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A Comparative Study of Three Approaches for Enhancing Teaching Knowledge of Dyslexia

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A Dissertation Submitted to

The Faculty of The Annsley Frazier Thornton School of Education

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Dissertation directed by

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Professor Annsley Frazier Thornton School of Education

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can never fully express my gratitude. We have walked this path together. You joked that you should get the D of my PhD, and if I could, I would share it with you.

Dedication

I dedicate my dissertation to all the people who struggle. You are amazing, and when you don't believe in yourself, know that someone out there does! Never give up. Read this quote by Orison Swett Marden and take it to heart, "Success is not measured by what you accomplish, but by the opposition you have encountered, and the courage with which you have maintained the struggle against overwhelming odds." You can do it. I believe in you.

Abstract

Teachers are the foundational component of the education system. Annually, they are required to engage in professional development opportunities to expand their knowledge. Since 1985 there has been a profusion of legislative attention to the reading disability dyslexia. Included in legislation is the mandate for teacher training, but there is a lack of research on effective professional development to increase teacher knowledge of dyslexia. This study compared three models of professional development to assess their efficacy in increasing declarative knowledge of dyslexia for elementary general education teachers. The results indicated that the use of simulation training alone was less effective at increasing teachers' knowledge than using lecture training or a mixed-method training which includes both lecture and simulation. Because of limitations in funding and time available to train teachers, this study could be helpful in considering options for training teachers about dyslexia.

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Chapter 1- Introduction to the Study

Teachers, the foundational component of the educational system, need to continually expand their knowledge and skills, and implement the best educational practice, in order to be as effective as possible (Jacob & Lefgren, 2002). Additionally, they must be familiar and comply with ever-changing federal and state mandates regarding educational standards (Beavers, 2009). In the fall of 2015, a new federal guideline was passed in education – the Every Student Succeeds Act (ESSA) – which defined professional development as a tool to increase student achievement, both socially and academically. Section 2103 of the law explains that schools should be "providing high-quality, personalized professional development that is evidence-based" (ESSA, 2015). Teachers who engage in professional development focus on the skills needed to address students' major learning challenges (Mizell, 2010). In general, professional development offers collaborative support and training to increase knowledge of skills, standards, and current legislation, all of which ultimately improve the quality of the education students receive (Hawley & Valli, 1999). However, for many teachers, professional development is seen more as meeting a compliance exercise than a learning activity. Stakeholders agree that professional development decisions are rarely made on rigorous evidence of effectiveness (Gates, 2014).

Awareness of the characteristics of dyslexia within educational stakeholders is increasing, and mandatory teacher training on this topic is being included in legislation across the country (Decoding Dyslexia, 2013; H.R. 3033: READ Act, 2016). Although the International Dyslexia Association (IDA) continues to publish articles and fact sheets to inform professionals about dyslexia, there is little research to measure the efficacy of their methods

(IDA, 2013; Northern California Branch of IDA, 2008; Wadlington, Elliot, & Kirylo, 2008). To supplement current awareness efforts and legislative actions, an investigation of available professional development models regarding knowledge of dyslexia is imperative.

Current research has revealed that teachers are often uninformed about the numerous potential manifestations of dyslexia (Bos, Mather, Dickson, Podhajski, & Chard, 2001; Cunningham et al., 2004; Joshi, Binks, Hougen et al., 2009; McCutchen, Abbott et al., 2002; Moats & Foorman, 2003; Spear-Swerling & Brucker, 2003; Wadlington & Wadlington, 2005). Washburn (2008) revealed that teachers have several misconceptions about dyslexia. For example, findings from her study supported the research that teachers have a misconception that the core deficit in dyslexia is visual rather than phonological. As a result, there is an increased probability of misunderstandings and ineffective instructional practices when working with children who have this unique learning difference (Wadlington et al., 2008).

Many educator preparation programs have addressed dyslexia only in broad terms, if at all (Bos, Mather, Dickson, Podhajski, & Chard, 2001; Gwernan & Burden, 2010). According to some experts, extant teacher-training programs do not provide adequate opportunities to become proficient in educating children with dyslexia (Jobling & Moni, 2004; Smith & Tyler, 2011). As a result, according to the National Institute for Child Health and Human Development (NICHD) (2000), many teachers have not had the instruction and practice necessary concerning the structure of the English language, development of reading, and use of assessment and remediation for students with reading difficulties. Explicit teaching, using systematic multisensory instruction, is an important factor for learning to take place (National Reading Panel, 2000; Shaywitz, 2003). However, many educators do not feel competent to teach students

with dyslexia (McCray & McHatton, 2011). Wadlington and Wadlington (2005) surveyed educators within the elementary school setting and found that 88% of teachers felt their education did not prepare them to work with students with dyslexia. Using the Dyslexia Belief Index, results showed that all types of educators (i.e., elementary, middle school, and high school general education teachers; special educators; school counselors and administrators) had a poor understanding of dyslexia (Wadlington & Wadlington, 2005). While comparing groups, the research showed that elementary teachers had the highest understanding, followed by school administrators, school counselors, and then special educators (Wadlington & Wadlington, 2005). Because dyslexia is a reading difference that is remediated through proper instruction, it is important for all teachers to have an understanding of the characteristics of dyslexia and how it impacts the student's ability to process language (IDA, 2007).

Grassroots parent movements and state and federal legislatures with a passion for the topic have influenced the critical need for teacher knowledge of dyslexia (DD, 2013; H.R. 3033: READ Act, 2016). Although expansion has been slow, 34 states have set initiatives or legislation in place related to dyslexia (Youman & Mather, 2015). One of the most recent instances of legislation has been the Research Excellence and Advancements for Dyslexia Act (H.R. 3033). This was signed on February 18, 2016 at the federal level (H.R. 3033: READ Act, 2016). Legislation passed in the time period since 2011has focused on five main areas: a) dyslexia awareness; b) pilot programs for screenings and interventions; c) teacher training, d) provision of interventions and accommodations; and e) overall legal rights of individuals with dyslexia. Every legislative action has included teacher training, yet there have been no guidelines outlining either the specific training to be provided or pinpointing those models found to have been the most effective in increasing teacher knowledge about dyslexia. Mizell (2010) notes the

disconnect between legislation and policy implementation, stating that policy makers have a responsibility to ensure that educators engage in continuous professional development. The purpose of the continuance of education should be to provide accurate knowledge, usable by teachers in their everyday pedagogical practices, as they work toward increasing student achievement.

Various dyslexia training models, including simulation and information presentations, are sold nationally even though there is limited data on their effectiveness in increasing teacher knowledge (NCBIDA, 2008; IDA, 2013). One type of training is simulation training, which provides teachers with a hands-on experience, allowing them to feel some of the frustrations that a person with dyslexia might routinely experience (NCBIDA, 2008). Leko et al. (2012) did an evaluation of 93 studies, published throughout 14 peer-reviewed educational journals, to evaluate teacher training models for special educators. According to the comprehensive review, training programs that included simulations produced promising results at the preservice level (Leko et al., 2012). Many other professional development models have been developed using information from dyslexia research – through presentation via PowerPoint, video, or lecture (IDA, 2013; Nessy, 2015; Learning Ally, 2015). The current education legislation, ESSA, requires professional development to be evidence-based (ESSA, 2015). Shortly following the passing of ESSA, the READ Act 3033 was signed into law, requiring that a line item in the national budget be set aside for research in the area of dyslexia that includes professional development for teachers and administrators (USDOE, 2016).

Currently, professional development (PD) is a very broad term with many limitations; the cost to provide the training, time for teachers to be away from the classroom, and overall

effectiveness (Hess, 2013; Sawchuk, 2010; The New Teacher Prpject, 2015). An extensive review of current professional development models resulted in only nine of 132 studies on PD meeting the evidentiary standards established by the Department of Education's What Works Clearinghouse (Institute for Education Sciences; What Works Clearinghouse, 2016). There is little evidence that the PD evaluated was effective or valid, however a small portion of the overall training, correlates with student gains, consisting of thirty to one hundred hours of teacher time (Hess, 2013). When asked about time spent on PD, a professor of education policy noted "We are locked into traditions of how we use time, and we allocate it to districts in ways that may be unproductive" (Sawchuk, 2015 p.4).

The New Teacher Project organization in a study of 127 school districts found that the majority of teachers spent an average of 17 hours per month equating to 150 hours per school year on mandated and voluntary training opportunities (2015). After teaching a decade, a teacher will have spent the equivalent of one school year on training alone (TNTP, 2015). Time allotted training teachers increased the overall cost of providing the professional development. A district in Philadelphia spent an addition $41 million when they calculated the time set aside in the district calendar for mandated professional learning (TNTP, 2015).

Cost is another substantial factor that is often unable to be evaluated in the equation of "effective" when looking at teacher professional development (Knowledge Delivery Systems, 2010). Often, districts and states cannot define exactly how much funding is allocated for teacher training. While line items in a budget may list staff development, that budget often does not account for salaries, facilities, fees, substitutes, stipends, materials, travel and more (KDS, 2010). The "Mirage" by TNTP stated that when all factors of cost associated with teacher

training are compiled, the 127 school districts in their study spent an average of $18,000 per teacher, each year (TNTP, 2015). Current experts on teacher training are urging districts to focus professional development, discern how the money is being used , and whether those patterns of spending align with goals for teacher or student improvement (Sawchuk, 2010). Professional development can be an exercise that is costing time and money with very little reward until it is being used as a problem-solving tool (Hess, 2013).

This study will provide some insight into models of professional development in terms of their efficacy in increasing declarative knowledge of dyslexia for general education teachers at the elementary level. Various training modules will be tested with groups of practicing educators to evaluate which is most effective in improving teacher knowledge about dyslexia. The models chosen took into account cost and time to deliver trainings on a small and large scale.

Purpose of the Study and Research Questions

The purpose of this quantitative study is to investigate the effectiveness of two currently available dyslexia training activities in increasing teachers' knowledge about dyslexia and characteristics of students with dyslexia. This study will provide insight as to the following research question: Is there a significant difference in knowledge acquisition regarding dyslexia definitions and characteristics, amongst groups of teachers trained with simulation only, lecture only, or trained with a mixed-method approach (i.e. simulation and lecture)? The first hypothesis is that teachers who receive the mixed-method training will demonstrate statistically significant greater knowledge overall. A second hypothesis is that teachers who receive lecture only training will have a statistically significant higher increase in knowledge than those receiving simulation only.

Significance of the Study

Although states continue to pass legislation mandating teacher training, there is a limited amount of research evaluating professional development models for increasing teacher knowledge of dyslexia (Hill; 2009; Moats, 2009). The ESSA explains that any professional training that is being provided must be effective. For example, it should increase teachers' awareness of the manifestations of dyslexia, guide them in screening for this reading difference, and enable them to provide the systematic multisensory interventions recommended for students with dyslexia. In addition, schools have a limited amount of time and money to provide training to teachers making the term “effective” be limited to training that fits the constraints of the current school system. This study evaluated three models of professional development, to inform educational institutions about the link between training models and increased teacher knowledge, and to assist them in choosing a professional development method that is effective in increasing declarative knowledge of dyslexia.

Conceptual Framework

Research has recommended that in order for students with dyslexia to learn to read, the teacher must understand both the correct approach, and just as importantly, why using that instructional support is necessary (Lyon, 2003; Shaywitz, 2003). Lee Shulman (1986) proposed a Pedagogical Content-Knowledge (PCK) framework that blends content and pedagogy into a transformative teaching method. PCK is concerned with how concepts are represented and formulated; the pedagogical techniques used within the classroom; knowledge of what makes concepts difficult or easy for students to learn; awareness of students’ prior knowledge; and their own awareness of epistemology (Rowan et al., 2001). PCK provides teachers with an

understanding of alternative ways of meeting the needs of learners with various abilities. Research supports the importance of early intervention for students with dyslexia and states that children who receive help immediately when they begin to display difficulty are often protected from more serious problems later on (Brady & Moats, 1997; Lyon, 2003; Shaywitz, 2003, 2014). Teachers who have an understanding of PCK framework may be more aware of alternative ways of meeting the variety of learners within their classroom. Clark and Uhry (1995) propose that individuals with dyslexia are usually relieved when educators understand their problem, thereby differentiating instruction. Teachers who have a strong PCK can represent and formulate the subject to make it comprehensible to *all* students (Shulman, 1986).

Malcolm Knowles (1980) recognized that adults learn differently than children. To teach adults new information, the theory of andragogy is applicable. Andragogy is based upon four assumptions, differing from those of traditional pedagogical teaching: 1) changes in self-concept; 2) the role of experience; 3) readiness to learn; and 4) orientation to learning. The andragogical model is a process model that allows for transformation of knowledge through provision of resources and procedures to assist learning and acquiring information. The learner takes an active role in acquiring knowledge through experiential, contextual, and elective learning. Changes to legislation requiring teacher training about dyslexia should adhere to the theory of andragogy. Zepeda (2013) explains the importance of looking through the lens of andragogy when evaluating an effective professional development, with the goal of simultaneously improving skills and increasing knowledge. The transformation of knowledge described by Knowles (1980) is later quantified by measuring an increase in knowledge, defined by Zepeda (2013).

Methodology

This particular study took place in an elementary public school setting. Fifty-eight elementary general education teachers volunteered to attend one of six training sessions that provided one of three treatment options. Treatment group one participated in a two-hour simulation training, using “Experience Dyslexia” (NCBIDA, 2008). Treatment group two received a two-hour training, using a PowerPoint presentation created from the International Dyslexia Association’s “Dyslexia in the Classroom: What Every Teacher Needs to Know” (IDA, 2013). Treatment group three attended a two-hour training, using a condensed version of trainings one and two.

All participants completed a pre-test immediately prior to treatment and a post-test afterwards. The assessment measure was derived from the “Teacher Knowledge of Basic Language Constructs of Literacy” (Binnks-Cantrell, Joshi & Washburn, 2012). Additional questions, drafted by this author, were added to create a measurement that assessed knowledge specific to dyslexia, as well as strategies for teaching. The assessment has been tested on a sample group, with a factor analysis completed to determine the instrument’s validity and reliability. A repeated-measures ANOVA was used to measure change in raw scores between the participants pre- and posttests. The “before and after” results of each group were compared, in an effort to determine the training affording the greatest raw score increase of knowledge.

Limitations

When evaluating the results, limitations were present. The sample size was small, and not able to be generalized beyond the measured groups. Participants were volunteers, rather than

teachers mandated to attend a professional development. Gender and race of participants was not collected or evaluated. This study was not designed to measure the long-term instructional effects on teachers, nor did it measure retention of the concepts, for any period of time following the session. Furthermore, the study did not document the impact of training on classroom instruction.

Professional development credit was offered to the participants who volunteered for this study. Random assignment was limited, because the training dates offered were predetermined, and based upon prior approval of school district administrators. The dates and times of trainings were posted online, and participants were blind to the treatment to which they were assigned. Training took place in an urban area of the Midwest and was offered over the summer, limiting teacher involvement, or availability for training, to a specific regional area or day.

Definition of Terms

Dyslexia. Dyslexia can be defined as a specific learning disability that is neurological in nature, and characterized by an unexpected phonological deficit (Ferrer, Shaywitz, Holahan, Marchione, & Shaywitz, 2010). Typical manifestations of dyslexia include poor spelling, difficulties with decoding, and challenges with fluent word recognition (IDA, 2002; NICHD, 2000). These challenges can lead to deficits with reading comprehension, vocabulary, and related knowledge (IDA, 2002; NICHD, 2000).

Special Education. Special education is the delivery of specially-designed instruction to meet the needs of a child with a learning or physical disability (IDEA, 2004). The content, methodology, or delivery of instruction, should be adapted to meet the individual needs of a

child. This specially designed instruction ensures the child's access to the general curriculum so that he or she can meet the educational standards that apply to all children within the jurisdiction of the public agency (IDEA, 2004).

Professional Development. Teacher training, often labeled as professional development, is a variety of specialized training, formal education, or advanced professional learning intended to help administrators, teachers, and other educators expand their professional knowledge, competence, skill, and effectiveness. It can vary in duration and may be provided online or in person, oftentimes by an expert in the field of interest. (Kutner et al., 1997; USDOE, 2015).

Knowledge. Knowledge consists of facts, information, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject (Merriam-Webster, 2015). In this study, a change in what is referred to as declarative knowledge is measured by an increase in correct answers (raw score) when comparing a pre- and post-assessment on the subject of dyslexia.

CHAPTER 2- Literature Review

Shaywitz, (1998) indicated in a study about the organization of the reading brain, that dyslexia is one of the most common problems affecting children learning to read. This finding has been supported by later research (IDA, 2016; Moats et al., 2010; Shaywitz, 2014). Shaywitz (1998) estimated the prevalence rate for dyslexia in school-aged children to range from 5% to 17.5% of the general population. Of the population of students identified with a reading disability, under the Individuals with Disabilities Act (IDEA), Shaywitz contended that 80% of the students exhibit characteristics indicative of dyslexia (Shaywitz, 1998). The most common cause of academic underachievement lies in a difficulty to read (IDA, 2010). In 2015, the U.S. Department of Education reported that 64% of fourth graders and 66% of eighth graders scored at the basic level or below, in reading, signifying that they had not acquired the skills necessary to perform grade-level reading tasks (NCES, 2015). Children gave up, rather than learning to read, which resulted in harsh consequences – not only for the dyslexic child, but for our country (Shaywitz, 2014).

Although dyslexia is a neurological difference, informed and effective classroom instruction can greatly mitigate the severity of the problems associated with it (IDA, 2010). However, most teachers lack awareness and information specific to learners with dyslexia (Brownell et al., 2009; Carlisle, Correnti, Phelps, & Zeng, 2009; Carlisle, Kelcy, Rowan, & Phelps, 2011; Washburn, Joshi, & Binks-Cantrell, 2011b). A lack of knowledge, coupled with misconceptions, can contribute as much as biological factors to the observed reading and writing difficulties of individuals with dyslexia (Berninger, Nagy, Richards & Raskind, 2008; Shaywitz, 2014; Worthy et al., 2016).

Reading

In 1998, the National Institute of Child Health and Human Development launched a research program, led by Dr. Reid Lyon, to elucidate how children learn to read, determine why some have difficulty learning, and identify effective ways to help them learn effectively. Among the noteworthy findings was the fact that at least 10 million children in America had not developed appropriate skills to utilize reading as a method for learning (Lyon, 1998). Lyon (1998) also noted that children did not have the capacity to read for enjoyment. According to the research, reading is not a natural process; it requires systematic and explicit instruction. The level of explicitness varies, with some children requiring more direct instruction than others (Lyon, 1998; Rayner, Foorman, Perfetti, Pesetsky, & Seidenburg, 2001; Wise, Ring & Olson, 1999, 2000).

Lyon (1998) also asserted that learning to read can begin before a child enters school, as reading is directly correlated to the frequency and quality of early language and literacy interactions (Law & Ghesquiere, 2016; Strom & Neuman, 2016). Exposure to oral reading and language-play activities, such as rhyming, is crucial to the development of phonemic awareness, a lack of which can be an indicator of dyslexia (Masland & Masland, 1988; Torgesen, 2002). In order to develop reading skills, one must acquire phonemic awareness and other phonological processing skills. Once these skills are acquired, a reader must also be able to apply them accurately, fluently, and automatically (Catts, Fey, Zhang, & Tomblin, 2001; Lyon, 1998; Scarborough, 1998a, 1998b; Wagner, Torgesen & Rashotte, 1994).

Dyslexia

Shaywitz (2003) described reading as a "code" that all persons, regardless of who they are, must find a way to transform from print into a neural format (code) that the brain can decipher. Learning to read encompasses two major components: decoding and comprehension (Hoover & Gough, 1990). One of the very first discoveries a child makes on his way to reading is the realization that spoken words have parts (Lyon, 2006; NICHD, 2000). As a child progresses, he or she learns that those parts are represented by written letters – and the process of decoding begins. An inability to read and spell presents significant roadblocks to children's educational progress (NICHD, 2000; Shaywitz, 2003). Furthermore, even if they receive proper instruction and are motivated to learn, some children have difficulty learning the skills needed to read even the most basic words (Shaywitz, 2003; Shaywitz, 2015).

Most definitions of dyslexia refer to either a discrepancy between observed and expected achievement, or to a discrepancy between reading and listening comprehension (Shaywitz, Fletcher & Shaywitz, 1995). Researchers have ongoing difficulty in asserting the existence of dyslexia and its prevalence (Moats & Dakin, 2008; Shaywitz, 1995). Some school administrators, teachers, parents, and even expert professionals refuse to discuss dyslexia as a cause of reading difficulty because of the lack of consistent research (Moats & Dakin, 2008, Tonnesen, 1997). The World Federation of Neurology, however, defines dyslexia using a causality approach, whereby someone may have dyslexia if he or she has difficulty reading even in the presence of factors such as adequate intelligence, conventional instruction, and social cultural origin (Critchley & Critchley, 1978; Galaburda, Sherman, Rosen, Aboitiz, & Geschwind,1985). Nevertheless, there is more agreement about what is unknown about dyslexia

than what is known (Worthy et al., 2016). Such a controversy makes it difficult to come to a consensus in defining dyslexia, often resulting in delays for students and adults in need of proper intervention.

The term *dyslexia*, morphologically, has two parts: *dys*, signifying *not* or *difficult*, and *lexia*, meaning *words, reading*, or *language*. Literally, dyslexia means *a difficulty with words*. This definition creates a nuance between a student who is struggling to read and a student who has a neurological difference that impairs the ability. Dyslexia is a reading difficulty that does not occur as a consequence of inadequate intelligence; lack of motivation; poor instruction; vision or hearing problems; cultural disadvantages; or other extrinsic factors. Rather, it is a genetic, neurologically-based disorder, where an individual has atypical brain structure and/or function. Because dyslexia is genetic, it can be inherited. It does not have a medical or educational cure (British Medical Journal, 1975; International Dyslexia Association, 2010, 2012; Lerner, 1971; Lyon, 1998; NICHD, 2000; Shaywitz, 2003, Tonnessen, 1997), but the reading difficulties can be mitigated, with appropriate educational intervention.

The earliest published observation of dyslexia took place in 1696, when a German physician, Dr. Johann Schmidt, published notes on a person with perceived reading difficulties (Shaywitz, 2003). In November of 1896, Dr. W. Pringle Morgan, an English physician, described the condition he called “congenital word-blindness” in a fourteen year-old boy who presented extreme reading difficulties, in spite of good arithmetic abilities. That same year, the British Medical Journal attributed a neurobiological etiology to congenital word-blindness (Morgan, 1896). Since then, the condition has been extensively studied, and the term "word blindness” has evolved into the term dyslexia (Shaywitz, 2003). It is most probably the result of a genetically

programmed error in the brain, whereby the neural system necessary for phonologic analysis takes an alternate neural pathway. There is neurological evidence for dyslexia using functional MRIs. Shaywitz (2003) discovered that individuals with dyslexia, when reading, exhibit under-activation of neural pathways in the brain, and externally present a phonologic impairment of spoken and written language.

The Individuals with Disabilities Education Improvement Act (2004), the Americans with Disabilities Act (ADA, 1990), and Section 504 of the Rehabilitation Act (1973) are federal laws that can support individuals with dyslexia. Although not specifically mentioned in IDEA (2004), it is cited as one type of specific learning disability – in Title 1/A/602 (30). Under IDEA and its implementing regulations, specific learning disability is defined, in part, as "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, write, spell, or do mathematical calculations, including conditions such as...dyslexia…." (IDEA, 2004). The International Dyslexia Association (IDA) has adopted the definition of dyslexia, published by Lyon et al. (2003), as the accepted one, at most state levels. It states:

> Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (para. 1, International Dyslexia Association, 2007)

Dyslexia affects individuals throughout the lifetime and can vary considerably from one individual to the next. The severity, duration, responsiveness to treatment, and co-morbid

conditions can also be divergent. Dyslexia is classified as a disability because it is not easy for a student with the condition to succeed academically in an instructional environment without additional support. When dyslexia has an adverse impact on education, a student will often qualify for special education services and receive extra support services and/or special accommodations (Catts & Kamhi, 1999; IDA, 2007; Shaywitz, 2003).

While various states in the US include dyslexia under the umbrella of a specific learning disability, the diagnostic term often remains unspecified in the Individual Education Plan (IEP; Colker, 2012), thus delaying appropriate interventions and, in some cases, creating lifelong issues (Lyon, 1996; Wadlington et al., 2008). In October of 2015, The Office of Special Education (OSEP) and Rehabilitative Services published a "Dear Colleague" article to clarify "…that there is nothing in the IDEA that would prohibit the use of the terms dyslexia, dyscalculia, and dysgraphia in IDEA evaluation, eligibility determinations, or IEP documents" (OSEP, 2015, p. 1). The OSEP encouraged states to review their policies, procedures, and practices to ensure that the use of the term dyslexia is not prohibited. The letter also informs local educational agencies of the importance of addressing the unique educational needs of children with a specific learning disability attributable to dyslexia (OSEP, 2015).

Teacher Knowledge

Dyslexia is not a condition that is medically curable; however, neurological pathways can be altered to allow a person to develop the skills needed to read effectively. Those who are identified and who receive appropriate instruction make more academic progress than those who are not identified, or are not taught using a systematic, multisensory, instructional method (Sanders, 2001). Teachers need to understand that dyslexia impacts individual children

differently; some will need more intensive instruction than others (IDA, 2007). For many children who struggle with reading, the problem lies at the basic word level (Scaborough, 2003; Siegel, 2004). Difficulty with word recognition can be attributed to a lack of understanding of the basic alphabetic and phonologic principles (Liberman & Liberman, 1990; Liberman, Shankweiler, & Liberman, 1989; Snow et al., 1998). A growing body of research has evaluated the connection between reading difficulties, such as dyslexia, and teacher knowledge of basic language constructs (Bos et al., 2001; Cunningham, Perry, Stanovich, & Stanovich, 2004).

Research has been conducted over the past 15 years to measure teachers' knowledge of dyslexia and their understanding of the basic language constructs needed to intervene with struggling readers (Bos, Mather, Dickson, Podhajski, & Chard, 2001; Cunningham et al., 2004; Joshi, Binks, Hougen et al., 2009; McCutchen, Abbott et al., 2002; Moats & Foorman, 2003; Spear-Swerling & Brucker, 2003; Wadlington & Wadlington, 2005). The seminal work regarding teacher knowledge specific to dyslexia was done by Moats, in 1994. A survey instrument entitled *The Informal Survey of Linguistic Knowledge* was used to determine the specificity and depth of teachers' awareness of specific language elements, such as morphemes and phonemes, and the manner in which they were represented in writing (Moats, 1994). Participants included reading, classroom, and special education teachers; speech-language pathologists; teaching assistants; and graduate students. They were asked to define terms; locate or give examples of phonic, syllabic, and morphemic units; and analyze words into speech sounds (Moats, 1994). Results indicated that, while teachers may have been literate, experienced, and well-educated, many lacked the essential knowledge of the language elements and structure needed to explicitly teach beginning readers, as well as that needed to assess and remediate struggling readers (Moats, 1994). Specifically, the survey highlighted a lack of teacher

knowledge in (a) phonology; (b) morphology; (c) orthography; and (d) syllabication. Most teachers were unable to identify the number of phonemes in a word, and only 10% to 20% were able to consistently identify consonant blends in written words (Carreker, Joshi & Boulware-Gooden, 2010; Moats, 1994). These results were indicative of the teachers' lack of knowledge essential to explicitly teach the skills necessary to address the needs of students with dyslexia.

The IDEA 2004 specifically addressed the need for highly-qualified special education teachers. However, it did not ensure that all teachers working with individuals with dyslexia were prepared to provide the explicit, systematic, and multisensory reading instruction so beneficial to students with dyslexia (Washburn, Binks-Cantrell & Joshi, 2014). Oftentimes, teachers are ill-informed about possible multiple manifestations of dyslexia within a classroom setting, which leads to misunderstandings and ill-advised instructional practices, affecting children who have this unique learning difference (Wadlington et al., 2008).

Wadlington and Wadlington (2005) found that only a small proportion of newly-qualified teachers had any clear idea as to how to provide help and support to students with dyslexia. A lack of information about disabilities can have a potential damaging effect on teacher self-efficacy (Palmer, 2011; Woolfson & Brady, 2009). Bos et al. (2001) revealed that many teachers were not cognizant of the fact that individuals with dyslexia were present in the classroom. Additionally, Wadlington and Wadlington (2005) found that teachers felt unqualified to deal with individuals with dyslexia.

Training

Teacher education is an ongoing and lifelong process that only begins with initial certification. Experienced teachers need additional appropriate training, as their careers progress (National Reading Panel, 2000; Spear-Swerling & Bricher, 2003; Wadlington & Wadlington, 2005). IDA (2010) found that the majority of practitioners at all levels were ill-prepared to sufficiently prevent reading problems; to recognize early signs of risk; or to successfully teach students with dyslexia and related learning disabilities. Additionally, there is insufficient research evidence to draw precise conclusions about what constitutes effective teacher education concerning dyslexia (Spear-Swerling & Bricher, 2003; Worthy et al, 2016).

To learn the skills needed to read and spell, dyslexic children require specific, systematic, multisensory instruction by highly trained teachers (Moats, 2009). A number of states have implemented training models that address the specific reading intervention programs effective for students with dyslexia (Youman & Mather, 2015). Mississippi and Texas alone financially support educators to obtain a dyslexia practitioner license or become a dyslexia specialist (Youman & Mather, 2015). Although many other states have legislation in place to promote teacher training, it is not financially supported, and teacher attendance is not mandated across the districts (Youman & Mather, 2015). Kentucky, for example, passed a law in 2012 (704 KAR 3:095) that included dyslexia under the description of specific learning disability, as well as under the Response to Intervention model. The law stated, “The department shall develop and maintain a Web-based resource providing teachers access to both information on the use of specific screening processes and programs to identify student strengths and needs…” (Ky. Acts ch. 45, sec. 1, p.2). In order to meet legislative requirements, the Kentucky Board of Education

created a website for teachers which included six hyperlinks to various websites – each one containing information about dyslexia and multisensory education, and a summary of information to be gained by visiting the linked site. KDE updated the website on March 3, 2016 (KDE, 2016). The first link provided was access to "Academic Interventions for Children with Dyslexia Who Have Phonological Core Deficits", last updated on April 20, 2000 (Frost, 2000). The website information lacked citations and updated research for teachers who chose to gain knowledge on the area of dyslexia. Three of the six resources highlighting dyslexia were broken links that resulted in an error when trying to access the website. More recently the Kentucky Department of Education assembled a dyslexia task force to meet monthly. Its purpose was to propose ideas in support of students with dyslexia to the Commissioner of Education, by May 2017 (KDE, 2016). According to Dyslexia Advantage, there are currently five other states in the "task force" stage of determining how dyslexia will fit within the educational system in the state (Eide, 2016).

There are several factors to consider when looking into effective teacher training in today's educational landscape. Time, money, and content are three major areas that should be evaluated when determining "effective" measures of training teachers. The nonprofit New Teacher Project did a study with 127 school districts and found that only 30% of teachers improves substantially with the help of district-led professional development, even though districts are spending an average of $18,000 on training for each teacher each year (TNTP, 2015). Very few professional development opportunities are linked to outcome measures of whether a teacher has increased his or her knowledge (Sawchuk, 2010). The U.S. Department of Education continues to give out nearly $3 billion a year in federal aid for professional development under Title II-A, and has never fully studied the impact of that spending (Sawchuk,

2010). Overall, professional development does not have a standard for “effective” as one might expect. The TNTP study found that no specific type of training or amount of training had helped teachers improve (TNTP, 2015). However, all professional development that is provided to teachers should have evidence that teachers improved in their knowledge of a subject or practices in the classroom (TNTP, 2015).

General education teachers are willing to assume the responsibility of all children, including those with special needs, if equipped with the necessary skills (Gafoor & Asaraf, 2009). Washburn, Joshi and Binks-Cantrell noted in their study of teacher knowledge that an overwhelming majority of teachers surveyed acknowledged receiving little training in working with children with dyslexia (2011a). Many teachers did not have access to extensive, intensive professional development to enhance their knowledge and skills and increase their instructional effectiveness for students (Hill, 2009). A study with pre-service teachers revealed that a vast majority of teachers desired more training about dyslexia, due to a lack of clear understanding as to the nature of dyslexia, and how to help and support dyslexic pupils (Gwernan-Jones & Burden, 2010) . Wadlington and Wadlington (2005) surveyed numerous groups of educators (i.e. elementary and secondary general education teachers; special educators; school counselors; administrators; and university faculty) and concluded that all had significant misconceptions about dyslexia, felt inadequate to work with students with dyslexia, and desired to learn more about how to provide effective instruction to students with it. However, with effective professional development focusing on the skills needed by educators in order to address students’ major learning challenges, student learning and achievement can increase (Mitzell, 2010). Teacher education is an ongoing, lifelong process – beginning with initial certification

programs and continuing throughout a professional's career (National Reading Panel, 2000; Spear-Swerling & Brucker, 2003; Wadlington & Wadlington, 2005).

Adult Learning through Professional Development

A final destination of 'knowing' how to teach is nonexistent. Rather, teaching is a lifelong process of learning (McRobbie, 2001). Professional development is the continuing education that teachers undertake each year to update to new standards and practices; refresh previously-learned skills; and align learning and teaching to school and district goals (Opfer, Pedder, 2011). According to Villarreal (2005), professional development is necessary because teachers have often been underprepared by their universities to deal with the exigencies of the classroom. They must take advantage of education opportunities to fill in the gaps. Professional development can be defined as a process in which teachers "gradually acquire a body of knowledge and skills to improve the quality of teaching for learners, ultimately, to enhance learner outcomes" (Kutner et al., 1997, p.6). Danielson (1996) asserts: continuing development is the mark of a true professional, an ongoing effort that is never completed. Educators committed to attaining and remaining at the top of their profession invest much energy in staying informed and increasing their skills (p. 115).

Professional Development

Effectively educating teachers requires actively viewing adults as unique learners and having a culture that is supportive to professional learning (Beavers, 2009; King, 2004; Zepeda, 2013). Ferguson (2006) designed the *Effective Professional Development Framework*, in which he states that school employees are more likely to be ambitious and industrious when the following five conditions are met: a) success seems feasible on goals that are clearly defined; b)

the goals seem important; c) the experience is enjoyable; d) supervisors are both encouraging and insistent; and e) peers are supportive (p.52). The term *effective* is used to describe trainings that are research-based, tied to standards, and present a coherent structure for teachers working in an environment where the work of teaching is rooted in learning (Mitzell, 2010); not an add-on or a series of discreet activities, but a continuum of learning (Ferguson, 2006; Gates, 2014).

Effective professional development includes a specific set of learning objectives; activities that support the objectives; and ongoing formative and summative evaluation of its impact on teaching and student learning (Mitzell, 2010). It should extend, add to, or improve skills, while simultaneously increasing the knowledge that the adult currently possesses (Zepeda, 2013). The goals of professional development should be grounded in data, to frame the important issues of teaching and learning within the context of the school system – in order to enable teachers to see the relevance to their daily work (Brookfield, 1990; Palmer, 1998; Zepeda, 2013).

Cocoran's work (1995) preceded Ferguson's (2006) framework by using the term *enjoyable* as providing opportunities to explore, question, and debate – in order to integrate new ideas into teachers' repertoires and classroom practice. The learner should be an active participant in learning activities, structured as cooperative ventures (Conti, 1989). Activities and experiences that engage teachers as learners are particularly effective and gratifying. Experiential learning can increase awareness of the role of children's thinking in the learning process. It can bring about understanding – altering misconceptions that a teacher may hold concerning the student-engaged learning process (Carpenter, Fennema, Peterson, Chiang, & Loef, 1989; Ferguson, 2006; Smith & Neale, 1991; Williams, 2012).

Meaningful professional development, crucial to successful teaching, should be a process of transformative learning that takes place in an environment where teachers feel comfortable enough to accept change. Teachers should be led to critically examine their own practice by increasing awareness of self and others (Cranton, 1996; Cranton & King, 2003). It is important for facilitators to foster respect in discussion and to guide teachers in finding their "learning" voices, while preserving the goals of the continuing education experience (Zepeda, 2013). For adult learning to take place, according to Webster-Wright (2009), group norms must be established – as well as a structure that allows for active participation with peers. To this end, Clark (2001) has emphasized the importance of inquiry, reflection, and conversations in professional learning for teachers, in support of DuFour and Eaker (1998), who maintained that collaboration and conversation are key to sustaining a learning community.

Experiential Learning

In addition to a teacher's intellectual knowledge about dyslexia, empathetic understanding can be fomented by experiencing first-hand the frustrations and learning difficulties faced by students with dyslexia (Currie & Wadlington, 2000; Jordan, 2002; Ryan, 1994; Wadlington & Wadlington, 2005). Understanding how it feels to struggle, when others are not struggling, may help a teacher relate to the student rather than labeling him/her "stupid" (Wadlington, Elliot & Kirylo, 2008). Only one, qualitative study has been published using the NCBIDA simulation training. The outcomes of the research included increasing empathy, as well as increasing understanding of dyslexia (NCBIDA, 2008). The data overwhelmingly indicated better awareness of dyslexia among 99% of teachers, over the period of three years, and stated that the simulation increased teachers' awareness of possible limitations, abilities, and feelings of a

learner with dyslexia. Additionally, 98% of teachers indicated that the simulation had influenced their dispositions to work with learners with dyslexia, and that they would be more likely to recognize a student exhibiting characteristics of dyslexia or another learning disability (Wadlington, Elliot & Kirylo, 2008). The major themes evaluated were: (1) empathy; (2) reflective practice; (3) connection to self, students, and others (Family and Friends); (4) professional development; and (5) difference versus disability (Wadlington, Elliot & Kirylo, 2008). Researchers asserted that the training demonstrated a powerful learning experience – one that enabled teachers to better help all students – especially those with learning differences (Wadlington, Elliot, & Kirylo, 2008).

Today, simulation training is one of the most multifaceted training models, and used widely in almost all disciplines and areas of work (Hertel & Millis, 2002). Simulation is being extensively used as a tool to increase the capacity of professionals such as doctors; engineers; computer professionals; administrators; students; and teachers – to name a few (Hertel & Millis, 2002). A simulation creates a representation of realistic elements working together to build a learning activity whereby participants can develop skills, gain knowledge, and/or alter their attitude about that reality (Duke, 1986; Hertel & Millis, 2002). These “problem-based units of learning...set in motion by a particular task, issue, policy, crisis, or problem” (Hertel & Millis, 2002, p. 18) are learner-centered and engaging. During a simulation, participants “carry out functions associated with their roles and with the settings in which they find themselves. The outcomes of the simulation are not determined by chance. Rather, participants experience consequences that follow from their actions within the simulation” (Hertel & Millis, p.19). The experiences should be as realistic as possible (Burgstahler & Doe, 2006). Simulation training can

be given in many contexts, such as through use of cadavers for medical training or by way of virtual flying exercises for pilots (Burgstahler & Doe, 2006).

In teacher education, the majority of simulation activities are provided implementing the real model approach, which uses either real students or real situations (Sharma, 2015). Simulations as commonly given tend to focus on experiencing what it is like to do daily tasks in the presence of a limitation or disability (Barney, 2012). They permit the attainment of learning goals that are beyond traditional and other computer-based instructional methods (Thomas & Hooper, 1991). As opposed to passive learning activities like watching a movie or reading a book about a disability, simulations allow learners to bridge the gap between passive learning and direct personal experience (Barney, 2012; Davis, 2014; Patterson, 1980).

In 1989, the Northern California Branch of the International Dyslexia Association (NCBIDA), under the direction of Martha Renner, created a dyslexia simulation “Put Yourself in the Shoes of a Person with Dyslexia” (NCBIDA, 2010). The simulation provided six activities allowing participants to feel the frustration, exhaustion, and difficulties with routine tasks often experienced by a person with dyslexia. The NCBIDA updated the simulation in 2008, changing the title to “Experience Dyslexia.” Participants were to rotate among six learning stations simulating language-related tasks possibly encountered in the classroom and workplace. Graduates from this training have opined that all teachers need to go through this seminar (Wadlington et al., 2008). Teachers stated the value of the simulation in regards to professional development, at the same time validating the overall importance of the experience (Wadlington et al., 2008). Wadlington et al. stated that it has proven to be a powerful learning experience in

enabling teachers to better understand the struggles faced by all students – particularly those with learning difficulties – and then being able to help them (2008).

The use of simulation for disability training has been criticized, due not only to a lack of evidence for its effectiveness (French, 1996), but because measured positive attitudes or behavioral changes linked to disability simulations have reportedly been brief (Smart, 2001). Some researchers argue that disability simulations place participants in situations for which they have no learned necessary coping skills in place (Kiger, 1992; Pfeiffer, 1989), leading to frustration. Because these emotions could possibly be projected onto the population with a disability, some potential for counterproductive effects exists (McGowan, 1999).

Despite the lack of data regarding the effectiveness of simulation training, a common approach continues to be to attempt to positively modify attitudes regarding those with disabilities (Hartwell, 2001). A meta-analysis of 34 studies, using disability simulations as a method for teacher training, concluded that data does not support the use of disability simulation training – especially with adults (Flower, Burnes, & Bottsford, 2007). Nevertheless, Burgstahler and Doe (2006) assert that with appropriate designs, careful facilitation, open discussion, and the involvement of people with disabilities, the potential for negative consequences of simulations can be diminished.

There is little empirical support for disability simulation to increase teacher knowledge (Herbert, 2000). Many of the research that evaluates simulation training focuses on functional, skill-based training, which allows the participant to manipulate a situation in order to practice a newly acquired skill. Of the limited research on simulation, there is even less published about experimental simulation, which requires that the participant take on the role of condition or

circumstance (Rex & Elizabeth, 2014). While there are advantages to simulation training, some contend that its popularity derives from learner enjoyment as much as from a lack of questioning on the part of educators concerning its efficacy (Herbert, 2000; Hyman, 1978; Patterson, 1980). Conversely, research emphasizes that when simulation is combined with other learning methods, positive attitudes toward persons with disabilities develop (Barrett & Pullo, 1993; Jones, Sowell, Jones & Butler, 1981; Pernice & Lys, 1996; Pfeiffer, 1989). Other learning methods might include reading or viewing materials about disability issues, taking coursework that addresses various aspects of a disability, or more personal interactions with persons with disabilities. Herbert (2000) found a combination of methods to be more effective in producing positive attitudes, awareness, and behavior towards persons with disabilities. Although there was a consensus about the need for a multifaceted approach, Herbert lamented the fact that there was no guidance from empirical literature as to what sequence may be most effective (Herbert, 2000).

Goal Oriented Learning

The International Dyslexia Association has set as its goal the provision of the most comprehensive information and services in addressing the characteristics of dyslexia and difficulties in learning to read and write (IDA, 2013). Few of the tests that license teachers utilize questions aligned with current research on effective instruction for struggling students (IDA, 2013). Furthermore, current licensing and professional development practices sanctioned by many states are insufficient for the preparation and support of teachers of children with dyslexia (Decoding Dyslexia, 2015). To address these gaps, IDA published *Knowledge and Practice Standards for Teachers of Reading*, which specifies what knowledge and abilities teachers of reading should possess. Ethical standards for the profession, combined with a framework of

courses and course sequences, are included – as well as pedagogic strategies useful for teaching students with dyslexia and other related difficulties (IDA, 2010). Later, a more succinct, broader-level version was created for use with classroom teachers. The new version, renamed *Dyslexia in the Classroom: What Every Teacher Needs to Know*, consists of nine sections and can be presented to teachers through reading assignments, lecture, hands-on activities, or with visual support (IDA, 2013).

Brownell et al. (2006) acknowledged that teachers were able to implement classroom practices and adapt them to meet the needs of their students when they: (a) had a strong understanding of the content and how to teach it; (b) were able to address the needs of individual students, while responding to the needs of the entire class; and (c) had beliefs that aligned with the innovations learned. Likewise, Dingle et al. (2011) concluded that teachers felt more confident teaching students with special needs when they had a better understanding of the content they were teaching. For example, one teacher revealed that after learning the consonant-vowel-consonant rule (CVC), he was quickly able to determine which students were struggling and where to begin interventions (Dingle et al., 2011). Professionals charged with improving the practices of special education teachers should take into consideration that content knowledge has a significant impact on the overall ability to teach.

In order for teachers to retain the information learned through professional training, it is essential to engage them in some form of on-going or follow-up training (Sparks & Hirsh, 2000). Norton (2001) examined the difference between a one-shot workshop and a longitudinal training, and reported that when training is discussed within the work environment, throughout the school year, learning from the initial training continued to be effective. While many educational

institutions continue to implement short-term training methodologies, current research argues that sustained professional development has a much greater impact (Soliday, 2015; Conn, 2014).

Conceptual Framework

Pedagogy. Shulman (1986) explored the link between knowledge and pedagogy wherein he noted that, reflecting an emphasis on classroom management, teachers were judged on how they organized activities; allocated time and turns; ascribed praise and blame; structured assignments; used questioning techniques; planned lessons; and assessed student understanding, albeit not on their knowledge of content. The familiarity with content was assumed, based on the field of study; however, it was not assessed in the professional setting. In 1994, Moats concluded that, despite having a teaching credential, most reading teachers did not understand basic concepts of reading.

Content knowledge has three different components: (a) subject matter content knowledge; (b) pedagogical content knowledge; and (c) curricular content knowledge (Schulman, 1986). To demonstrate subject matter content knowledge, a teacher is required to understand the concept he or she is teaching. Furthermore, the teacher must understand why a given topic is central to the discipline being taught. In this respect, it is essential for teachers of reading to understand the phonemic principles, in order to teach decoding (Moats, 1994). Additionally, Moats (1994) concluded that 80% to 90% of teachers were unable to consistently identify consonant blends in written words – and even fewer were able to consistently identify a consonant diagraph. As Schulman (1986) suggested, teachers need to understand THAT a combination of letters makes a certain sound in order for them to learn WHY it does. While teachers may be literate, experienced, and educated in an academic setting, they still may lack

the knowledge of language elements and structure needed to explicitly teach beginning and struggling readers (Bos et al., 1999; Cunningham et al., 2004; Moats, 1994).

Pedagogical Content Knowledge. Since 1987, the educational community has included the second component, pedagogical content knowledge (PCK) as a keystone to developing teacher training (Deng, 2007). Pedagogical content knowledge comprises the strategies used to teach content – in other words, a teacher's ability to present the material (Schulman, 1986). For instance, a teacher can know what makes learning a concept easier or more difficult by being aware of student preconceptions. It is important for teachers to employ organizing strategies to help students understand material. Additionally, Schulman (1986) emphasizes the importance of awareness of alternatives available for instruction. Possessing specific pedagogical content knowledge is imperative for teachers of reading, so that they understand the multisensory instruction needed for students identified with dyslexia (Shaywitz, 2003).

The third component to PCK addresses the formation of knowledge consisting of the philosophical inquiry, practical experience, and moral or ethical reasoning (Schulman, 1986). This dimension encompasses how a teacher delivers the previous two components. When a teacher does not understand the content, does he or she independently search for the knowledge or continue teaching without the understanding? Is it practical to continue to have a student participate in an intervention program, when no progress has been documented? Is it ethical to ask a student who has dyslexia to read aloud when the child reads below the level of the peers in the classroom? Pedagogical content knowledge holds the key to transformation. It allows teachers “to transform the content knowledge he or she possesses into forms that are

pedagogically powerful, and yet adaptive to the variations in ability and background present in students" (Schulman, 1987, p. 15).

Theory of andragogy. Having noted that most studies on how living things learn employ animals and children, and that the environments in which they learn are more controllable than the environments in which adults learn, Knowles (1973) formulated his own theory of learning – to reflect, to a greater degree, the ways in which adults adapt to new knowledge. As adults mature, their ways of learning change, creating a situation in which instruction must be approached differently (Zmeyov, 1998). The term *andragogy* can be broken down to the Greek origins: *Agein* means to lead, and *Andros* means man, just as pedagogy means to lead a child. Adult learners are eager, sometimes extremely so, to obtain new knowledge, and will seek out information to satisfy their needs, passions, and curiosities. Knowles based his andragogical model on the idea that adults will seek knowledge, while children are *given* knowledge (Uszler, 1990).

The theory of andragogy, the manner in which adults learn, is based upon four assumptions, the first of which is that an adult's learning is characterized by self-direction. When an adult finds himself or herself unable to self-direct, tension arises, often leading to resistance and resentment. The second assumption concerns the role of experience, since every life experience shapes the person. According to Knowles (1973), it is crucial to tap into experience of the learner and to involve him in analyzing prior knowledge. A third component is that adult learners are ready to learn concepts they need to know to enhance their personal or professional lives. David McClelland (1970) supports the idea that readiness to learn can be stimulated. According to Knowles (1973), it is important to time the learning experience to coincide with the

task being taught. The final assumption of the theory of andragogy is that children learn because of their desire to advance to the next stage in the schooling process, whereas most adult learning is accomplished for immediate application. Adults enter education with a problem-centered orientation to learning. Information presented should be relevant and organized around a problem that can be solved with the new training provided (Flores et al., 2016; Knowles et al., 2005; Knowles, 1973).

Andragogy theorists consider the learner as the real instigator of his or her learning process. Some basic fundamental principles of adult learning are experiential, contextual, and elective (Flores et al., 2016; Zmeyov, 1998). The learner in an adult education setting is viewed as more of a responsible, self-directed learner. Experiential learning occurs when a learner's life experiences (social, occupational, family) are tapped as a source of not only his or her own learning, but that of others, as well. Self-directed learning can lead to transformational learning, which allows for critical reflection of the new learning as it relates to previous life experiences (Merriam, 2001). Contextual learning comes about by way of a person being organized in the context of his or her life as an adult. Learning must aim at what is personally important and must be in accordance with occupational, social, and family activities – associated with time, place and everyday adult life factors (Zmeyov, 1998). Learning activities should be provided that fit within the context of common tasks, performed so as to allow for the occurrence of transformative knowledge (Knowles, 1984). The ultimate goal is to improve organizational performance by transfer of learning directly to the context work or life situation (Zmeyov, 1998). Elective learning allows the learner to have freedom of choice in his or her learning process. Choices may include the objectives, contents, forms, methods, sources, means, terms, time, place, evaluation procedures, facilitator, etc. (Zmeyov, 1998). Providing adults with a choice

allows for a sense of responsibility and active involvement in the learning process (Benson, 2013).

Chapter 3: Methodology

The purpose of this study was to investigate the effectiveness of two currently available dyslexia training activities designed to increase teachers' declarative knowledge about dyslexia. Once approval was granted from Bellarmine University's Institutional Review Board to conduct the study (approval #516), research was conducted through six training sessions, using a pre/post assessment with participants to measure their knowledge immediately before and after the training. Careful consideration was given to research design, participant selection, instrumentation, data collection, and data analysis.

Research Question

Is there a significant difference in knowledge acquisition regarding dyslexia definitions and characteristics amongst groups of teachers trained with simulation only, lecture only, or trained with both simulation and lecture (mixed-method)?

It was hypothesized that teachers would statistically show significantly greater knowledge overall, following the mixed-method training, compared to those who received an isolated simulation or lecture training. A second hypothesis was that trainees in the lecture-only method would statistically score significantly higher than those receiving the simulation-only training.

Design Description

This quantitative study employed a pre-test/post-test design to test the hypothesis that teachers who receive the mixed-method training will gain more overall knowledge than those who receive simulation-only or lecture-only training. Teachers elected to attend one of six training sessions. Sessions were then randomly assigned to one of three treatment conditions,

with each condition receiving two sessions – to insure equally-balanced groups. The research design then was a quasi-experimental, completely balanced, block one (Shadish, Cook, & Campbell, 2002). This particular design was selected so that baseline data could be collected to determine initial understanding of dyslexia concepts, so as to directly compare the results with understanding of dyslexia concepts after training had taken place. The use of a repeated measures ANOVA was used to measure covariance, a measure of the extent to which two variables change together, and the strength of the relationship between them (Field, 2009).

Setting and Sample

A study was completed, utilizing treatment of three distinct training models: a) simulation-only training; b) lecture-only training; and c) simulation and lecture combined (mixed-method). In order to detect a difference beyond random variation, replication was used. Each of the three treatments would be delivered twice to separate groups for a total of six training sessions. The sessions, held over the course of five days, were administered to elementary school teachers voluntarily applying to attend one of the six sessions. Random assignments were made, which eliminated the possibility that a participant would be aware of his or her training model ahead of time.

The desired sample size for the study was a minimum of 36 participants. A prior power analysis for a repeated measures ANOVA with three groups and two repetitions was conducted using G*Power (Faul, et al., 2013), to determine a sufficient sample size, using an alpha of 0.05, a power of 0.80, and a medium effect size $f^2(V) = 0.25$. Elementary general education teachers from the Midwest area participated in this study. No other identifying information was collected for the study. A public-school district in the region approved the research to be conducted within

the county, and one elementary school principal offered to assist in distributing the information to other elementary school principals within the district. A word document was created to explain the purpose of the study to principals and afford them the opportunity to choose whether or not to support the training for their teachers (See appendix A). Additionally, the document was sent to principals of private schools in the surrounding area, in an effort to find additional participants. To encourage teachers to attend the training, many schools offered two hours of continuing education credit.

Table 1

Sample Size by Training Method

	Group 1	Group 2	Total
Simulation	10	12	22
Lecture	8	11	19
Mixed- method	10	7	17
Total			58

All sessions took place during summer break, at an elementary school within the approved county. Principals promoting the training emailed teachers a link to a website containing further information. The website Signupgenius.com was utilized to allow teachers to view available training dates and voluntarily register. The platform explained the three treatment options and the overall purpose of the study, but the individual signup dates did not specify the training type to be offered (See appendix C). After the signup window had closed, training option assignments were randomly distributed. On the day of the training, participants signed a

consent form verifying their teaching role as an elementary general education teacher, as well as their willingness to be a part of the research. Upon entry to the training session, a folder that chosen, labeled with a number between one and seventy-five. Folders were not in numerical order and were chosen indiscriminately by teachers. The folder number assignment correlated to the participant number, and was used to identify the pre- and posttests to be completed. Teachers completed a pencil and paper test immediately before and after the training, in a group setting. Participants placed all completed assessments in a manila envelope and handed it to a volunteer participant, who then sealed and gave it to the researcher. The consent forms were distributed and collected prior to distribution of the assessment, to eliminate linkage between them.

Instrument

One test instrument was used in this study (Appendix D). The five-question assessment was used to collect data regarding the impact of the three training models. Participants read a list of five questions and then indicated on a 4-point Likert scale the extent to which they believed the question to be true. The choices were: 1 (definitely false); 2 (probably false); 3 (probably true); or 4 (definitely true). Identical instruments were administered, taking approximately 10 minutes each: the pretest at the onset of training, and the posttest at the conclusion of training. The purpose of the pre- and posttests was to evaluate teachers' growth in declarative knowledge of dyslexia.

The five-question assessment was adapted from the 25-question survey used in the research study "Teacher Knowledge of Basic Language Constructs of Literacy" (Binks-Cantrell, Joshi & Washburn, 2011). There were no reliability measures made available for publication, by the authors, for the initial, exploratory survey implemented. For that reason, the survey

instrument used in this research was piloted with 55 elementary teachers, in an effort to evaluate validity and reliability. The trial results yielded five questions as one common factor that explained 40% of the variance, with a reliability score of $\alpha = 0.66$. The remaining 20 questions were eliminated, because they neither fit the context of this research nor indicated reliability. Three of the five questions were rewritten for clarity, to use as the assessment instrument for this research study. The final instrument employed was composed of five questions (see Appendix D), forming a single factor that explained 48% of variance, with reliability measured by Cronbach's alpha of $\alpha = 0.71$.

Dependent Variable

The dependent variable was declarative knowledge of dyslexia. The score was measured by assigning points on a continuous scale from 1 to 40. Measurement of knowledge for this study included (a) prevalence; (b) inheritability; (c) impact on writing and spelling; and (d) influence on social and emotional well-being. The total score was used to classify the amount of knowledge the teacher displayed both before and after the training. The score was calculated by computing the total number of selected responses to Questions 1-5 on the survey. Lower scores indicated lesser understanding of dyslexia, while higher scores reflected deeper understanding.

Independent Variable

The independent variable was dyslexia training consisting of three levels: (1) simulation-only training; (2) lecture-only training; and (3) simulation and lecture training (mixed-method). Each model was given to two groups of teachers, with an average number of nine participants, for replication purposes. Treatment one was a two-hour simulation training, using "Experience

Dyslexia", in which participants engaged in six, hands-on activities replicating the struggles that a person with dyslexia might experience (NCBIDA, 2010). The simulation was based on *Put Yourself in the Shoes of a Person with Dyslexia*, developed under the direction of Martha Renner (Northern California Branch of the International Dyslexia Association, 1989). The modified version of the simulation, used in this research, consisted of a small group of participants, seated around one table: 10 in training one and 12 in training two. An introduction, scripted from the simulation package, was given to the group. It included an explanation of the simulation stations, an overview of information about dyslexia, and a disclaimer that the simulation did not reflect the feelings of all people who have dyslexia. The script described dyslexia as being a language-based learning disability; provided information about its prevalence and its impact on social and emotional wellbeing; and a few common myths pertaining to it. Participants were led simultaneously through each station, with the researcher offering a short discussion on the skills required for each task, and appropriate debriefing questions.

The first station was "Learn to Read" which simulated a beginning reading problem. Participants read a special primer, published for inclusion in the simulation package, with a unique code for words written with symbols versus letters. Station 2 was entitled "Listen to Me" - simulating hardships experienced in an auditory figure-ground setting. Auditory figure-ground refers to a student's ability to decipher speech sounds given the presence of background noise. Participants listened to a recording of a field trip and took notes articulated by a guide. Consequently, the third station – "Write with Mirrors" – simulated a combination writing / visual-motor task. Participants used their dominate hand to write, while looking only in the mirror. Activities included tracing, and writing both shapes and numbers. Station 4, "Name that Letter", was a simulation of a letter-word identification issue. Using a poor copy, written in

mirror image, participants took turns reading a story and answering comprehension questions based upon it. Station 5, “Write or Left”, simulated the difficulty a student may face while writing and copying. In this simulation activity, participants used their non-dominate hand to complete a variety of tasks – from writing to tracing an irregularly-shaped line, while counting aloud. Finally, Station 6, “Hear and Spell”, was a simulation of an auditory discrimination problem. Participants listened to identical lists of spelling words, dictated three times on CD, but at a different decibel level each time.

After all stations were completed, the researcher conducted a final debriefing with questions concerning the thoughts and feelings raised throughout participation in the exercises. Topics prompting participant discussion included descriptions of how they had felt while completing the simulation tasks, difficulties they experienced, and strategies they used to compensate in the most troublesome areas. A final statement, scripted from the simulation package, reminded participants that dyslexia was a language-based disability affecting reading, writing, and spelling. Mention was made as to the prevalence of prisoners experiencing difficulty with reading, and reminders to provide support and encouragement at all times. A closing announcement was given and participants were provided with a copy of the *Simulations Skills Summary*, recapping all of the station exercises, *Dyslexia Basics*, and *Is My Child Dyslexic?* (IDA, 2010).

Treatment two was a two-hour lecture based on the IDA publication “Dyslexia in the Classroom: What a Teacher Needs to Know” (IDA, 2010). This sixteen-page document was adapted into a 66-slide PowerPoint presentation. All information from the publication was disseminated during the two-hour training, through visuals narrated by the researcher. The

presentation was scripted from the PowerPoint and notes section, to retain consistency among groups. Participants were led through ten sections, beginning with an introduction consisting of a brief overview of the points to be discussed, as well as the toolkit's intent. The next section outlined the mission and purpose of IDA, followed by a formal, detailed definition of dyslexia, and then some of the causes, effects, and misconceptions related to it. Next, signs and symptoms of dyslexia were explained, and both general examples and those specific to students with dyslexia were given. A disclaimer was provided to explain that these signs and symptoms are not diagnostic and all-inclusive. A unique aspect of this publication was the social and emotional connection, where participants learned about self-image and depression issues often present in students with dyslexia, and information on how a teacher could provide support in regards to the social and emotional aspect. Teachers then listened to a variety of strategies to apply in the classroom. Accommodations were categorized as those including materials, involving interactive instruction, and impacting student performance. The specific method of multisensory, structured language teaching was explained, and research was provided to support the necessity. An important discussion on screening, evaluation, and diagnosis was provided. Information about how dyslexia is diagnosed; why evaluation is important; when to evaluate; and an outline of the Colorado Learning Disabilities Questionnaire (Willcutt et al., 2011) was distributed. Lastly, additional resources and further reading referred participants to fact sheets available from IDA online and other publications of interest. To conclude, references were provided to allow participants to peruse a list of all research used throughout the publication.

The third treatment was a mixed-method treatment, presenting three simulation activities and a condensed version of the lecture. The simulation was identical to treatment one, however stations four, five, and six were eliminated. The decision to use the first three simulation

activities was derived from informal discussions with professionals who have modified this simulation for professional training, and then by determining the three most widely used activities. Immediately following the closing announcement and script from the simulation, the lecture portion began. During this portion, a modified version of the lecture-only presentation was used. It consisted of a condensed version of 50 slides presenting the same information as the lecture-only session, but in a more concise fashion. The 16 slides that were removed included specific details or examples of the content being discussed. For instance, information pertaining to the general signs and symptoms of dyslexia remained, while examples of the common characteristics seen in elementary students were omitted. Similarly, the full presentation included multiple slides devoted to emotional issues such as self-image, stress and anxiety, and depression. For the compressed version, these social and emotional issues were reduced to a single slide indicating the basic components relating dyslexia to the psychosocial difficulties brought about by its existence. Reducing the presentation time was not the sole purpose for removal of the slides. Rather, the main objective of the mixed-method training was to provide the attendees with an overview of the publication. The omitted slides were not pertinent to the end result.

Chapter 4: Findings

Introduction

Research supports the notion that most teachers do not understand the characteristics of dyslexia, so they often misunderstand the learning difference (McCutchen, et al., 2002; Moats & Foorman, 2003; Spear-Swerling & Brunker, 2003). Teachers' misconceptions may contribute to the perpetuation of common myths, such as the fact that letters and words being perceived backwards is indicative of its presence. A study undertaken by Washburn, in 2009, revealed that only 8% of teachers were cognizant of this inaccuracy. The lack of understanding about dyslexia is an expected outcome given the shortage of professional development provided to teachers about it (Bos et al., 2001; Joshi et al., 2009; Washburn, 2009). Only 10 of the 50 states in the U.S. require teachers to be trained or seek out continuing education about dyslexia, its indicators, and the recommended intervention strategies (MD Task Force, 2016). Within the legislation of those 10 states, there is no regulation as to which training should be provided, let alone ways in which teachers can acquire knowledge about dyslexia. Moreover, there is a lack of research to support various training models for increasing teacher knowledge in the field. This dissertation sheds light as to the effectiveness of three training models designed to increase teachers' declarative knowledge about dyslexia.

One standard model of professional development is simulation training, which provides participants a firsthand experience of dyslexia through reading, writing, and listening activities (NCBIDA, 2008). Simulation training has been the most requested model in the past two years, and some professional organizations have adopted this style of adult learning into their training programs (Learning Ally, 2016), despite a paucity of published research on its effectiveness in

increasing teachers' knowledge. Research publications denoting results of simulation training are based on an increase in empathy, but nothing is reported in terms of the teachers' expanded knowledge about dyslexia itself. The present study is essential, as many states begin to pass legislation for mandatory teacher training, without suggested training methods. This study will evaluate the efficacy of multiple training styles when looking at teachers' declarative knowledge of dyslexia (Thomas-Beck, 2016).

The objective of this dissertation was to evaluate three professional development models to establish the most effective method for training teachers about dyslexia. Given three standard training models, pre- and posttest survey data was used to adjudge the increase in participants' knowledge about characteristics of the learning difference. The following research question guided this study: Is there a significant difference in knowledge acquisition, regarding dyslexia definitions, amongst groups of teachers trained with simulation, lecture, or both (mixed-method)? It was hypothesized that the increase in knowledge after lecture-only training would be statistically significantly higher than after simulation-only training, and that the mixed-method model would lead to greater acquired knowledge than either lecture-only or simulation-only models.

Three training models were used to test the research question: (1) simulation only; (2) lecture only; and (3) mixed-method. Each training method was offered twice – for replication purposes. Fifty-eight teachers participated in one of the six available training sessions.

Primary Data Analysis

Statistical analyses were performed using SPSS for Windows version 23. A repeated measures 2 x 3 analysis of variance (ANOVA) was conducted to determine the significance between teacher knowledge before and after the training, in each of the three treatment groups. The dependent variable and within-subject factors were the results of the pre- and posttest assessment. The three independent variables and between-subject factors were the treatment groups a) simulation; b) lecture; and c) mixed-methods. A repeated measures analysis of variance (ANOVA) was used to determine whether differences existed between training conditions. When overall significance was found, pairwise comparisons were conducted to assess differences between the three conditions. Assumptions in an ANOVA design are (1) that the dependent variable is continuous and normally distributed; (2) that homogeneity of variance exists between groups; and 3) that participant responses between groups are independent of each other (Field, 2009).

To determine if the assumption of normality was met, skewness and kurtosis values on the pretest instrument were analyzed. The skewness value of -.15 (*SE* = .31) and kurtosis value of .41 (*SE* =.62) were within range of +/- 2 (SE) which was considered normal (Field, 2009; George & Mallery, 2010; Trochim & Donnelly, 2006). The histogram with a normal curve overlay had a slight positive skew – with more scores at the high end of distribution. However, taken with the skewness and kurtosis values, these results indicate that the pretest scores were reasonably normally distributed. The visual analysis of the P-P plot also established normal distribution. There were no outlier scores reported, and an analysis of the Kolmogorov-Smirnov scores revealed non-significant results, indicating normality on the pre-test assessment. Additionally, the central limit theorem supported normality of pretest scores, because the total

participants (58) exceeded the sampling threshold (36), as determined by G*Power (Faul, et al., 2013; Field, 2009).

Checks of model adequacy were validated with graphical analysis of residuals. Data met norms for homogeneity, normality, and linearity, according to Field, 2009. To test for homogeneity of variance, an assumption in analysis of variance designs (ANOVA), a Levene's homogeneity of variances test was conducted. Results supported that equality of variance existed between the three training groups in the pre-test score $F(2,55) = 1.33$, $p = .276$. This confirmed that the equality of variance condition for the repeated-measures ANOVA test was not violated.

To account for independence of groups, all training sessions were held at separate times, and participants were anonymous through sign-ups. This precautionary step helped reduce participants' opportunity to share or discuss information regarding the particular training they attended, with someone attending a different training. The pretest was given to participants after initial research protocol was completed, and immediately prior to training. Participants were given a number and chosen at random in analyzing pretest and posttest scores. The pretest asked participants to verify their current job placement, so as to ensure qualification under this research guideline of general education elementary teacher. The posttest was given immediately following training, and participants matched their assigned number to the pretest that had been previously turned in. Scores on the test were adjusted to receive zero to four points, based on correctness of each question. The total score on the pretest was compared to the total score on the posttest to analyze increase in declarative knowledge of dyslexia.

Descriptive Statistics

Table 2

Pre- and Posttest Descriptive Statistics by Group

	Simulation		Lecture		Mixed-Method	
	M	*SD*	M	*SD*	M	*SD*
Pretest	15.30	2.96	15.76	2.23	15.53	1.97
Posttest	16.90	1.55	18.90	1.26	19.29	0.99

Table 2, above, shows the means and standard deviations by training group. The descriptive statistics established equality of groups on the pretest. From the table, it can be seen that the mixed-model group attained the highest mean score (3.76), followed by the lecture group (3.14), and then the simulation group (1.60). There was an increase in knowledge in all three groups as seen in the mean reported in table 2.

Table 3

Correlations

Measure	S Pre	S Post	L Pre	L Post	Mi Pre	Mi Post
S Pre	1					
S Post	.55*	1				
L Pre	.32	.06	1			
L Post	-.26	-.10	-.15	1		
Mi Pre	-.35	-.01	-.16	-.25	1	
Mi Post	.15	-.07	-.15	.38	-.25	1

Note. $*p < .05$.

A Pearson correlation coefficient was computed to assess the relationship between the pretest and posttest scores for all three groups. As displayed in table 3, there was a positive correlation between the two simulation training variables. The simulation group pretest had a significant correlation with the simulation group posttest, $r = .55$, p (two-tailed) $< .05$. No other group variables revealed significant correlation, which rejects the null hypotheses of no difference, and accepts the alternative hypotheses that states there is a difference between simulation only, lecture only, and mixed-method pretest and posttests.

Data Analysis

To answer the research question, a repeated measures ANOVA was conducted with two within-subject factors and three between-subject factors, to determine if statistically significant differences had occurred between the pre- and posttest assessments. Repeated-measures

ANOVA was used, because it had the capability of measuring the difference in mean scores under three or more different conditions (Stevens, 2005). In a repeated-measures ANOVA, the independent variable is measured more than once using the same participant, resulting in a gain in statistical power, by controlling the individual-level differences within subjects. Repeated measure designs analyzed performance over time, thus increasing statistical power and requiring fewer participants.

The instrument used to measure declarative knowledge was created using exploratory research questions that had been reduced and rewritten for clarity. To assess the structural properties of the instrument, a principal component analysis (PCA) was conducted on the 5 items, using varimax rotation to account for the lack of correlation among the question items. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = .68 (approaching 'good' .7 according to Field 2009). Bartlett's test of sphericity x^2 (10) = 59.19, $p <$ .000, indicated that correlations between items were sufficiently large for PCA. An initial analysis was run to obtain eigenvalues for each component of the data. One component had eigenvalues over Kaiser's criterion of 1 and, in combination, explained 48% of the variance. The factor used for the pretest met good reliability standards according to Field (2009), Cronbach's α = .71.

To assess the dependent variables for pretreatment equivalence, an analysis of variance (ANOVA) utilizing a Bonferroni adjustment to control for Type I error was conducted (Stevens, 2009). Results from the ANOVA were found to be non-significant, $F(2, 57) = .18$, $p = .83$, indicating the three groups met group equivalency assumptions (Field, 2009).

Pillai's Trace was utilized to determine if statistically significant differences existed between the three training groups on the posttest outcome measure. Results indicated statistically significant differences were present, $F(1, 55) = 86.42$, $p < .001$.

Table 4

Pre- and Posttest Differences by Group

Group	(df)	MS	*t*	*d*
Simulation	1, 15	.64	-2.16*	.66
Lecture	1, 20	.59	-5.28**	1.76
Mixed-Method	1, 16	.58	-6.44**	2.28

Note. *d* = Cohen's *d*.

*$p < .05$, **$p < .01$

Table 4 shows differences in pre- and posttest outcomes by treatment group. All three groups had a gain in knowledge at the conclusion of the training. The simulation-only group had a statistically significant increase; $p = .05$, with a medium effect $d = .66$. The lecture-only group had a statistically significant increase; $p = < .001$, with a very large effect $d = 1.76$. The group with the highest increase in scores was the mixed-method one, with a significant increase; $p = < .001$, and a huge effect $d = 2.28$.

Table 5

Pairwise Comparison between Training Groups

				95% CI[a]	
Group	Group	M (SD)	*d*	LL	UL
Simulation	Lecture	-1.23* (.49)	0.36	-2.45	-.02
	Mixed-Method	-1.31* (.52)	0.43	-2.60	-.03
Lecture	Simulation	1.23* (.49)	0.36	.02	2.45
	Mixed-Method	-0.08 (.52)	0.07	-1.35	1.19

Note. CI = confidence interval: *LL* = lower limit; *UL* = upper limit
[a]Bonferroni adjustment used to measure family-wise experimental error rate
* $p < .05$

Three pairwise comparisons were used to make post-hoc comparisons between conditions (Table 4). Pairwise comparisons indicated statistically significant differences between the simulation and lecture groups $p = .05$, $d = .36$ and the simulation and mixed-method conditions, $p = .04$, $d = .43$. A third pairwise comparison indicated no significant difference in the scores between the lecture and mixed-method conditions, $p = .88$.

Summary and Conclusion

Initial analysis found that all training conditions resulted in posttest increases. Post hoc analysis revealed a statistically significant difference between the training models, however only one model – simulation-only – resulted in significantly less learning than the other two. Based on these findings, the teachers who had the greatest increase in declarative knowledge of dyslexia were those attending the lecture-only group and the mixed-method group. These results support that simulation training alone is not effective for increasing teacher's knowledge about dyslexia.

However, when paired with a lecture and presented in a mixed-model format, it can be just as effective as lecture only.

Chapter 5: Conclusions and Recommendations

Dyslexia affects as much as 17.5% of the general student population in the United States (Shaywitz, 1998). However, many educators do not understand what dyslexia is and how this disability impacts those students in the classroom (Brownell et al., 2009; Carlisle et al., 2009; Carlisle et all., 2011, Shaywitz, 1998). There are current legislative efforts being made on the national and state levels to address the need for teacher training about dyslexia (Dyslexia Advantage, 2015), but there is a paucity of research evaluating effective teacher training models in relation to increasing teachers' knowledge of dyslexia. The objective of this dissertation was to identify the most effective way to increase teachers' declarative knowledge of dyslexia. Three methods of teacher professional development about dyslexia were evaluated, with the goal of identifying the most effective model.

The research question guiding this study was: Is there a significant difference in knowledge acquisition regarding dyslexia definitions and strategies amongst groups of teachers trained with simulation-only, lecture-only, or a mixed-method involving both simulation and lecture?

It was hypothesized that teachers who received the mixed-method training, i.e. simulation supplemented by lecture, would demonstrate greater knowledge than the teachers who underwent lecture-only or simulation-only training. A second hypothesis was that teachers who received lecture-only training would gain more knowledge than those receiving simulation-only.

A total of 58 teachers received one of the three training models, provided by the researcher in a two-hour session, over the summer of 2016. The participants consisted of general

education elementary school teachers who had volunteered to receive professional development about dyslexia in one of six training sessions. After teachers had selected their day and time of training, each session was randomly assigned to one of three training models, to insure balanced groups. The result was a quasi-experimental, completely balanced block design. Each participant completed a pretest at the start of the training, and a post-test immediately after it. Scores from the pretest and posttest were analyzed to compare the increase in declarative knowledge about dyslexia, upon completion of each training session.

Teachers from all three groups displayed no difference in their pretest knowledge of dyslexia; the mixed-method (n =17), lecture-only (n =21), and the simulation-only group (n = 20) started the training with the same level of knowledge. After the training, all three groups had increased their knowledge, with the simulation-only group having the lowest measured increase in knowledge, followed by the lecture-only group. The mixed-method group made the largest knowledge gain. The data did not indicate a significant difference between the mixed-method and the lecture groups. The hypothesis that mixed-method would be more effective was not supported by data, as it did not indicate a significant difference between the two groups. Additionally, there was no effect between the lecture and mixed-method groups.

When comparing the magnitude of change between the simulation and lecture-only groups, the results indicated a medium effect (Cohen, 1988). Lastly, the differences between the simulation-only and mixed-method training indicated a large effect (Cohen, 1998). The data revealed that lecture-only and mixed-method training significantly increased teacher knowledge of dyslexia as compared to simulation-only training. This study can assist professionals as they select training models to utilize with teachers in their state, district, or school.

Professional development is the primary vehicle in support of teachers, by creating new understandings about teaching and learning (Zepeda, 2013). Because dyslexia is a neurological reading difference that can be mitigated with proper instruction, teacher training should focus on increasing teachers' awareness of the characteristics of dyslexia as well as strategies needed to help students with dyslexia (IDA 2010, 2012; Lerner, 1971; Shaywitz, 2003; Tonnessen, 1997). Some researchers have suggested that a lack of knowledge, and misconceptions about dyslexia, can contribute as much as biological factors to reading and writing disabilities (Berninger et al., 2008). Since reading is not considered to be a natural process and because it requires systematic and explicit instruction (Lyon, 1998), it has become evident that multisensory, systematic instruction enables dyslexic children to more effectively adjust the neurological pathways, in order to begin the skill of decoding and comprehending words (Shaywitz, 2003).

The International Dyslexia Association (IDA) has published research suggesting that the majority of educators have not been prepared to recognize students with dyslexia, and that they do not possess the skills to provide adequate instruction (2010). This study supports the IDA's suggestion that general education elementary school teachers lack initial knowledge of dyslexia (IDA, 2007). The pretest results in this study support the literature that elementary educators have similar, limited levels of declarative knowledge as to the prevalence of dyslexia; its impact on reading, writing, and emotional wellbeing; and the fact that it is genetic.

Ferguson (2006) averred that for professional development to be deemed “effective”, it must be research-based, tied to standards, and must present a coherent structure for teachers working in an environment rooted in learning. Additionally, Knowles outlined the theory of andragogy when delivering new information to adults. The information should be given in a

manner that will engage the adult learner, allow him or her the ability to tap into prior experience, and present information that will enhance their profession. The IDA training methods used in the current study, simulation and publication, were chosen in an attempt to satisfy those terms of effectiveness and adult learning styles. Another aspect of effective professional development includes developing a specific set of learning objectives, along with supporting learning activities (Ferguson, 2009). The training methods used in this research were developed to increase teacher knowledge of dyslexia. The two programs chosen were in alignment with the objective of increasing declarative knowledge for general education elementary school teachers. Finally, for professional development to be deemed effective, it should improve skills or extend knowledge, while simultaneously increasing the adult's current level of knowledge (Palmer, 1998; Zepeda, 2013). The International Dyslexia Association is a professional organization that creates information for various audiences, in order to build upon and extend a participant's current knowledge base. The training models chosen were both appropriate for the teacher audience, with consideration given to the goal of building upon existing knowledge of reading instruction, thereby increasing knowledge of dyslexia.

Recently in education, the issues of cost and time have been a factor in choosing professional development options for teachers (Mader, 2015; TNTP, 2015). No national data exist on how much districts spend to support teacher training, however research with 137 school districts reveals an average of $18,000 is spent per teacher per year. That same research also found that teachers spend an average of 150 hours a year in training opportunities (TNTP, 2015). For the current research on dyslexia training, the models chosen took into account the minimal cost for providing the training including cost of materials, time spent by teachers in the training, as well as facilities. It also factored in overall time teachers would have to spend outside of the

classroom to receive the training. The data from this research supports an effective two hour training model using limited money and time can increase declarative teacher knowledge of dyslexia.

To assist in providing information to educators, the IDA published an article entitled *Dyslexia in the Classroom: What Every Teacher Needs to Know*, a comprehensive packet informing educators about characteristics of students with dyslexia; associated risks; possible screening tools useful in identifying students at risk; and effective strategies for use with students who may have dyslexia (2013). The intent of the toolkit was to provide teachers with basic information about dyslexia and dispel some of the myths and misconceptions surrounding it. It was also a "resource that will increase the teachers' capacity to ensure the success of the diverse group of learners in their classroom" (IDA 2013, p. 2). The toolkit was provided to every elementary school in the United States to raise awareness and serve as a resource for schools' administration and staff (IDA, 2013).

In addition to the publication, the Northern California Branch of the IDA produced a training that used simulation activities to help teachers experience what it might be like to have dyslexia (2010). It is research-based and has been updated to more fully align with classroom standards. In addition, it included specific objectives that were explained as participants experience each activity. Finally, it simulates common classroom situations that utilize previous knowledge and skills of teachers to extend their declarative knowledge. In a conversation with Learning Ally representative, Mark Brugger, he commented that simulation training is the most requested type of training. It is provided across the United States for stakeholders, parents, and teachers. Whenever simulation trainings are held, they are highly attended and the audience is

more engaged than they were during the two-hour lecture training Learning Ally used to provide (Brugger, personal communication, April 12, 2016).

The learning outcomes of both models were measured to determine the efficacy in increasing declarative knowledge of dyslexia among elementary school teachers. The results of this study supported use of the IDA publication *Dyslexia in the Classroom: What Every Teacher Needs to Know* to increase declarative knowledge of dyslexia. However, when analyzing the data, this study did not support using only the simulation to increase declarative knowledge. The results also suggested that using an abbreviated version of both models together, in a mixed-method approach, was more effective than using simulation alone, and equally as effective as a lecture using the publication.

One conceptual framework underpinning this study was Pedagogical Content Knowledge (PCK). Through its precepts, teachers learn that literacy acquisition may be difficult for some students – and how to adjust their teaching methods to better meet the needs of children with various learning abilities (Shulman, 1986). The theory of andragogy was also used, as it explicated the adult learning process and ways in which adults adapt to new knowledge (Knowles, 1980).

Shulman's pedagogical content knowledge (1986) highlighted the importance of foundational knowledge, as well as alternatives for accessing that knowledge. It is necessary for teachers to understand exactly what makes learning easier versus more difficult for students. Pedagogical content knowledge informs the teacher of multiple strategies in presenting materials that help students understand (Deng, 2007; Schulman, 1986). The results of this study support the fact that when training includes lecture, and when teachers learn *why* students with dyslexia

are not learning, they increase their declarative knowledge about the impact of dyslexia on writing, reading, and spelling.

Knowles (1973) explained that adults access knowledge differently than children. When determining effectiveness, it is important to look at how training for adults is aligned with andragogy. According to the theory, adults desire to learn what can be applied immediately (Knowles, 1987). In the publication provided to teachers during a lecture, participants were given key facts about dyslexia that they could immediately relate to their students, as well as tips for screening and remediating those students who might be at risk.

The three training models used in this study included material that informed participants about how dyslexia impacts the students' reading. This was expounded upon by indicating that such impacts can lead to difficulties in other areas, such as spelling and writing. Through the simulation, participants experienced firsthand the difficulties inherent in spelling and writing. The lecture provided specific details about the associated problems and gave strategies to implement in the classroom. The mixed-method model combined firsthand experience and the lecture's format of explaining difficulties. Despite the fact that all participants were exposed to the same information, albeit in differing formats, the results of the posttest questions varied. When asked, "Does dyslexia make spelling [or writing] difficult?" more participants in the lecture and mixed-method groups answered correctly. There were few correct answers from those in the simulation-only group.

Simulation training creates a realistic experience to assist adults in gaining knowledge (Hertel & Mills, 2002); thus, the inclusion of an element of simulation is in accordance with the theory of andragogy. As teachers experience dyslexia and feel students' sense of helplessness

and frustration, the resulting tension and resentment may lead to an analysis of previous knowledge, as well as application of new knowledge. However, the results of this study do not point to the use of simulation-only training as the most effective in increasing declarative knowledge about dyslexia.

The results of this study align with previous research, which indicated that simulation alone is ineffective in increasing knowledge of a disability (French, 1992; Kiger 1992; Siebers, 2008). It is possible that the simulation experience increases empathy; however, empathy was not evaluated in this study. Nevertheless, informal observations of participants and reactions, throughout the simulation, appeared to indicate that the simulation lacked impact on those experiencing it. Participants were very involved, asked questions, and commented that more teachers should receive the training.

This study did support the theory of experimental learning, including the use of simulation activities, if properly constructed (Burgstahler, & Doe, 2014; Herbert, 2000; Leo & Goodwin, 2013). Herbert (2000) posited that a combination of methods would prove more effective in producing awareness of persons with disabilities. Research on simulation training has supported that carefully-designed simulations are effective learning tools in specific situations. When objectives are clearly stated, participation is voluntary, and there is a debriefing to allow for connections between the experience and disability, then simulations can have a positive outcome (Burgstahler, & Doe, 2014). Results from this study indicated that when simulation training was supplemented with a lecture (mixed-method) it was significantly more effective in enhancing declarative knowledge. The mixed-method training model had objectives stated at the beginning of the training, followed by simulation activities and lecture. This model

allowed participants to experience the difficulties of dyslexia, as well as acquire specific information about the disability. The combination of the two models into one mixed-method design yielded a greater effect than any other training model.

Limitations

The present study, however, does have several limitations. In the first place, the number of participants was small. The study evaluated the increase of declarative knowledge using three training methods, provided to a total of 58 participants. Even though the participants exceeded 36 (the number suggested by GPower), the sample remained small, and thus limited, for large-scale generalization. Moreover, this study was conducted in a constrained geographic location, further limiting the ability to generalize.

Another limitation to this study was the testing instrument. In order to meet reliability standards, the questionnaire was reduced to five items. Having a small number of questions limited the information gained in evaluating the teacher's declarative knowledge of dyslexia. The research measured change in knowledge over a two-hour training. It did not measure sustained knowledge or application, or knowledge to classroom practice, both critical when considering appropriate professional development modes.

Although participation in training in this research study was ostensibly voluntary, some principals strongly encouraged their staff to participate, and some previously-trained teachers encouraged their peers to do likewise. As a result, a predisposition toward active participation and acquisition of knowledge could have been present. The use of two separate participation groups for each of the three training models allowed for comparison of the means. The data

supported equivalency in their initial knowledge, so that even if participants came with some prior knowledge, they all began at the same level of understanding of dyslexia. Results on the outcome of training may have varied when participants were mandated to attend the training. The theory of andragogy outlines the importance of adult learning as self-directed – or self-motivated and fitting within the context of the learner's life (Zmeyov, 1998). If teachers did not recognize the importance of the training, or if they were involuntary attendees,then the results of the training may have been found to differ from those of this study.

Lastly, the primary internal threat to this study was the testing effect. Participants took an identical pretest and posttest. The effects of practice familiarity in taking the same test more than once, in such a short period of time, may have acted to improve performance, simply because of test familiarity (Edmonds & Kennedy, 2016). Nevertheless, while the limitations and threats listed above had an overall impact on the study, results were not discredited.

Recommendations

With new initiatives in legislation at the federal level, including the READ Act, passed in the spring of 2016, it is crucial that educational institutions continue to evaluate training methods (H.R. 3033: READ Act, 2016). The publication *Dyslexia in the Classroom: What Every Teacher Should Know* (IDA, 2013) was found to be effective when used in conjunction with a lecture supplemented with portions of *Experience Dyslexia* (NCBIDA, 2010). However, using *Experience Dyslexia* (NCBIDA, 2013) in isolation was not as effective for measuring knowledge of prevalence; inheritability; and impact on writing, spelling, and social and emotional wellbeing. This study reported the answers to five questions regarding knowledge of dyslexia. Although the questions related to important aspects of dyslexia, this study did not evaluate

knowledge of interventions, or the most common misunderstanding about dyslexia: reversals. This research would have been strengthened by a more comprehensive survey instrument for evaluating the declarative knowledge of both the characteristics of dyslexia and appropriate strategies for utilization with students.

Cocoran (1995) and Ferguson (2006) emphasized that effective professional development should be enjoyable, and should offer opportunities for active participation in a learning activity. Simulation training is a form of active participation, as it allows teachers to participate in activities that simulate being a student with dyslexia. The Dyslexia Training Institute (DTI) has published *Dyslexia for a Day* (2012) – a simulation training manual with activities that differ from *Experience Dyslexia* (2010). Activities included in the DTI simulation utilize facts about dyslexia throughout the simulation activities. Future research may evaluate the use of simulation using both formats, to see if *Dyslexia for a Day* has more of an effect on increasing declarative knowledge for teachers than *Experience Dyslexia* (Dyslexia Training Institute, 2012; NCBIDA, 2010). While research appears to indicate that simulation increases positive attitudes toward persons with disabilities, research should be conducted combining lecture with the simulation, to explore the efficacy of both increasing knowledge and influencing attitude (Herbert, 2000).

Zepeda (2013) highlighted that, for professional development to be effective, it should not be an add-on or a series of discrete activities. The current research study does not support this model however. With additional coaching or follow-up training, it could be a valuable piece of a larger professional developmental series. Research also states that professional development should be sustained throughout multiple opportunities, in order to maintain knowledge gained. Mastery only comes as a result of continuous practice and support (Truesdale, 2003). Studies

have revealed that effective professional development programs require anywhere from 50 to 80 hours of instruction, practice, and coaching before teachers arrive at mastery (Banilow, 2002; French, 1997; Yoon et al., 2007). This study only measured short-term acquisition of knowledge, from a two-hour training provided during summer break. Because extant research supports the use of long-term, continual training for professional development (Desimone, 2009), it would be recommended that dyslexia training for teachers be much longer than the limited training provided in this study, in order to measure the knowledge both retained over time and applied to classroom practice.

While Desimone (2009) and others provided evidence that the most effective training models were carefully developed and provided over multiple sessions (Banilow, 2002; French, 1997; Yoon et al., 2007), schools are restricted to a limited amount of training time, as mandated by legislation. For example, according to state regulation XXX 156.095, “Each local board of education shall use four (4) days of the minimum school term for professional development and collegial planning activities for the professional staff, without the presence of students pursuant to the requirements” (Professional Development Programs, 2016). Because school districts are limited in the amount of time they have to properly train teachers, this research has important implications that should be considered. While the two-hour training does not meet the criteria that aligns with best-practice, long-term training models, it does allow teachers to learn a significant amount in such a short period. Schools could consider implementing the lecture or mixed-method designs to accomplish efficient training during one of the few mandated days provided to all schools within the state – with the aim of increasing declarative knowledge of dyslexia. Future research could evaluate the effectiveness of using these models at the middle

and high school levels, to allow for states to consider the models for a state-wide initiative of teacher training.

Another aspect of teacher professional development to consider is the cost associated with providing materials and resources for implementation. There was a significant cut in funding to the federal education budget appropriation between 2015 and 2016, and a proposed additional cut of $1.3 billion dollars with the passing of the Every Student Succeeds Act (2015) (Committee for Education Funding, 2016). In one state, it was proposed to legislators that an area to cut funding might be teacher professional development (KDE, 2016). The training models used in this research had a minimal cost per participant and could be implemented by educated professionals at the school or district level. *Experience Dyslexia* can be purchased online for $285 and includes all paper materials needed (NCBIDA, 2010). The training can be used repeatedly and would require minimal supplementation, such as the purchase of mirrors and use of speakers, to complete the simulation experience. As this research suggests, it is also important to consider adding lecture to a simulation. The publication *Dyslexia in the Classroom: What Every Teacher Needs to Know*, used for the lecture training and to supplement the simulation, is free – and available online via the IDA website (IDA, 2013). Due to the low cost, these methods could be envisaged for the large-scale training of teachers regarding dyslexia. Furthermore, both the IDA publication and simulation training packet include a script or explicit information for the presenter to utilize during training. Therefore, no expert trainer or consultant would need to be hired, which would allow the districts an opportunity to develop experts internally.

Teachers continue to comprise the foundational component of the educational system, and it is imperative that they continually expand their knowledge and skills, in an effort to implement the best educational practices, according to student needs (Jacob & Lefgren, 2002; Zepeda, 2012). Additionally, legislative and financial constraints on districts, including cost and training time, make it highly important to choose effective professional development models to increase teacher knowledge. Research has demonstrated the teacher knowledge of dyslexia is limited (Berninger et al., 2008; McCray & McHatton, 2011; Wadlington, 2005). However, when as many as one in five students may have characteristics of a reading difference such as dyslexia, it is important for teachers to be trained on the topic. This study has evaluated three potential methods to use in a short term, cost effective manner. Depending on the preference of the school districts or schools themselves, the use of a lecture-only or mixed-method design, to include lecture and simulation, could act to increase declarative knowledge about dyslexia for general education elementary school teachers. While future research opportunities exist, based upon the topics discussed herein, this study can be a starting point when considering professional development about dyslexia, for teachers.

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Appendix A: Solicitation Letter to Principals

BELLARMINE UNIVERSITY
IN VERITATIS AMORE

ANNSLEY FRAZIER THORNTON SCHOOL OF EDUCATION

Dear Principals,

I would like to let you know about a research study that may be of interest to your teachers and ask you to consider referring your general education teachers for possible participation.

I am completing my PhD in Education and Social Change through Bellarmine University. My dissertation research involves training general education teachers about dyslexia. I will be testing three different presentation methods to determine which method is the most effective in increasing teacher knowledge. The training methods used are based on publications by the International Dyslexia Association. I will use a pre/post-test to measure teacher knowledge. The participants will be confidential and no identifying information will be used in evaluating data.

At this time, I am looking for general education elementary school teachers. In order to meet the needed sample size, I need at least 60 teachers to participate in one of six trainings. I believe the training will align with your school goals for reading and addressing struggling readers. It is my hope that you will allow teachers to use the two hour training as flex hours for the 2016-2017 school year.

I look forward to speaking with you or your teachers who may be interested in participating. I would be happy to stop in to your school during a closing day to give a brief explanation to your teachers and encourage them to participate.

Please see the signup genius link below for more information.

http://www.signupgenius.com/go/10c0a4fa4aa2ea5ff2-dyslexia/

Please feel free to contact me with questions, or have your teachers contact me themselves, using the contact information provided below.

Thank you for your time and consideration.
Sincerely,
Kayla Steltenkamp
KSteltenkamp01@bellarmine.edu
1-859-333-4458

Appendix B: Participant Consent

BELLARMINE UNIVERSITY
IN VERITATIS AMORE

ANNSLEY FRAZIER THORNTON SCHOOL OF EDUCATION

Dear Teacher,

I am doing a research study as part of my dissertation project. Mu study is about the efficacy of professional development for dyslexia. You have volunteered to participate in this study because you teach elementary school and have interest in learning more about dyslexia.

You will be taking a survey about dyslexia prior to the training and immediately following the training. I will not share your answers with anyone. You will be given a random participant number that will keep your answers confidential. I will not be able to identify the name of the participant number assuring your anonymity.

You may choose to leave the study voluntarily at any time. You will not be paid in this study. This study can count as flex or professional development hours pending prior approval of your building administrator.

There are minimal risks to participating in this study. Participants may experience stress when engaging in the simulation training, or filling out the survey. Educators and students with dyslexia may benefit from this study.

You may contact the researcher, Kayla Steltenkamp, at KSteltenkamp01@bellarmine.edu at any time.

The researcher's faculty advisor is Dr. Kathleen Cooter. You may reach her at kcooter@bellarmine.edu. She is available for any further questions or concerns you may have about the research.

I appreciate you participation, please feel free to contact with any comments, questions or concerns.

Sincerely,

Kayla Steltenkamp
Kayla Steltenkamp
KSteltenkamp01@bellarmine.edu
1-859-333-4458

Appendix C: Participant Sign Up

The following excerpt was a copy of the online signup form teachers used to sign up for a training.

Research

Dyslexia Training

This training is being completed as part of a research project to determine the most effective professional development method for training elementary general education teachers about dyslexia. Participants will sign up for ONE date and time and be randomly assigned to participate in one of the three proposed training methods. Participants will take a pre test prior to the training and a post test immediately following the training. All information is confidential and there will not be a way to determine identity when analyzing data.

The three trainings are detailed below:

1) Experience Dyslexia: A simulation training that is a hands-on activity that lets participants experience some of the challenges and frustrations faced by people with this language-based learning disability. (2 hrs)

2) "What Every Classroom Teacher Should Know About Dyslexia": This training uses the International Dyslexia Association publication to inform classroom teachers about the language-based learning disability, dyslexia. Presentation is given as a lecture with visual supports. (2hrs)

3) Mixed Method: This training is a condensed version of both of the above two trainings. Participants will engage in three simulation activities and hear the main ideas of "What Every Classroom Teacher Should Know About Dyslexia." (2hrs)

**This training may count towards flex time depending on prior approval from your building administrator.*

Appendix D: Pre Test Instrument (Post Test was a replication with a title change)

Dyslexia Questionnaire **Pre-Test** Participant #_____

Date:_____

This survey is **completely anonymous**. I

sincerely appreciate your help in answering these questions. For more information about this questionnaire please contact Kayla Steltenkamp at KSteltenkamp01@Bellarmine.edu.

A) Please list what area you teach (i.e. general ed., special ed., para):

B) How confident are you in your ability to teach students with dyslexia?
*Please circle one number.

1 = not confident 2 = somewhat confident 3 = confident 4 = extremely confident

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DIRECTIONS: Please indicate the extent to which you agree with the following statements.

1 = definitely false 2 = probably false 3 = probably true 4 = definitely true

1. Dyslexia can cause difficulty with writing……	1	2	3	4
2. Dyslexia is genetic……	1	2	3	4
3. Dyslexia makes spelling difficult……..……	1	2	3	4
4. Dyslexia and emotional/social problems are highly correlated	1	2	3	4
5. One in five students have dyslexia……. ..	1	2	3	4