ways would you say your use of technology for instruction changed as a result of one-to-one devices? RQ1a, RQ1b, RQ2
- What impact, if any, did the transition to online instruction due to COVID-19 last spring have on your perception of one-to-one devices? RQ1b
- If I were to step into your class, how would I see students using one-to-one devices? RQ2, RQ3
- How have you integrated one-to-one devices into classroom instruction? RQ3
- What are some learning activities or instructional strategies you have tried since the one-to-one initiative began? Can you explain their impact? RQ2, RQ3
- Have you tried any new or novel activities due to the availability of technology? If so, what has that been and what has been the response of students? RQ3
- In what ways would you say one-to-one devices have supported learning for the dyslexic student? RQ 2

- How do you feel one-to-one devices impact academic achievement for those with dyslexia? RQ1a
- How do you feel about dyslexic students using one-to-one devices as assistive technology? RQ1a
- What are some ways your students have used one-to-one devices as assistive technology? RQ1a, RQ3
- How would you describe the impact of one-to-one devices on the learning environment and student engagement? RQ1a, RQ2
- What technology tool or resource would you want to incorporate into your instruction in the future, and why? R1a, RQ2

APPENDIX F

SITE APPROVAL

From: [redacted]
Subject: Re: Descriptive Research Study
Date: November 4, 2020 at 8:57:15 AM EST
To: Debbie Irwin <dairwin33@gmail.com>
Cc [redacted]

Debbie,
Yes, please proceed with the study.
Thanks,
[redacted]

Sent from my iPad

On Nov 3, 2020, at 16:39, Debbie Irwin <dairwin33@gmail.com> wrote:

[redacted]

If you remember, I met with you back in the Spring of 2020 to see if I could conduct my dissertation study at [redacted]. I want to thank you for the time you and your faculty have given me already to provide background information including detailed information about your faculty, computer usage at the school, and the one-to-one initiative which began at the beginning of this school year.

My study will describe the implementation of the one-to-one device initiative in middle school at [redacted]. The study's aim is to answer the following questions: 1). What are the teachers' beliefs about one-to-one devices for students with dyslexia? 2). How did the value beliefs related to the importance of technology integration in the learning process change after the one-to-one initiative was implemented? 3). How does the value a teacher holds toward the use of devices with dyslexic students affect their integration of one-to-one devices in the classroom? 4). How did teachers integrate devices during the instruction of dyslexic students?

Data for the study will be gathered during the Spring of 2021. The study will focus on middle school subject area teachers, although tutorial teachers are welcomed to participate as well. Participation in the study is purely voluntary in nature, and teachers can withdraw from the study at any time. Participants will be asked to complete a researcher developed survey and participate in two focus groups. Five teachers, one from each content area, will be asked to be interviewed individually. In addition, I will conduct classroom observations and review lesson plans in order to describe how teachers are integrating one-to-one devices in their classrooms. The mixed methods data collection and analysis process will seek to maintain confidentiality of the data and ensure anonymity of individual faculty members.

I have been working with my dissertation advisor at the University of South Carolina concerning this descriptive study. I am looking forward to discovering how teachers with specialized training in Orton-Gillingham principles integrate one-to-one devices for students with dyslexia. I believe this study will be very insightful, and I am very thankful to be sharing the experience of [redacted] with others.

At this time, I am seeking your written approval and support for this study as the Head of School. Please let me know if you would like me to answer any questions. Once I have approval from the IRB at UofSC, I will be glad to provide you a copy of it along with what I have written so far on my dissertation.

Many Thanks,
Debbie Irwin

APPENDIX G

IRB APPROVAL

OFFICE OF RESEARCH COMPLIANCE

INSTITUTIONAL REVIEW BOARD FOR HUMAN RESEARCH
APPROVAL LETTER for EXEMPT REVIEW

Deborah Irwin
1705 College Street
Close-Hipp Suite 552
Columbia, SC 29208 USA

Re: **Pro00105837**

Dear Mrs. Deborah Irwin:

This is to certify that the research study ***TEACHERS' VALUE BELIEFS OF ONE-TO-ONE DEVICES: A DESCRIPTIVE STUDY OF TECHNOLOGY INTEGRATION AT A MIDDLE SCHOOL FOR DYSLEXIC STUDENTS*** was reviewed in accordance with 45 CFR 46.104(d)(2) and 45 CFR 46.111(a)(7), the study received an exemption from Human Research Subject Regulations on **11/12/2020**. No further action or Institutional Review Board (IRB) oversight is required, as long as the study remains the same. However, the Principal Investigator must inform the Office of Research Compliance of any changes in procedures involving human subjects. Changes to the current research study could result in a reclassification of the study and further review by the IRB.

Because this study was determined to be exempt from further IRB oversight, consent document(s), if applicable, are not stamped with an expiration date.

All research related records are to be retained for at least three (3) years after termination of the study.

The Office of Research Compliance is an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB). If you have questions, contact Lisa Johnson at lisaj@mailbox.sc.edu or (803) 777-6670.

Sincerely,

Lisa M. Johnson
ORC Assistant Director and IRB Manager