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An Examination of Preschool Teachers' Beliefs about Early Literacy within the Context of a Transdisciplinary Neuroeducation Learning Framework: An Exploratory Qualitative Case Study

Robert D. Cantwell

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Abstract

Teacher beliefs have been shown to be an influential factor in student outcomes in all areas of learning. In light of the persistent achievement gap between White students and students of color, it seems important to study and understand the role of teacher beliefs in public education. This exploratory case study contributes to a deeper understanding of how preschool teachers' beliefs about early literacy are expressed or may evolve within a context of implementing the Neuro-semantic Language Learning Theory, a learning framework integrating neuroscience, Western cognitive psychology, and language acquisition into educational applications. The study design included a sample of three preschool educators and multiple data collection events using a robust variety of elicitation methods, including concept map construction, video-stimulated recall, and semi-structured interviews. The data were analyzed following Saldaña's first, second, and third cycle coding methods and employed both deductive and inductive approaches. Findings included broader definitions of early literacy by study participants than are noted in the literature and the belief that meaningful learning requires context within social interactions in addition to skill-based interventions. The most significant finding highlighted the complex and contextualized nature of teacher beliefs, which may be changed through the insertion of cognitive disequilibrium supported by a complex and contextualized system of theoretical translation, professional learning opportunities, ongoing coaching, and believable vicarious experiences. Specific recommendations for professional learning experiences and future research are offered.

Acknowledgements

I beg you…to have patience with everything unresolved in your heart and try to love the questions themselves as if they were locked rooms or books written in a very foreign language. Don't search for the answers, which could not be given to you now, because you would not be able to live them. And the point is, to live everything. Live the questions now. Perhaps then, someday far in the future, you will gradually, without even noticing it, live your way into the answer…
- Rainer Maria Rilke, 1903, Letters to a Young Poet

There are several people to whom I am indebted for their support, guidance, and wisdom during this journey. I would like to thank my dissertation chair, Dr. Julie Kalnin. You taught me to love and live the questions now as I gradually lived my way into the answers. You challenged me to embrace the process and supported the fact that I was exactly where I needed to be every step along the way (a very neuro-semantic approach). Thank you for helping me learn to write like a researcher and the many laughs during our consultations. I could not have completed my study without your big blue microphone!

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Dedication

Children are the living messages we send to a time we will not see. – Neil Postman

For my three brilliant and beautiful daughters, Olivia, Sophia, and Julia. You are the living messages that make a difference now and into the future. I am grateful to share this path that we walk together. I have learned so much from each of you.

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Chapter 1: Introduction

In January 2020, David Steiner, Director of the Institute for Education Policy at Johns Hopkins University, told an audience at a national literacy summit, "We've had about 130 years of bad [reading instruction] practice" (Steiner, 2020). The comment was made within the context of perceived stagnation in reading achievement in the United States the last 30 years, and a frustration over a debate that has been waged over how best to teach reading.

Learning to read has been such a high profile priority in the United States that, in 1997, the U.S. Congress asked the Director of the National Institute of Child Health and Human Development (NICHHD) to convene a national panel to identify the most effective ways to teach reading to the nation's K-12 students (NICHHD, 2000). As a result, the National Reading Panel (NRP) was formed. In 2000, a report from the National Reading Panel was published summarizing their findings, which guided many policymakers and school districts in making decisions about literacy instruction.

Political action followed the NRP's metanalysis of the current research. In 2002, the No Child Left Behind (NCLB) Act was signed into law by President George W. Bush. The law significantly increased accountability of schools in ensuring all students made adequate academic progress, especially English-language learners, students in special education, students of low socioeconomic status, and students of color, whose achievement, on average, trailed their peers (NCLB, 2002).

Because the National Reading Panel Report did not examine instructional practices used with children from birth through age 5, the National Early Literacy Panel was formed in 2002. Its primary goal was to "identify interventions, parenting activities, and instructional practices that promote the development of children's early literacy skills" (NCFL, 2009, p. vi). In its 2009

published report, the panel identified a wide variety of interventions that improved children's early literacy skills, however, it found significant problems with the quality of the research in this area.

National and State Level Results

The effectiveness of these expansive policies and metanalyses is called into question due to the evidence reflected in national and state performance measures. The National Assessment of Educational Progress (NAEP) is a nationally representative measure of trends in academic achievement of United States students in grades kindergarten through 12 (NCES, 2019). Since 1969, it has assessed what the nation's students know and can do in select subjects. According to the 2019 NAEP Report Card for both Reading and Mathematics, overall student performance in the United States has improved slightly over the last two decades, however, the performance of economically, racially, and neurologically diverse students continues to lag behind their White middle class neurotypical peers (Darling-Hammond, 2014; NCES, 2019). For example, in 1992, fourth-grade White, Hispanic, and Black students had average scores of 224, 197, and 192 respectively in reading. In 2019, average scores for these three fourth-grade groups were 230, 209, and 204 respectively in reading (NCES, 2019). It is clear that each group of students improved their average scores. What is also apparent is, over the span of 27 years, the gap between White students and Hispanic and Black students has remained relatively static. In other words, as White students' average scores have increased, Hispanic and Black students' scores have increased, on average, at the same rate, so that the same discrepancy in performance remains.

As evidenced by the 2018 Program for International Student Assessment (PISA) and the 2019 NAEP Report Card, the achievement gap between White students and students of color in the United States continues to persist (NCES, 2019; NCES, 2020) even in the face of major reform efforts over the last several decades. Kendi (2019) offers another perspective using a lens of racial equity and social justice. "The acceptance of an academic-achievement gap is just the latest method of reinforcing the oldest racist idea: Black intellectual inferiority" (Kendi, 2019, p. 101). While I also take issue with the use of test scores and attendance rates as some of our only measures of academic "achievement," statistical resources such as PISA and NAEP are some of the only widely accepted longitudinal reports on which researchers can argue for or against current practices in the field. My study's focus finds inspiration in Kendi's call to action in questioning dominant theoretical frameworks and narratives in the areas of pedagogy and assessment.

Opportunity Gaps in the Oregon Context

It appears these opportunity gaps exist in the Oregon context as well. There is evidence of a performance gap as early as entry into kindergarten. In fall 2013, the state of Oregon first administered the Oregon Kindergarten Assessment (OKA) to incoming kindergarten students. The annual assessment is required to be administered to all entering kindergarteners by all public schools in the state, although families can opt out. The purpose of the OKA is to provide an overview of skills that students have when they enter kindergarten. The assessment measures students' skills in the domains of Early Literacy (letter names and letter sounds), Early Math, and Approaches to Learning. These domains are strongly linked to third grade reading and future academic success (Duncan et al., 2007; McClelland et al., 2013). Statewide data from the OKA

over the last seven years indicate the gap in Early Literacy and Early Math between White students and students of color persists from year to year at similar differences over time with White students outperforming students of color (Hispanic, African American, American Indian) every year (ODE, 2020). Achievement gaps based on race/ethnicity and income just prior to entry into kindergarten appear to mirror those persistent during the K-12 years (Friedman-Krauss et al., 2016).

Importance of Early Literacy Acquisition

These gaps are especially alarming given research shows the acquisition of early literacy skills that support young children's ability to read has been identified as an essential component of high quality early learning programs (NCFL, 2009). Cooper and Kiger (2009) operationalized the term, *literacy*, as speaking, listening, reading, writing, thinking, viewing, and calculating. *Early/emergent literacy* has been defined by Ghoting and Martin-Diaz (2005) as the knowledge that children have about reading and writing before they learn to read and write. *Early literacy* is used interchangeably with *emergent literacy* in the research. Both terms imply that literacy development begins at birth, gradually develops over time, and must be fostered by adults. I have chosen to use the term *early literacy* rather than *emergent literacy* for the purposes of this study.

Although the details of how the National Assessment of Educational Progress assesses reading is beyond the scope of this study, this researcher would like to note that NAEP defines reading as "a dynamic cognitive process that involves understanding written text, developing and interpreting meaning, and using meaning appropriately for text type and purpose" (p. 3). In describing its reading assessment framework, NAEP goes on to say that, "by design, the texts used in the assessment require interpretive and critical skills" (p. 3). These definitions are key to

understanding why I chose to study the expression of preschool teachers' beliefs within a neuroeducation framework, defined later in this chapter.

Role of Teacher Beliefs

Teachers have an important role in helping *all* students succeed in all areas of learning. This is especially true in closing and eliminating gaps in performance among students. What teachers believe, what they know, and the instructional approaches they choose are critical in influencing student outcomes.

Beliefs about the nature of learning, the potential of learners, and the effectiveness of specific strategies and interventions are embedded in the profession of teaching and vary among educators (Borg, 2004; Gregoire, 2003; Hindman & Wasik, 2008; Lynch & Owston, 2015; Pajares, 1992). For this study, I adopted definitions of belief offered by Pajares (1992) and Kagan (1992). Pajares proposes that a belief is "an individual's judgment of the truth or falsity of a proposition…that can only be inferred from a collective understanding of what human beings say, intend, and do" (p. 316). Kagan's definition of teacher beliefs as "implicit assumptions about students, learning, classrooms, and the subject matter to be taught" provides an educational lens that adds clarity to my research focus (p. 66). The reciprocal relationship between teachers' beliefs and practices has been examined at some length (Buehl & Beck, 2015; Fenstermacher, 1979, 1986; Nespor, 1987; Pintrich, 1990). Evidence in the literature suggests that teachers' beliefs can be disconnected from and not aligned with teachers' practices (Jorgensen et al., 2010; Lim & Chai, 2008; Liu, 2011). It appears there is a reciprocal, yet complex, relationship between beliefs and practices. They influence one another, and the strength of this relationship may vary across individuals and contexts as well as the type of beliefs and practices being assessed.

Buehl and Beck (2015) found that lack of alignment between beliefs and practices is no reason to discount the power of beliefs, and that it is important to understand the relationship between beliefs (about the truth/falsity of propositions) and behaviors (practices), as well as the internal and external factors that may support or hinder their connection to each other. All beliefs exist within a complex, interconnected, and multidimensional system (Buehl & Beck, 2015). Beliefs can change with time or experience, but Buehl and Beck (2015) found they are more or less static in the individual. The authors hold that some beliefs are explicit to the teacher whereas others are implicit. They also found that beliefs are distinct from knowledge.

Research shows that teachers' beliefs, knowledge, and practices can have a direct effect on students' school experiences and overall student achievement (Lortie, 1975; Lynch & Owston, 2015; Pajares, 1992). Researchers have studied preschool and kindergarten teachers' beliefs in the areas of developmentally appropriate practices (Jones et al., 2000; McMullen et al., 2005) early childhood curriculum (Wang et al., 2008), and early literacy acquisition (Brown et al., 2012; Hindman & Wasik, 2008; Lynch & Owston, 2015). To better understand the achievement gap, it is important to understand what beliefs teachers hold and how they express them in relation to early literacy.

Power of Beliefs

Research supports the argument that beliefs are the best indicators of teachers' planning, decision-making, and subsequent classroom behavior (Gregoire, 2003; Kagan, 1992; Pajares, 1992). The powerful influence that beliefs have on teachers' practices is well-documented in the historical literature (Abelson, 1979; Nespor, 1987), however, researchers have been disappointed with the progress the field has made in establishing a strong research foundation to understand

the nature of beliefs as educator preparation programs endeavor to develop and educate the nation's teachers (Houston et al., 1990; Pintrich, 1990). Nespor (1987) theorizes that belief systems rely heavily on emotions and affect, which could account for the tenacity with which beliefs can be held in the face of contradictory evidence. Pintrich (1990) recommended "a general constructivist paradigm could be the most fruitful approach to pursue for research" (p. 850) on teacher beliefs. Pajares (1992) goes so far as to say that teachers' beliefs are "the single most important construct in educational research" (p. 329). If this is the case, it is challenging to find current studies examining these issues, especially given that prospective teachers who complete an accredited teacher preparation program appear to be entering the teaching profession with their initial beliefs intact (Borko & Putnam, 1996; Richardson & Placier, 2001; Rust, 1994; Zeichner, 1981).

With the increased attention to and investment in preschool in the United States, it seems worthwhile to examine the beliefs that preschool teachers have about early literacy, what they know about early literacy, and how those beliefs can be influenced to align with best practice. With many competing interests, contested views of approaches, and pressure to make children "ready" for kindergarten, how is learning and early literacy defined by teachers in early childhood contexts? Examining these perspectives, including those within the context of implementing a promising practice, could support improved student outcomes for all preschool students, including racially, culturally, linguistically, and neurologically diverse students. Fenstermacher (1986) subscribed to a philosophy that education was a moral task. He stated that the appropriate use of research is to alter "the truth or falsity of beliefs that teachers have, as it changes the nature of these beliefs, and, as it adds new beliefs" (p. 43).

Research Gap

There is much research examining teachers' beliefs about literacy at the elementary and middle school levels (Asselin, 2000; Barnyak & Paquette, 2010; Duffy & Metheny, 1979). There is an increasing body of research over the last 20 years looking at teachers' beliefs about early literacy at the preschool level. A search of peer reviewed articles in the Education Resources Information Center (ERIC) on June 26, 2020 using the search terms *preschool teachers' beliefs* and *early literacy* showed 1,567 results. I could find no studies, however, about preschool teachers' beliefs and practices around early literacy within a transdisciplinary neuroeducation framework of learning. Given the emerging field of neuroscience over the last 30 years and increasing evidence that translations of neuroscience research into educational practice are showing great promise, this represents a significant gap in the research.

The Promising Practice of Neuroeducation

After decades of failed reform efforts, research in neuroscience offers new ways to think about learning and how the brain functions. An example of an innovative, research-based reform that recognized the evidence for intervening early in a young child's life, especially to counter the effects of poverty, was the federal Head Start program. In 1965, as part of President Johnson's War on Poverty, Head Start was created to meet the physical, emotional, and educational needs of low-income preschool children and their families (NHSA, 2020). An analysis of poverty's effects on child development is outside the scope of this study, however, research has shown that factors associated with poverty can have negative effects on children's language and cognitive development, which can then result in lower academic achievement (Sharkins, Leger, & Ernest, 2016).

One promising practice that preschool teachers might find effective in improving student outcomes, thereby reducing the persistent achievement gap, is a neuroeducation translation known as Arwood's (2011) Neurosemantic Language Learning Theory (NsLLT). The NsLLT is a *transdisciplinary* translation of the neuroscience research, cognitive psychology, and language acquisition literature.

In order to understand the nature of the NsLLT as presented in this study, it is important to clarify how academic fields, or disciplines, can be classified. Jensenius (2012) discusses the concept of academic disciplines or subdivisions of knowledge, and how separate disciplines may be paired, integrated, and synthesized in research and study. *Intradisciplinary* can be defined as working within a single academic discipline or theoretical framework, i.e. mathematics or western cognitive psychology. To take an *interdisciplinary* approach is to synthesize knowledge and methods from different disciplines. Jensenius (2012) defines *transdisciplinary* as "creating a unity of intellectual frameworks beyond the disciplinary perspectives" (para. 2) or creating something new through a synthesis of disciplines.

Neuroeducation, as described by Arwood (2011), is a model of translating the literature from western cognitive psychology, neuroscience, and language function acquisition into a theory of learning called the Neuro-semantic Language Learning Theory (NsLLT), a theory that synthesizes these three academic disciplines. The NsLLT unifies the tenets of these three disciplines into a new theoretical framework. Learning is defined at the neuronal (Haines & Mihailoff, 2018), cognitive (Anderson, 2015; Baars & Gage, 2007), and linguistic (Dreyer & Pulvermüller, 2018; Garagnani & Pulvermüller, 2016; Pulvermüller, 1999, 2005, 2012, 2018; Stahl et al., 2016; Vygotsky, 1962) levels through an integration of these three disciplines. The

neuroscience research indicates that learning results in changes to the brain at the cellular (neuron) level with the formation of circuits and networks. Every learner has a neurobiological learning system that performs best when educators facilitate the acquisition of language and language functions as well as language structures (Robb, 2016). This study will examine the intersection of expressed teacher beliefs about early literacy within the context of implementing the NsLLT, a transdisciplinary, neuroeducation-based model of learning.

Significance of the Study

The significance of this research is threefold. It affirms the importance of early childhood education, acknowledges the academic pressure on U.S. preschool programs, and highlights the need to improve outcomes for vulnerable children.

Importance of Early Childhood Education

Research shows that the early years play a key role in children's brain development (Kuhl, 2011). Children's early experiences deeply affect their future cognitive, social, physical, and emotional development (Mustard, 2010). During the early years, a child learns to walk, use language and speech to express needs and thoughts, establish social connections, and acquire a sense of agency or self. Preschool programs and preschool teachers play an important role in providing healthy and meaningful learning environments for our youngest learners.

The last five decades have seen a surge in public interest and investment in early childhood services in the United States. The federal government and 43 states offer preschool programs serving 1.5 million children nationwide at a cost of 7.6 billion dollars (Friedman-Krauss et al., 2018). This is an increase from 2007 of 5 states, 400,000 children, and almost 5 billion dollars (Barnett et al., 2008).

In addition to increases in both enrollment and expenditures, there has also been increased attention to the quality of these early childhood programs. Along with ensuring a child's nutrition, health, and emotional well-being are addressed in early childhood settings, much discussion and debate is occurring among researchers, families, teachers, and leaders regarding the literacy and social-emotional development of 3- and 4-year children (Walter & Lippard, 2017; Wilcox-Herzog et al., 2015). Given the significant investment of time, money, and effort, stakeholders want to know how preschool programs are addressing the acquisition of literacy skills. Early childhood educators and leaders at all levels are grappling with what preschool should look like according to societal norms, pressures to achieve, and translations of theoretical and empirical research (Fuller et al., 2017; Pajares, 1992; Stipek & Byler. 2004; Wilcox-Herzog et al., 2015). Educators, leaders, researchers, and policy makers are also arguing about what constitutes appropriate expectations for literacy and language acquisition in the early years (Hindman & Wasik, 2008; Lynch & Owston, 2015; Schachter et al., 2016).

Academic Pressure on Preschools

On an international scale, researchers and practitioners are noticing a Global Education Reform Movement (GERM), where academic expectations from upper grades are being pushed down into early childhood (Bialik & Shefi, 2017; Katz, 2015; Mongillo, 2017; Ringsmose, 2017; Sahlberg, 2011). The GERM is a well-documented effort that has the potential to influence how preschool is experienced in the United States. This mindset misses the importance of understanding children's brain development, and, with it, children's learning needs in order to acquire language and literacy (Kuehn, 2014; Sahlberg, 2015).

Impact on Vulnerable Children

Despite major reform efforts in the U.S., such as the No Child Left Behind (NCLB) Act (2002), a standards-based education reform, the educational achievement gap among U.S. students, especially groups defined by race/ethnicity, socioeconomic status (SES), and learning difference continues to persist. Research into the causes of this student achievement gap have been ongoing since the publication of James Samuel Coleman's (1966) report entitled, *Equality of Educational Opportunity,* also known as the Coleman Report. One possible cause could be the mismatch of students and teachers. The beliefs and practices of our nation's predominantly White, female teachers arguably have more of an impact on students who are racially, culturally, linguistically, economically, and neurologically diverse. Why? Because historically many of these students do not enter school (kindergarten) with the same advantages and do not have access to the same enrichment activities and external supports as their White middle class English-speaking neurotypical peers (Delpit, 2012; Hammond, 2015).

Too many children from diverse backgrounds continue to experience schooling in unsuccessful ways and perform below expectations. The assumption that replicating elementary level pedagogical strategies and increasing academic expectations at the preschool level is developmentally inappropriate and unethical, particularly for programs like Head Start which serve our country's most vulnerable children (Clausen, 2015; Colwyn & Ebrahim, 2016; Kuehn, 2014; Mongillo, 2017; Ringsmose, 2017; Sahlberg, 2011).

An achievement gap persists. Students of color and students experiencing learning differences have waited in vain for decades for effective reforms. With the rise in interest, support, and investments in early childhood, a key developmental period in a child's growth, it is

important to understand the relationship between teacher beliefs and practices, and how beliefs, knowledge, and practices may be shaped by professional learning experiences.

Educators, families, and the general public want all children in their care to succeed in preschool and beyond, because a literate citizenry is key to a high-functioning society. More importantly, the elimination of the persistent achievement gap between White students and students of color is a racial equity and social justice issue. This study is the first known study to examine preschool teachers' beliefs about early literacy within the context of a neuroeducation learning framework.

Conceptual Framework

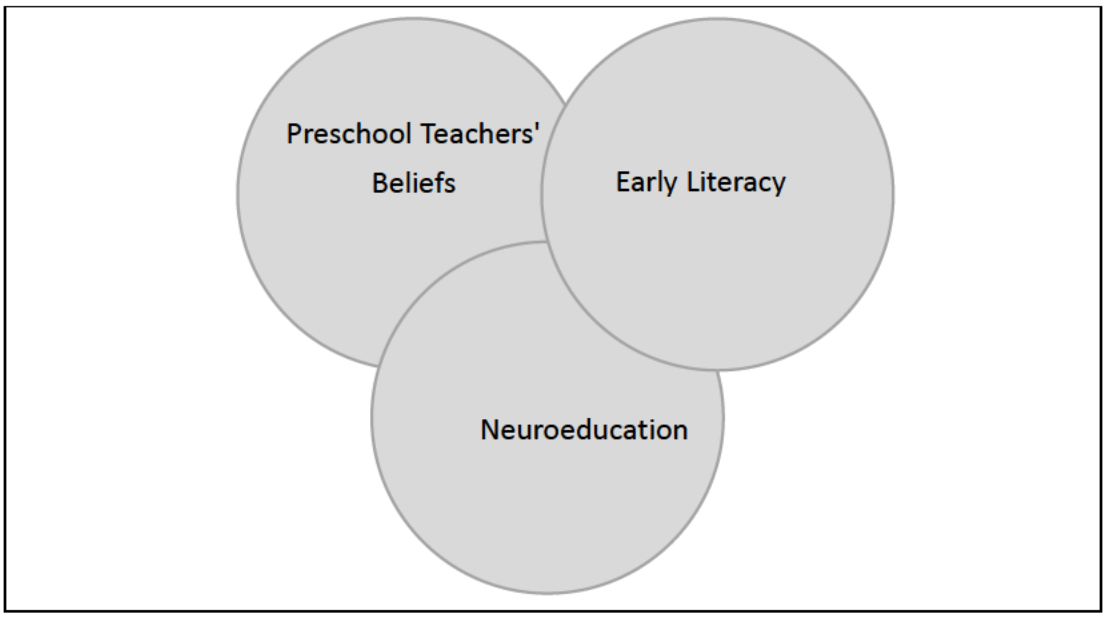
The function of a conceptual framework is to build a foundation, demonstrate how a study may advance knowledge, conceptualize the study, assess research design and instrumentation, and provide a reference point for interpretation of findings (Merriam & Simpson, 2000). Figure 1 represents my conceptual framework for this study. I aim to examine preschool teacher beliefs, a powerful construct in the act of teaching and learning. Early literacy is an essential component in the development of young children as learners and literate citizens. One of my assumptions is preschool teacher beliefs can impact the acquisition of early literacy concepts. Arwood's (2011) neuroeducation model builds on the research disciplines of western cognitive psychology and the emerging field of neuroscience. The NsLLT (Arwood, 2011) integrates a language acquisition lens not commonly included in other theoretical frameworks. Adopting and enacting a mindset which accounts for and understands the neurobiological learning systems of our youngest learners and which views increasing the capacity of young children to acquire language function as a key aspect of learning is an, as yet, unexamined

experience of preschool teachers. The promising practice of neuroeducation offers a potentially impactful opportunity to reduce or eliminate the persistent achievement gap that exists in the United States. My study will advance the field's knowledge of early literacy beliefs as expressed by a sample of preschool teachers engaged in implementing neuroeducation-based interventions and strategies.

This framework is best suited for my particular study, because the debate about what early literacy is and how the acquisition of early literacy occurs at the preschool level is an active topic of conversation at the national level. Simultaneously, the emerging field of neuroscience and its potential applications to educational settings is receiving increased attention from nationally and internationally renowned researchers. I have the opportunity to study the intersection of preschool teachers' beliefs about early literacy within a neuroeducation framework, because there a teachers in close proximity to me who are in the process of implementing neuroeducation-based interventions and strategies. This close proximity allows me to utilize robust elicitation methods, such as concept map construction and video-stimulated recall along with semi-structured interviews, in order to possibly make better inferences about the role that beliefs may play in paradigm change.

Figure 1

Conceptual Framework



Purpose of the Research

The purpose of my study will be to therefore explore the beliefs expressed by preschool teachers about early literacy as they implement neuroeducation-based strategies and interventions. More specifically, this study will investigate the following research question:

RQ1: How do preschool teachers describe their beliefs about early literacy as they implement neuroeducation-based strategies and interventions?

Study Scope

My study will be a qualitative case study exploring the expression of early literacy beliefs by current preschool teachers with knowledge and experience in the Neuro-semantic Language Learning Theory (Arwood, 2011). To keep the study reasonable in scope and still address the research questions for the specified teacher beliefs, a bounded system, or case, (Creswell & Poth,

2018; Merriam, 1998) needed to be established. Bounding the case, or delimiting the object of study, is a defining characteristic of case studies. The object of study could be a person (or group of people), a policy, or some other phenomenon that can be contained within a context (Merriam, 1998; Miles and Huberman, 1994; Smith, 1978). To bound a case is to specify what will be included in the object of study and what will not (Merriam, 1998). In this study, the unit of analysis (teacher beliefs) is bounded by grade level (preschool) and developmental domain (early literacy). This case is further defined by geographic location (Pacific northwest) and experience with Arwood's (2011) neuroeducation model. After inviting teachers who meet the selection criteria to participate in the study, this researcher will select three teachers who met the criteria of this bounded system. I am bounding the case in this way because I want to better understand the beliefs expressed by preschool teachers about early literacy within a context of neuroeducation. I am curious to know whether experience with Arwood's (2011) neuroeducation-based professional learning has an impact on preschool teachers' beliefs in the area of early literacy. Because this study seeks to investigate preschool teacher beliefs about early literacy within a context of the Neuro-semantic Language Learning Theory (Arwood, 2011), I must choose people with experiences and knowledge about the neuroeducation framework.

Research Design

The qualitative nature of this study's research questions lends itself to several research-based methods of exploring the research problem. Studies similar to this in focus and scope have utilized teacher questionnaires or surveys (Hindman & Wasik, 2008; Rimm-Kaufman et al., 2006; Sandvik et al., 2014; Wilcox-Herzog & Ward, 2004). Individual interviews of instructional

staff have also been completed as part of case studies (Farrell & Guz, 2019; Merriam, 2009; Stake, 1995) as have observations of classroom practice (Stipek & Byler, 2004).

While these methods have provided an array of insights into teacher beliefs, Kagan's (1992) analysis of 25 studies of teacher beliefs shows, for the most part, that teachers' beliefs are stable and resistant to change. She goes on to state that the tacit nature of beliefs prevents them from being measured reliably through interviews, questionnaires, or inferred from behavior (observations). She suggests more subtle indirect methods, such as constructing concept maps of their pedagogical understandings and engaging in "*think alouds*" (in which teachers analyze their own or others' videotaped performances), reveal teachers' beliefs are primarily influenced by three elements - the students, the content, and the personal beliefs they derive through experiences. Similar conclusions about teachers' beliefs are echoed by Fives and Buehl (2012) decades later.

I plan to use a phased approach of face-to-face, semi-structured interviews (Merriam, 1998, 2009) with purposively selected preschool teachers with varying degrees of knowledge and experience with a neuroeducation learning framework. Interviews embedded in video-stimulated recall (VSR) activities (Calderhead, 1981), where teachers watch a video of themselves teaching while being queried about their thinking and decision-making process, will be conducted. In addition, I plan to ask sample participants to construct concept maps of their pedagogical understandings and beliefs of early literacy as part of the data collection task (Ausubel, 1968; Kinchin et al., 2019; Mihai et al., 2017; Novak & Cañas, 2008). The concept maps, VSR tasks, and semi-structured interviews will serve to triangulate the results of the coded

data analysis of each type and phase of the interview process. I explain more about this study's methodology in Chapter 3.

Summary of Chapter

Although many studies have explored teachers' beliefs around literacy acquisition (Egloff et al., 2019; Farrell & Guz, 2019; Gregoire, 2003; Hindman & Wasik, 2008; Lynch & Owston, 2015), no studies I could find have examined early literacy beliefs held by preschool teachers while implementing neuroeducation strategies and interventions. In a time when an achievement gap between White students and students of color continues to persist after decades of reform efforts (Friedman-Krauss et al., 2016; NCES, 2019; NCES, 2020; NCFL, 2009; ODE, 2020), it seems worthwhile to look at the emerging field of neuroscience and the promising practices of a neuroeducation theoretical framework that integrates language theory, cognitive psychology, and neuroscience.

Chapter 2, the Review of the Literature, provides the reader an overview of the literature on early literacy beliefs expressed by preschool and elementary teachers. It also identifies an absence of research exploring the intersection of early literacy beliefs held by preschool teachers while implementing neuroeducation strategies and interventions.

Chapter 3 provides an explanation and outline of the methods, setting, participants, recruitment procedures, instruments, and data analysis for this study. Results and findings for this study are reported in Chapter 4, followed by the discussion and conclusion of the findings that are reported in Chapter 5.

Chapter 2: Literature Review

In the previous chapter, I presented the nature of the research problem I propose to study as well as its importance to the field of early childhood education and the diverse children being served. I shared results of national, and state assessments showing that marginalized and vulnerable student populations continue to consistently achieve at lower rates than their White peers. This pattern has repeated year after year for at least two decades. The importance of early literacy acquisition was highlighted. A theoretical framework that synthesizes research from neuroscience, cognitive psychology, and language acquisition theory was introduced. This transdisciplinary promising practice, neuroeducation, has the potential to help all young children succeed in acquiring literacy concepts, because it accounts for the unique neurobiological learning system of each child and requires the teacher to work off the child's learning system rather than require the child to work off the adult's.

In this chapter, I will expand on the conceptual framework of my research focus that I introduced in Chapter 1. I will provide background knowledge on early literacy, preschool teacher beliefs, and neuroeducation as a learning theory. This chapter will look in-depth into what the literature says about preschool teachers' beliefs, attitudes, and philosophies about early literacy, teachers' beliefs, attitudes, and philosophies on neuroeducation, and neuroeducation's view on early literacy. Finally, this chapter will review preschool teachers' beliefs, attitudes, and philosophies on early literacy in a neuroeducation framework.

Teacher Beliefs

Understanding the relationship between teachers' beliefs, knowledge, and practices is of great value and importance to improving students' success in acquiring early literacy and

language skills, especially in preschool. Teacher beliefs and practices have been posited to have an impact on student outcomes (Lynch & Owston, 2015; Schachter et al., 2016). The relationship between teacher beliefs and practices is not always reciprocal or aligned (Buehl & Beck, 2015; Joyce & Calhoun, 2015). Piaget (1977), theorized that individuals, when in the midst of a cognitively challenging event, engage in a process of assimilating new information into their preconceived mindsets and accommodating their mindsets to new information. Individuals do this to maintain cognitive equilibrium. This could explain what happens when teachers' beliefs are confronted with new evidence or ideas about the process of learning.

For the purposes of this study, I am adopting the definitions of *belief* as offered by Pajares (1992) and Kagan (1992). Pajares (1992) states a belief is "an individual's judgment of the truth or falsity of a proposition, a judgment that can only be inferred from a collective understanding of what human beings say, intend, and do" (p. 316). Kagan's (1992) definition of teacher beliefs as "implicit assumptions about students, learning, classrooms, and the subject matter to be taught" provides an educational lens that adds clarity to my research focus (p. 66). In addition, I used both definitions as a basis for my selection of elicitation methods, analysis of the data collected, and my interpretation of the findings.

A search for research from the last 20 years into preschool teacher beliefs about early literacy and alignment with developmentally appropriate practices produced 233 peer-reviewed results. A variety of variables have been analyzed for potential correlations, such as level of experience, level of education, and gender.

A chapter in the International Handbook of Research on Teachers' Beliefs (Fives & Gregoire Gill, 2015) focused on the relationship of teachers' beliefs to teachers' practices and

whether congruence between the two matter. Buehl and Beck (2015) found that lack of alignment between beliefs and practices is no reason to discount the power of beliefs, and that it is important to understand the relationship between the two as well as the internal and external factors that may support or hinder their connection to each other. The authors hold that some beliefs are explicit to the teacher whereas others are implicit. All beliefs exist within a complex, interconnected, and multidimensional system (Buehl & Beck, 2015). Beliefs can change with time or experience, but Buehl and Beck found they are more or less static in the individual. They also found that beliefs are distinct from knowledge. In addition, Kagan (1992) found consistent evidence that simply reading and applying research to their practice failed to change the beliefs of preservice and inservice teachers.

Elementary Teachers' Beliefs

Nespor (1987) is a noted researcher in the area of teacher beliefs. His Teacher Beliefs Study investigated the structures and functions of teachers' beliefs. In Nespor's view, teachers' beliefs about teaching are integral in how teachers develop goals and define teaching practices (Nespor, 1987). To ignore teachers' beliefs renders studies of their practices difficult to clearly understand.

Preschool Teachers' Beliefs

Researchers have studied preschool and kindergarten teachers' beliefs in the areas of developmentally appropriate practices (Jones et al., 2000; McMullen et al., 2005) early childhood curriculum (Wang et al., 2008), and early literacy acquisition (Brown et al., 2012; Hindman & Wasik, 2008; Lynch & Owston, 2015).

Literacy

There is a plethora of research addressing the importance of literacy development in young children (Arwood, 2011; Arwood, Kaulitz, & Brown, 2009, 2018; Arwood & Robb, 2008; Brown, 2014; Delpit, 2012; Fantuzzo et al., 1997; Mashburn et al., 2008; NCFL, 2009; Robb, 2016; Socol, 2006). In summarizing the five stages of literacy development, Cooper and Kiger (2009) describe the first stage, Early Emergent Literacy, as a time, usually before a child enters kindergarten, when children develop the foundations of literacy, which includes oral language, writing by drawing or scribbling, and being curious about print. During the second stage, emergent literacy, a child may use more standard oral language patterns and forms. They may name letters. Concepts about print, such as recognizing a letter or word, also develop. Most children complete most of this stage by the end of kindergarten or beginning of first grade. This is a stark contrast to some current societal expectations of what children should be learning in preschool and what standardized assessments, such as the Teaching Strategies Gold, measure and curricula, such as *Tools of the Mind*, include as content. What recent research there is on early literacy development in preschool children appears to be grounded in the dominant paradigm of a western cognitive psychology approach to teaching and learning (Brown, C. S., 2014; Gonzales & Hughes, 2018; Heilmann et al., 2018; Kaminski & Powell-Smith, 2017; Nitecki & Chung, 2013; Piasta et al., 2018). Many of these authors cite meta-analyses conducted by the National Early Literacy Panel (2009) and the National Reading Panel (2000) as the foundation guiding their research questions and findings. While the National Reading Panel called for more refined research in effective reading interventions, a review of the NRP Report's references revealed no citations of neuroscience research. In addition, Dr. Joanne Yatvin (2000), a member of the

National Reading Panel, wrote in her Minority View Report that a major deficiency of the NRP report is its failure to investigate early language and early literacy development. Yatvin also points out that part of the NRP's charge from Congress was to assess implications for practice from its research findings. She argues that most of the members of the NRP were university professors making them unqualified to be the "sole judges" of whether their findings could be generalized to classrooms.

The National Early Literacy Panel (NELP) was formed to analyze and synthesize the research on early literacy development and "to identify interventions and practices that promote positive outcomes in literacy for preschool children" (NCFL, 2009, p. 55). A review of the NELP report reveals no references to neuroscience studies. While Chapter 7 of the report summarizes findings in the area of "language-enhancement interventions," the methodology for selecting studies to analyze in this area resulted in inconclusive findings due to the lack of empirical studies meeting criteria for selection (p. 211). The other chapters in the NELP report address various areas of early literacy (NCFL, 2009). The definition of early literacy adopted by the panel and the criteria for selecting studies for its meta-analysis appears to preclude the inclusion of neuroscience and more theoretical language acquisition sources as the nature of empirical research over the last six or seven decades has taken a decidedly western cognitive psychology lens. All of the members of the National Early Literacy Panel are university professors. While an analysis of these members' backgrounds and affiliations is beyond the scope of my study, it is interesting to note the prevalence of member associations with medical, special education, and psychology departments.

Literacy Beliefs Expressed by Elementary Teachers

Maggioni et al. (2015) looked at K-12 teachers' beliefs about reading and learning from text. Their analysis indicated the primary factors influencing teachers' beliefs about reading instruction were grade taught, undergraduate methods courses, and years of professional experience. In general, elementary teachers viewed reading as a set of skills to be learned. Most studies showed teachers viewed reading to learn as restricted to vocabulary development and comprehension, which "tended to be reduced to reproducing and organizing information extracted from text" (p. 360).

Early Literacy Beliefs Expressed by Preschool Teachers

Several studies have examined preschool teachers' beliefs about the teaching and learning of language and literacy. Two studies utilized the Preschool Teacher Literacy Beliefs Questionnaire (TBQ) (Seefeldt, 2004) and explored preschool teachers' beliefs about how and what children should learn about language and literacy (Hindman & Wasik, 2008; Lynch & Owston, 2015). Findings indicated there was much uncertainty in best practice beliefs among teachers. Those with less teaching experience showed beliefs more in line with research-based best practices than teachers with more experience. Lynch and Owston (2015) use a position statement by the International Reading Association and the National Association for the Education of Young Children (NAEYC) as their source for establishing what they defined as best practices.

Through multi-cohort data analysis and teacher interviews, Walter & Lippard (2017) examined changes in Head Start teachers' beliefs over a decade regarding "developmentally appropriate practice" (DAP). The authors define "beliefs" as "developmentally appropriate

beliefs" (DAB) and found that after 2003, DAB decreased significantly, while "developmentally inappropriate beliefs" (DIB) increased. Walter & Lippard report that teachers "with more education consistently held the most appropriate beliefs" as measured by the *Teacher Beliefs Scale (TBS)* (Burts et al., 1990). While some authors have studied preschool teachers' beliefs, those studies have adopted an intradisciplinary lens of western cognitive psychology (Brady et al., 2009; Brown, 2014; Fuller et al., 2017; Nitecki et al., 2013). I did not find any research investigating teachers' beliefs utilizing a lens of neuroscience or neuroeducation. This is interesting given the increased knowledge of brain function that recent neuroscience provides and the potential educational applications of neuroscience research (Dubinsky, 2010; Dubinsky et al., 2013; Dubinsky et al., 2019; Murphy, 2017; Pickering & Howard-Jones, 2007; Serpati & Loughan, 2012).

Theoretical Frameworks of Learning

Given that theories of learning are central to the work done in and by schools, several learning theories in the U.S. will be briefly described to provide some historical and pedagogical context; specifically, behaviorism (Skinner, 1974), whole language (Goodman, 1992; Leigh, 1980), western cognitive psychology (Anderson, 2015; Bandura, 1977), constructivism (Piaget, 1964; Vygotsky, 1962), sociocultural theory (Bakhurst & Shanker, 2001; Bruner, 1990, 1996), and the Neuro-semantic Language Learning Theory (NsLLT) (Arwood, 2011).

The discourse about early literacy and reading has included multiple perspectives that appear to be driven by a variety of forces, including research, theoretical preconceptions, and politics (Dewitz & Graves, 2021; Goodman, 1992; Goodwin & Jiménez, 2020; Peters, 1977). The literature documents a history of theoretical frameworks that have influenced U.S. public

education. It is not possible to list all theoretical constructs, so I will summarize a sampling of those that appear to have played, or continue to play, a prominent role in research and instructional practice. The ordering of these is somewhat chronological in nature, however, a strict chronology is not truly possible given the reappearance of certain theoretical ideas over time.

Generalizing research-based learning theories to classroom practices is challenging. Kemp (2020) supports the idea that researchers and practitioners need to be collaborative partners if any research finding is to be successfully implemented in the classroom. Kemp argues that educators need to be the ones implementing the interventions in the natural learning environment rather than researchers in clinical lab settings. In contrast, Rimm-Kaufman, Storm, Sawyer, Pianta, and LaParo (2006) argue that determining effective interventions based on researcher scrutiny is imperfect in its process, because educators are implementing the interventions and fidelity of implementation is often questionable. Rimm-Kaufman et al. stress the contribution of any intervention is only measurable if teachers are implementing practices effectively. This led to the development of the Teacher Belief Q-Sort assessment tool.

Some literature would appear to support an increased awareness among practitioners and leaders of theoretical constructs of learning, especially in early childhood, when exploring the adoption or implementation of professional learning opportunities, instructional approaches, and curricula. Hattie and Donoghue (2018) have observed that "the teaching of 'learning' has diminished to near extinction in many teacher education programs" (p. 98). They lament that there seem to be only passing references to Vygotsky's zone of proximal development, constructivism, and learning progressions. They also assert there is an emphasis on teaching

content rather than the methods of learning the content. A broader approach may include findings from and translations of the fields of neuroscience and language acquisition that could inform the professional learning experiences of pre-service and in-service educators, which, in turn, may help mitigate the potential continued marginalization of racially, culturally, socio-economically, and neurologically diverse children.

Behaviorism

Behaviorist theories focus on behavior modification through strategies such as stimulus response pairs and selective reinforcement. A child's imitation of adult behavior is a focal point. The pedagogical focus is on control and adaptive response. Because it ignores issues of meaning, behaviorism's usefulness lies in situations where addressing issues of social meaning is made impossible or is not relevant, such as animal training (Skinner, 1974). In this theory, learning is defined as a change in observable behavior, principles of which are still present in training programs in business and industry, the military, and self-help programs (Merriam, 2018).

Whole Language

An EBSCO search of peer reviewed sources using the term "whole language" without time parameters revealed 5,203 results. A subsequent search using the ERIC system revealed similar results with and without time parameters. Goodman (1992) states that Canadian researchers and teachers popularized the term as a way to "differentiate their developing educational philosophy, programs, and practice from the skill-drill, text-test model they saw in U.S. schools" (p. 195). New Zealand also developed official national policies based on whole language and other related educational philosophies (Goodman, 1992). Very few articles on the topic appeared prior to 1980, suggesting that the theoretical approach of whole language became

more prevalent and mainstream in the U.S. after 1980. Leigh (1980) describes the main principles of a whole language philosophy :

- Reading, writing, speaking, and listening are closely interrelated language processes rather than separate, autonomous academic skills
- The fundamental purpose of any language activity is to acquire, mediate, or express meaning
- Language involves an interactive process which occurs in social contexts
- Oral and written language are learned rather than taught
- Children need competence in using language for several different functions
- Whole language evaluation should be based on naturalistic, observational procedures which focus on comprehension
- The teacher's attitudes and competencies are essential determinants of the effectiveness of a whole language program

Goodman (1992) adds to these by saying whole language is an inclusive and holistic educational philosophy that emphasizes problem solving and the value of democratic learning communities. Roots of this framework can be traced to Dewey (1943), Halliday (1975), Piaget and Inhelder (1969), Rosenblatt (1938), and Vygotsky (1978).

Western Cognitive Psychology

Instructional pedagogy in the U.S. appears to be situated primarily within an intradisciplinary theoretical construct – western cognitive psychology – which promotes an input/output model of learning and where discrete skill acquisition, auditory input,

practice/repetition, and memorization are valued tenets of learning (Anderson, 2015; Robb, 2016). This contrasts with sociocultural (Bakhurst & Shanker, 2001; Bruner, 1990, 1996), constructivist (Vygotsky, 1962), and neuro-semantic (Arwood, 2011) frameworks of learning that are social, meaning-based, more visual in nature, understand the neurobiological functions of the human brain, and utilize scaffolded language acquisition as a primary strategy to leverage learning.

An intradisciplinary approach to learning, such as cognitive psychology, operates within one branch of knowledge or one subject area. In the case of cognitive psychology, the behavior of the child is the definition and measure of learning. A transdisciplinary approach to learning, such as Arwood's neuroeducation or NsLLT, relates to more than one branch of knowledge and places the characteristics, needs, interests, and personal learning processes of students at the forefront of the learning experience. It integrates the perspectives of multiple disciplines in order to connect new knowledge.

As Anderson (2015) outlines, in a western cognitive psychology paradigm, learning happens when our senses are activated by stimuli and the brain perceives patterns. This theory of learning proposes that if a teacher delivers information in auditory or visual form and the students to whom this teaching is directed are able to recite back or reproduce the teacher's model, then learning has occurred. Knowledge and demonstration of patterns is considered learning. Language is utilized in terms of labelling and following routines. The teaching of language structures (perceptual patterns) is a priority in this learning model, therefore, language must be broken down into its smallest component parts in order to be learned. In this model, the parts are greater than the whole. Repetition and practice enhance the ability to learn. Again,

learning occurs when one can perceive patterns, remember those patterns, and repeat the patterns back to the teacher. It is an input/output model limited to two levels of learning – sensory input and perceptions (Anderson, 2015).

Many national and global reforms are relying on the same theoretical framework of western cognitive psychology that Western cultures have been using to ground instructional practices for the last six decades or more (Anderson, 2015; Bruer, 1997, Compton-Lilly, 2005). In fact, Bruer (1997) goes so far as to say, "There is a well-established bridge, now nearly 50 years old, between education and cognitive psychology" (p. 4). Western cognitive psychology emphasizes pattern level learning where the learning of discrete skills (parts) tend to carry just as much, and sometimes more, importance than the acquisition of concepts (the whole) (Konza, 2014; Krashen, 2002; NICHHD, 2000). It assumes the act of teaching results in student learning as it is an input/output model of learning. If the student can replicate the product the teacher models and expects, then it is assumed the student has "learned" (Arwood, 2011). Practice and repetition are important tenets of cognitive psychology as is a system of rewards and consequences (Anderson, 2015; Bandura, 1977). Our current educational paradigm appears to adhere almost exclusively to a western cognitive psychology approach to teaching and learning. Working within a single research discipline or theoretical framework could be described as an *intradisciplinary* approach to pedagogy and learning.

Some initiators of reform continue to use well-established research studies and theories to develop "new" curricula and "innovative" teaching approaches, when, in fact, they may simply be processed and marketed through an established paradigm (Bruer, 1997; Bodrova & Leong, 2004). Some educational translations of neuroscience, a recently emerging field of research on

the human nervous system and how it functions, still result in a product firmly grounded in western cognitive psychology. One such example is the *Tools of the Mind* curriculum created in 1993 (TOTM, 2018). While there are merits to certain aspects of these products, these translations fall short in matching the neurobiological learning systems of all children as evidenced by the persistent student achievement gap (NCES, 2019).

Constructivism

Constructivist theories focus on the processes by which learners build their own mental structures when interacting with an environment. Hands-on, self-directed activities oriented towards design and discovery define this approach (Piaget, 1954, 1964). Vygotsky (1962) added that language and thinking have a reciprocal relationship in learning.

Drawing on the developmental theories of Piaget and Vygotsky, Cook et al. (2002) and Grossman et al. (1999) describe the act of appropriation where knowledge is socially constructed and students have an active role in its construction. In this learning experience, the learner adapts the information in a way that is meaningful to them and they can use the knowledge as their own.

Sociocultural

Jerome Bruner (1990, 1996), an American psychologist, was influenced by the work of Russian psychologist, Lev Vygotsky. Bruner viewed human development as a process of assistance and collaboration between a child and an adult where the adult assumes the role of sociocultural mediator. When a young child is learning new concepts, they need active help from teachers and other adults on their way to becoming more independent in their thinking and acquisition of new skills and knowledge. Bruner (1990, 1996) calls this *scaffolding*, a concept closely related to Vygotsky's *zone of proximal development* (1962).

Neuroeducation

The neuroscience research related to language acquisition and currently represented in the literature is emergent (Egorova et al., 2016; Pulvermüller, 1999, 2005, 2012, 2013, 2018), filtered through a lens of cognitive psychology (Baars & Gage, 2007; Sousa, 2017), or a theoretical and translational debate between educational neuroscience and cognitive psychology (Bowers, 2016a, 2016b; Bruer, 1997; Horvath & Donoghue, 2016; Howard-Jones et al., 2016). None of the recent transdisciplinary research of which I am aware incorporates language acquisition with neuroscience and cognitive psychology or offers a concrete translation of theory into practice, except for Arwood's Neurosemantic Language Learning Theory (NsLLT) (Arwood, 2011; Arwood & Meredith, 2017) and the Neuro-Viconic Education System (NvES), a brain-based approach to learning (Arwood & Robb, 2008; Arwood & Rostamizadeh, 2018; Arwood & Young, 2000).

Within the context of neuroscience, learning is described as a system of receptors, pathways, circuits, and networks. Our central nervous system (brain and spinal cord) and peripheral nervous system work together at the macroscopic and microscopic levels to receive, process, and integrate information from the environment and initiate appropriate motor responses. Learning starts at the cellular level. Billions of neurons serve "as the basic structural and functional units of the nervous system" (Haines & Mihailoff, 2018). As neurons fire and wire together (Hebbian learning theory), they create neural circuits and networks. Cells change when learning occurs. The major lobes of the brain (frontal, parietal, temporal, occipital) have distinct functions, but they all work synergistically when it comes to thinking and learning. Learning is a brain-based function that involves the inhibition (filtering out) and integration of

meaningful information (Baars & Gage, 2007). In the two books referenced here, not much attention is paid to language and language function. What attention is paid summarizes language as a distinctively human capacity "that makes it possible to transmit culture across time and space" (Baars & Gage, 2007, p. 339).

Language Acquisition Theory

The language literature supports the integration of language function if we are to acknowledge that the whole (conceptualization) is greater than the sum of its parts or structures (Arwood, 1983). Peirce (1902), considered the "Father of Pragmaticism," suggests that literacy be based on language activities that are dynamic (pragmatic) in nature in line with Vygotsky's social interactionism (Vygotsky, 1962). Peirce also recommends the following:

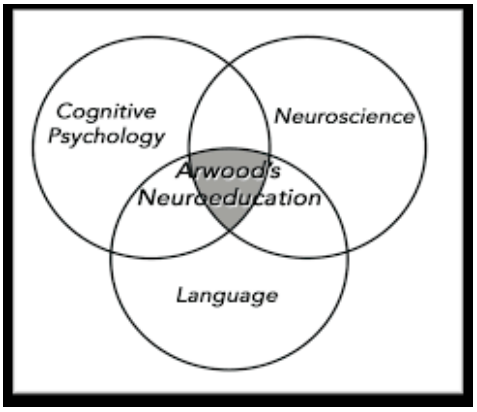
- Language should serve a purpose for the learner
- Materials and activities should function at the semantic level of the learner
- Activities should be scaffolded (preoperational concrete preoperational)
- Activities should represent the learner's language (Peirce, 1902).

In the Neurosemantic Language Learning Theory (NsLLT) (Arwood, 2011; Arwood & Meredith, 2017, Arwood & Rostamizadeh, 2018; Robb, 2016), learning is neuro-semantic in nature and occurs at four levels. All learning starts with the senses and our brain's detection of neuro-semantic features. Sensory input moves afferently (inward) through our peripheral nervous system to the central nervous system where we perceive neuro-semantic patterns. Messages are sent along efferent (outward) pathways back to the peripheral and motor systems for responses. These patterns are layered through multiple experiences helping us to acquire concepts, the third level of learning in the NsLLT. Language labels our thinking and thinking influences our

language acquisition. In the NsLLT, learning is about finding meaning in patterns and connecting this perceptual information to previously acquired concepts to form new concepts. For every idea (concept), there is a neural circuit. Neural circuits make up a neural network (Arwood, 2011; Pulvermüller, 2012; Robb, 2016). Figure 1 is a visual representation of the NsLLT and the neuroeducation model.

Figure 2

Arwood's (2011) Neuroeducation Model



(Robb, B. E., 2016)

The NsLLT is a theoretical framework supported by emerging neuroscience research and a small but growing body of evidence as to its effectiveness in creating a learning environment rich in language function and one that matches the neurobiological learning system of each student (Arwood, 2011; Robb, 2016). In *Learning to Read and Write: Neuro-Viconic Education System*, Robb, Arwood, and Rostamizadeh (2018) claim that the NvES is grounded in Vygotsky's social interaction theory of learning (Vygotsky, 1962). In this brain-based and visual approach to learning, importance is placed on the acquisition of concepts with the goal of increasing language function. The teaching of discrete parts of language structures, such as letter names and letter sounds, and the repetition of auditory pattern-based skills is de-emphasized and

discouraged in favor of moving learners back and forth between preoperational levels of learning and conceptual levels through someone assigning meaning to the learning through the use of language.

Research Gap

There is much research examining teachers' beliefs about literacy at the elementary, middle, and high school levels. Since 2000, there is an increasing amount looking at preschool teachers' beliefs about early literacy (Brown et al., 2012; Cash et al., 2015; Hindman & Wasik, 2008; Lynch & Owston, 2015; Ottley et al., 2015; Schachter et al., 2016; Walter & Lippard, 2017). I could find no studies, however, about preschool teachers' beliefs and practices around early literacy within a transdisciplinary neuroeducation framework of learning. Given the emerging field of neuroscience over the last 30 years and increasing evidence that translations of neuroscience research into educational practice are showing great promise, this represents a significant gap in the research.

Summary

In this chapter, I reviewed the literature in the areas of preschool teachers' beliefs, literacy, specifically early literacy, and learning theories, in particular, neuroeducation. Teacher beliefs represent a powerful construct in the field of education that may have an impact on student outcomes. The literature reflects a more discrete approach to studying literacy and early literacy, meaning research tends to define early literacy in more specific and discrete ways, i.e. it tends to discuss literacy in terms of reading, writing, and math skills. It also tends to measure these discrete skills in clinically quantitative ways. When asking preschool teachers about early literacy and its acquisition, questionnaires, surveys, and interviews are used, and, many times,

specific literacy skills are targeted rather than more holistic perspectives of what can be defined as early literacy or the holistic context of the preschool learning environment.

Learning theories were highlighted in this chapter to show the wide variation of frameworks within which teachers may facilitate the acquisition of early literacy and to demonstrate the challenge of generalizing clinically researched learning theories to the classroom. Some learning theories contrast with each other, i.e. adult-directed versus child-directed, product-oriented versus process-oriented. The emergence of findings in neuroscience offer potential applications in the classroom setting. A research gap exists in the study of preschool teachers' beliefs about early literacy within a transdisciplinary neuroeducation-based framework of learning.

Chapter 3: Methodology

The purpose of this case study was to examine the early literacy beliefs expressed by preschool teachers and the extent to which those beliefs might change within the context of implementing a neuroeducation framework. This chapter will discuss the rationale, setting, participants, role of the researcher, data collection methods, data analysis, ethical considerations, and issues of trustworthiness. The limitations of this study are also considered in this chapter.

Research Question

The following research question guided this study:

RQ1: How do preschool teachers describe their beliefs about early literacy as they implement neuroeducation-based strategies and interventions?

Rationale for Methodology

Case study research can be positivistic, existentialist (non-deterministic), and interpretive/constructivist in orientation (Merriam, 1998; Merriam, 2009; Stake, 1995; Yazan, 2015; Yin, 2003). This study was a qualitative exploratory case study (Yin, 2003), because its research questions were grounded in exploring the "how" and "what" of teachers' beliefs. This study did not seek control of behavioral events and examined a contemporary phenomenon. Therefore, a case study approach was the most appropriate (Yin, 2003).

While there are similar, yet divergent, views on the design and implementation of case study methodology (Yazan, 2015), I decided to follow Merriam's (1988, 1998) approach. Merriam (1988) defines a qualitative case study in relation to its end product by describing it as "an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (p. 21). This aligns with Merriam's (1998) constructivist epistemological view that "reality is

constructed by individuals interacting with their social worlds" (p. 6). Since the unit of analysis of my study was teacher beliefs, and the focus of my research was to examine the early literacy beliefs of several preschool teachers within a neuroeducation framework, a case study following Merriam's (1998) framework applies. According to Merriam (1998), "reality is not an objective entity; rather, there are multiple interpretations of reality" (p. 22). Following Merriam's philosophical assumption, my primary interest was to understand how preschool teachers make sense of early literacy, and how conceptual change may occur based on their experiences. The meaning making of teachers was at the heart of my research interest.

Strategic Data Collection Approaches

I was interested in understanding how preschool teachers interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences. My study, therefore, required data collection methods that were sensitive to detecting underlying meaning in context when I gather and interpret the data.

Some qualitative researchers in the field assert the methods used to examine teacher beliefs, in particular, need to move beyond the use of surveys, questionnaires, and interviews. Pajares (1992) encourages researchers not to be content with questionnaire assessments of teachers' self-reports of their beliefs. Ashton (2015) summarizes Kagan's (1992) and Pajares's (1992) call to action as follows:

> [Researchers of teachers' beliefs] must seek carefully conceptualized, integrated, and validated understandings, by focusing on teachers' context-specific beliefs and their interconnections to other beliefs and behavior. They should use open-ended interviews, observations, and related think-alouds to determine consistencies and inconsistencies

> between what teachers say, intend, and what they do; reactions to dilemmas that challenge core beliefs; creations of concept maps that identify the connections between educational and personal beliefs; and most important, explorations of the beliefs that lead to motivations and behaviors that affect students' learning and well-being. (p. 39)

In an analysis of 25 studies of teachers' beliefs, Kagan (1992) found that since teachers' beliefs were mostly tacit, that is, assumed or unspoken, they could not be measured reliably through interviews, questionnaires, or inferred from observations of teacher practice. Her analysis did reveal, however, that more subtle indirect methods, such as creating concept maps of their pedagogical understandings and engaging in what she called *think alouds* (in which teachers analyzed their own or others' videotaped performances), were able to provide more detailed sources of teachers' beliefs, including the students, the content, and teachers' experientially derived personal beliefs.

When asked about their beliefs through just a survey or even a face-to-face interview, a teacher may express what they know they should believe rather than what they believe if they were speaking only to themselves. They may also state different beliefs to themselves than what they may say to a researcher. Given the difficulty in capturing teachers' beliefs, I decided to use a combination of methods not typically utilized in investigations of teachers' beliefs or whose data results haven't often been triangulated in the data analysis phase.

For this reason, my data collection methods comprised participants' construction of concept maps, video-stimulated recall tasks, and semi-structured interviews conducted at each phase of data collection. Using these three methods enabled me to understand the *emic* (Merriam, 1998), or internal, perspectives of practicing educators. These methods enabled me to capture my

participants' voices within the meaningful context of their setting. Kagan (1992) and Pajares (1992) assert researchers are better able to make inferences from data produced by concept maps and video-stimulated recall tasks than through questionnaires or interviews alone.

Since my study sought to provide an in-depth, holistic description and analysis of three preschool teachers' beliefs about early literacy within a neuroeducation framework, it seems my choice of data collection methods aligned better to a neuroeducation framework where adults can represent their thinking through visual media, i.e., drawing concept maps, naming their thinking through the use of language, i.e., discussing videos of themselves teaching, and semi-structured interviews where I have the opportunity to explore the who, what, when, where, why, and how of participants' thought processes and decision making . Through the use of concept maps, video-stimulated recall, and semi-structured interviews, I engaged practitioners in co-constructing their belief systems so that they could be analyzed and better understood. It was challenging for me not to include a questionnaire or survey in my study, because, as a novice researcher, I assumed quantifying my research methods might make my study more reliable and valid. Merriam (1998), Kagan (1992), Pajares (1992), and my dissertation advisor, however, convinced me that other research-based qualitative methods are as good, if not better, at establishing a high level of trustworthiness.

Setting

My study was situated within a large urban Head Start preschool program within a large urban school district in the Pacific northwest. This program serves a culturally and linguistically diverse population of children and families who meet U.S. Federal Poverty Guidelines (DHHS, 2020; USCB, 2020). There are 35 teachers and 760 students in this program across 9 different

sites within a single school district. Twenty-nine of the teachers teach an extended day (full day) class and 6 teach a double session (two groups of students for a half day) class. The district has other preschool programs situated within its larger elementary schools that are funded by Title I (3 classrooms across 3 sites) and Preschool Promise (5 classrooms at one site). Historically, the Title I and Preschool Promise classrooms have operated separately under different supervision, following different policies and procedures, and choosing their own curriculum. In the last several years, there has been an effort to align the policies, procedures, and curricula of all the preschool programs within the district. For example, a Director of Early Learning was established in the fall 2019 to oversee all early learning programs in the district.

The professional learning within the program these preschool teachers receive is considered part of the setting as these experiences have the potential to influence their beliefs. Over the last five years, the professional learning priorities of this program have included Early Childhood Positive Behavior Interventions and Supports (ECPBIS) (Winnekar & Fox, 2020), LEAP (a peer-mediated model of inclusive programming for children with autism) (Strain & Bovey, 2014), and the Tools of the Mind curriculum (TOTM, 2018). Annual required trainings include Teaching Strategies Gold (TSGold), a progress monitoring tool, and the Classroom Assessment Scoring System (CLASS) (Pianta et al., 2008), an observation tool to assess the learning environment. More recently, program staff have been invited to participate in workshops related to Arwood's (2011) Neuro-semantic Language Learning Theory (NsLLT), a neuroeducation translation of neuroscience and language acquisition research.

The neuroeducation courses and workshops that teachers who would meet the criteria to participate in this study have participated in comprise the context for this study. These courses

and workshops are offered by a local private university and a small therapy clinic in the metropolitan area. While the courses offered at the university include a range of neuroscience theories, most of the graduate level neuroeducation professional learning opportunities are based in Dr. Ellyn Arwood's (2011) Neurosemantic Language Learning Theory (NsLLT). Each graduate course in neuroeducation at this local university provides three components: 1) core neuroscience research; 2) current applications of the brain-mind connection; and 3) transactional studies into educational practices. The workshops offered by a local therapy clinic are also based on Arwood's (2011) NsLLT.

One of the core workshops offered by this local therapy clinic is called the Neuro-Viconic Education System (NvES), which is an education system grounded in how to provide opportunities for all students to learn and based on the NsLLT. The NvES is a holistic approach designed to meet the learning needs of all children. The NvES rests on four principle beliefs: 1) all learning is brain-based (Arwood, 2011), 2) all children learn to think (Arwood & Robb, 2008), 3) all children learn to be pro-social (Arwood & Young, 2000), and 4) all children learn through context (Arwood & Rostamizadeh, 2018). NvES essentially represents a translation of the theory (NsLLT) into practice.

An NvES learning environment supports the acquisition of reading and writing as part of the language acquisition process. The learner "uses language and creates deep semantic connections between concepts, allowing the learner to access reading and writing as a form of literacy" (Robb et al., 2018, p. 3). Simultaneously, the processes of reading and writing support the expansion of conceptual understanding. Reading and writing, then, exist cooperatively with

thinking and literacy in a learning environment focused on language acquisition (Robb et al., 2018).

Participants

While there are fairly common standards across the United States guiding the licensing of public school K-12 teachers (i.e., minimum of a Bachelor's degree from an accredited program), wider variation of standards exists for the licensing of preschool teachers. Varied levels of education, unique backgrounds, and eclectic professional learning experiences of preschool educators is evident throughout the profession (OACF, 2008; OACF, 2014; OACF, 2015; C. Rep. No. GAO-04-5, 2003; Walter & Lippard, 2017; Zigler & Styfco, 2010). Factors influencing preschool teacher beliefs about how and what early literacy skills preschool children acquire can vary widely and result in varying effects on student learning and student outcomes (Brown et al., 2012).

I was interested in understanding the evolution of early literacy beliefs of preschool teachers who have been exposed to, and who may be implementing, the tenets of Arwood's (2011) neuroeducation model or the NsLLT. Several teachers within this large urban preschool program have participated in a variety of graduate level neuroeducation courses as well as evening and weekend neuroeducation workshops. This means they are, at varying levels, familiar with Arwood's (2011) Neuro-semantic Language Learning Theory (NsLLT) and have implemented some tenets of the Neuro-Viconic Education System (NvES) (Arwood & Rostamizadeh, 2018) in their instructional practice.

This unique group of educators presents an opportunity to study in-depth what Patton (1990) describes as *information-rich cases*. This is an example of purposeful sampling because I

wanted to discover, understand, and gain as much insight as possible about the links between preschool teacher beliefs about early literacy and experience with neuroeducation (Merriam, 1998). I, therefore, defined selection criteria to create a sample from which I felt most likely to learn about the relationship between neuroeducation and early literacy beliefs.

I utilized a purposive criterion-based unique sampling method (Lecompte & Preissle, 1993; Merriam, 1998; Patton, 2002) to choose my study's participants. I first solicited interest from a group of 35 preschool teachers who all teach in the same preschool program in the pacific northwest. I then selected preschool teachers who have varying levels of knowledge and experience with Arwood's (2011) Neuro-Semantic Language Learning Theory (NsLLT). Patton (2002) describes this type of sampling as *intensity sampling*, because these cases strongly represent the phenomenon of interest. The predetermined criteria for selection were: (1) currently employed as a preschool teacher in a large urban preschool program in the Pacific northwest, (2) assigned to facilitate the learning of 3 and 4 year-old children in multiple developmental domains, including the acquisition of early literacy concepts, and (3) knowledge and experience at varying levels with Arwood's (2011) NsLLT.

From an initial group of 4 interested candidates, I selected three preschool teachers to participate in this case study. I eliminated one candidate because they did not have any knowledge or experience of the NsLLT. All of my study's participants work as teachers in a large urban preschool program situated within a large urban school district.

Adjacent to my study in fall and winter 2020-2021, two of this study's participants, Lisa and Cheryl, were leading a pilot implementation of the NsLLT in their preschool classrooms. They volunteered for these roles and committed to completing a comprehensive professional

learning plan during the 2020-2021 school year. This includes three full-day Saturday workshops on NvES, four professional learning community (PLC) meetings, and weekly coaching support from an expert in the NsLLT. The primary expert coach in this professional learning plan is Carole Kaulitz, a career educator and Speech Language Pathologist as well as a specialist in the NsLLT. Dr. Bonnie Robb supported two PLC sessions this school year. Dr. Robb is an elementary classroom teacher who has been implementing the NsLLT for many years and is considered an expert on the NsLLT and NvES. This professional learning is ongoing. Pseudonyms are used for all three study participants to protect anonymity. Participant demographics are shown in Table 1.

Table 1

Study Participant Demographics

Participants	Race/Language	Level of Education	NsLLT Learning Completed	# Years Teaching Total/PreK
Jill	White/English	M.Ed.+	Neuroeducation Certificate at local university (4 graduate level courses) Several weekend NsLLT workshops Several hours NsLLT coaching in spring 2020	30/29
Cheryl	White/English	M.Ed.+	Neuroeducation Certificate at local university (4 graduate level courses) Several weekend NsLLT workshops Many hours NsLLT coaching since January 2020; ongoing weekly coaching	18/13
Lisa	White/English	M.A.T.+	Several weekend NsLLT workshops since fall 2020 Many hours NsLLT coaching since fall 2020; ongoing weekly coaching	27/6

Role of the Researcher

It is an ethical imperative to reflect on one's own positionality in a given research situation. Positionality can be defined as the stance or positioning of the researcher in relation to the social and political context of the study (Coghlan & Brydon-Miller, 2014). This position affects every phase of the research process.

In this study, I explored the beliefs of fellow members of the preschool program within which I work. I situated myself as a *participant as observer* in this study, meaning I was directly involved with the activities and participants in the study (Creswell & Poth, 2018). This gave me the advantage of an "inside view" and allowed me to gather more subjective data, however, my positionality may have had an influence on the phenomenon being observed.

My epistemological perspective on knowledge is social-constructivist in nature, so I was naturally drawn to the Neuro-semantic Language Learning Theory (Arwood, 2001) and those preschool teachers who were also studying it and putting it into practice with young children, something I could not personally do given my position in the organization. I do not directly supervise any of the educators in this case study, but I have built a trusting relationship with most teachers in the program. I have engaged in many conversations about theories of learning, what seems to work with 3 and 4 year-olds, and conceptual change.

My Experience with Neuroeducation

Since completing my first neuroeducation course in fall 2018 as part of my doctoral studies, I felt that the Neuro-semantic Language Learning Theory (Arwood, 2011) had the potential to address the persistent student achievement gap that seems to begin in preschool. The integration of neuroscience, cognitive psychology, and language acquisition theory requires a

shift in perspective on the nature of teaching and learning, a change which I was open to in fall 2018 after so many frustrating years as a teacher and administrator implementing one new initiative after another, but failing to see any improvement in outcomes for our most vulnerable studens.

Having now completed all of the neuroeducation courses in the strand, I find myself conflicted, frustrated, reinvigorated, and inspired, all at the same time. I am in a position to help create meaningful change on a larger scale. My initial efforts included introducing others to the neuroeducation research in an accessible way, encouraging teachers to try NsLLT strategies, co-presenting at a local early learning conference in fall 2019 with two teachers, and striving to understand the role and changeability of preschool teacher beliefs during times of change.

Through conversations with and observations of teachers, it is clear that teachers possess a set of beliefs, but their beliefs do not always align with their practice. Their beliefs and practices are, at times, counter to each other even though they may have taken the same neuroeducation courses taught by the same university professor. Finally, it was apparent how challenging it is for educators to complete a professional learning course or seminar related to a new theory of learning and then translate and apply those concepts in their classroom with students. This experience showed me the significance of this issue and the nature of the problem I wanted to explore. What are the beliefs expressed by preschool teachers and how do those beliefs shift (or not) within the context of change? In order to better understand what is needed to support an effective shift in educator practice when educators become more aware of potentially effective learning theories that may help all preschool children experience success at school, it is

important for me (and all leaders) to understand the nature and power of beliefs and what is needed to support conceptual change.

With my knowledge about neuroeducation and other learning theories, I tried to ensure my interview questions related directly to the research questions. I needed to remain aware of my theoretical and contextual knowledge and experiences related to early childhood and the NsLLT.

Researcher Presuppositions

I propose that preschool teachers' beliefs and practices around early literacy are shaped and influenced by a dominant intradisciplinary theory of learning sustained by specific types of professional learning experiences. These same elements of learning theory and professional learning can also promote changes in teachers' beliefs and practices. More specifically, if teachers had access to a transdisciplinary theory of learning based on the current research in neuroscience and language acquisition as well as the translations of that research into educational applications through a professional learning format of believable vicarious experiences delivered via demonstration classrooms, we may begin to see tangible changes in the student achievement gap that so significantly impacts our diverse learners.

Data Collection

The data was collected through the construction of concept maps with accompanying interview questions, video-stimulated recall interviews, and a final semi-structured, open-ended face-to-face interview. All interviews were conducted in-person in the teachers' classrooms following all health and safety protocols, except the last two interviews in phase 3, which were held virtually via Zoom due to sharp increases in COVID-19 infection rates in our local community. These three elicitation methods are operationalized in the instruments section below.

My goal in this research design was to engage in a recursive and dynamic conversation with participants about their experience with the process of change.

Instruments

As mentioned above, data collection instruments comprised concept maps with accompanying interview questions, videos of participants facilitating early literacy lessons with accompanying interview questions, and a final semi-structured, open-ended interview to wrap up the data collection process (see Appendices A, B, & C). The purpose of the concept maps and video recorded lessons was to elicit information-rich responses from each participant and gather information about the early literacy beliefs of each participant. The use of these instruments was based on the research design and qualitative nature of understanding experiences (Creswell & Poth, 2018; Merriam, 1998; Patton, 2002).

Concept maps. Concept maps are rooted in Ausubel's (1968) meaningful learning theory. These graphic organizers illustrate the connections among concepts that represent an individual's belief or knowledge structure (Ausubel, 1968; Kinchin et al., 2019).

In their study examining Head Start teachers' understanding of the concept of early literacy, Mihai, Butera, and Friesen (2017) define *concept maps* as "graphic organizers that organize and represent knowledge, commonly including a central concept with related components, indicated by connecting lines" (p. 328). This is the definition I adopted for this study. Concept maps are a proven tool to gauge teachers' understanding of concepts (Artiles et al., 1994; Correa et al., 2004; Morine-Dershimer, 1993; Novak & Cañas, 2008). The use of concept maps as an artifact of study is well-situated in this study as a way for preschool teachers to express their beliefs in a way not typically analyzed by researchers. The nature of this

evidence allows for the exploration of conceptual information that may not be articulated using other qualitative or quantitative measures (Ausubel, 1968; Kagan, 1992; Kinchin et al., 2000; Novak & Cañas, 2008) (see Appendix A & C for specific procedures and examples).

Video-Stimulated Recall. The concept of video-stimulated recall as a research method is described by Calderhead (1981) as a "systematic approach to the collection of data potentially useful in research on teaching" (p. 211). It presents a way for researchers to gain access to the interactive thoughts and decision making of others. In video-stimulated recall interviews, participants view video recordings of their own teaching practice and answer a series of questions about their thinking and beliefs at specific points in time during a lesson, i.e., "Why did you choose to respond to the student in that way?" The goal of the questions and interactions during this interview is to keep the discussion as in the moment as possible, so that the researcher can access the teachers' thought processes at the time. Several studies have utilized this technique to explore teachers' beliefs and practices and as a mechanism for professional learning (Geiger et al., 2016; Kuzborska, 2011; Lutovac et al., 2015; Reitano & Sim, 2010) (see Appendix A for specific procedures).

Interviews. Interviews are necessary to obtain information about how others interpret the world (Merriam, 1998) Semi-structured interviews are a type of structured interview where the researcher conducts a scripted interview with the participant (Yin, 2003). Semi-structured interviews with open-ended questions allow for a verbal exchange between the researcher and the participants eliciting natural conversation (Merriam, 1998). Semi-structured interviews also allow the researcher to be responsive to interviewee responses and guide the conversation to explore topics that arise (Galletta, 2013).

Interviews with study participants were semi-structured and one-to-one. The purpose of the open-ended interview questions was to further understand the teachers' beliefs about early literacy, particularly within the context of implementing neuroeducation strategies.

Procedures

Following procedures approved by the University of Portland's Institutional Review Board, each activity and interview was preceded by an informed consent process. The purpose of my study was reviewed, and the ways in which member anonymity will be maintained was explained. Cases were identified and assigned a pseudonym, unless the participant gave permission to use their real name. As mentioned earlier, this study included three instruments (concept maps, video-stimulated recall, and semi-structured interviews) across 3 phases during October and November of 2020.

Concept Maps. Four factors impact the effectiveness of concept map construction: 1) how the map is constructed, 2) overall structure, 3) inclusion of attributes, and 4) accuracy and quality of included information (Yin & Shavelson, 2008).

This study used aspects of the concept map process outlined by Subramaniam, Kirby, Harrell, and Long (2019). In their qualitative exploratory study of pre-service elementary teachers' conceptions of buoyancy, Subramaniam et al. analyzed data sets from pre- and post-concept maps and semi-structured interviews. In their study, participants were provided instruction and practice with CmapTools (a shareware concept mapping program) to construct concept maps as recommended by researchers to evaluate knowledge constructs (citations). I followed some elements of the CmapTools process as outlined by Subramaniam et al. (2019) and the protocol suggested by Harrell & Subramaniam (2015). I did not, however, ask participants to

use the CmapTools program to construct their concept maps. During two pilot sessions, where volunteers were asked to create a concept map, the use of the downloadable shareware proved to be a barrier to volunteers' thinking and engaging in the process. I, therefore, oriented my study participants to the construction of a concept map by co-constructing one at the beginning of the first session using a neutral topic, such as *music* or *cooking*. Although these researchers used the protocol to examine teachers' knowledge, I used the protocol to explore teachers' beliefs.

First, participants were shown a handout developed by me defining concept maps with a graphic example of a concept map. I used the definition provided in the *Instruments* section. The handout I used is located in Appendix C. I also offered participants various-sized paper (8½ x 11 and large chart paper) and an assortment of colored markers, pens, and pencils. The reason I offered a variety of paper sizes and writing instruments was I wanted participants to have choice in the process and to express their thoughts with as few constrictions as possible. In my first pilot session with a volunteer who was not a preschool teacher, the size and complexity of their concept map was smaller and less complex than the second volunteer, a current preschool teacher, who participated in my second pilot session. These differences could be attributed to professional background, but I decided I didn't want to take the chance of using a smaller piece of paper with my true sample. The potential downside of offering a larger piece of paper is they may feel the need to fill it up. I included in my instructions to participants that concept maps can be any size and as complex as they turn out to be. There were no expectations other than that it represents the teacher's thinking on the concept. After completing the instructions and co-constructing a sample concept map, I checked in with each participant to answer any questions and then asked each person to construct a concept map about their beliefs with early literacy as

the central concept. Participants were told to spend about 15 minutes constructing their concept map, but the time constraint was flexible and all of them spent about 20-25 minutes on it. After completing their map, I then asked participants a series of open-ended interview questions.

The process of constructing a concept map and the interview protocol that accompanies this method was piloted with two volunteers who did not have the potential to be a participant in this study. I tried to select volunteers who are familiar with early childhood and early literacy or who could provide good feedback on the data collection procedures. The purpose of piloting this process and the accompanying questions was to ensure participant understanding of the construction of a concept map, establish a clear procedure to increase consistency of implementation across participants, and to refine the questions in order to maximize the method's capacity to gather the data desired.

Video-Stimulated Recall. Due to the fact that schools in this part of the state were closed and instruction was delivered 100% online, there were several options for obtaining and using videorecordings. All participants in the study had previously recorded videos of themselves teaching literacy lessons from spring 2020 during the initial closure of schools and remote delivery of instruction. These videos are stored on a remote learning website: https://sites.google.com/pps.net/prekremotelearning/home?authuser=0. One participant selected a pre-recorded video from this time period. The other two teachers had been recording themselves during Comprehensive Distance Learning (CDL) during the fall of the 2020-2021 school year. These two teachers selected video recordings of their live sessions with children and families as part of this phase of data collection.

I planned to provide a video of a preschool teacher engaged in facilitating a literacy lesson from the internet if any participants did not or could not provide one of their own instruction, however, this option did not need to be used.

The process of reviewing a video of an early literacy lesson in preschool and the interview protocol that accompanies this method was piloted with one volunteer who did not have the potential to be a participant in this study. I selected a volunteer who was familiar with early childhood and early literacy. The purpose of piloting this process and the accompanying questions was to ensure participant understanding of the video-stimulated recall process, establish a clear procedure to increase consistency of implementation across participants, and to refine the questions in order to maximize the method's capacity to gather the data desired.

Interviews. Interviews with the preschool teachers were semi-structured, one-to-one, and completed in phases as outlined below in this section. All interviews were recorded using a professional microphone and a laptop, with a smartphone as a backup. All interviews were conducted in-person and physically distanced in each teacher's classroom. Two out of the nine interviews were conducted via a web-based format and were recorded in audio and visual form. After completion, all interviews were transcribed by Rev.com using professional transcribers. Transcriptions were then analyzed and coded using Saldaña's (2016) first and second cycle coding methods.

The third interview protocol and questions were not piloted with any volunteers, but input was solicited from my doctoral classmates and my doctoral committee.

Timeline

This study occurred across three phases in fall and winter 2020. Table 2 shows the data collection procedures, analysis, and purpose in summary form.

Table 2

Data Collection Procedures, Analysis, and Purpose

	Data collection	Analysis	Purpose
Phase 1			
Concept map	Preschool teachers construct concept map of their understanding of the concept of early literacy Following construction of concept map, 30-45 min 1:1 semi-structured interview is completed with each teacher focused on the concept map	Inductive content analysis of teacher responses to researcher-generated questions to identify emergent themes. Identification of key words and terms emphasized by preschool teachers Saldaña coding methods: 1st: Open coding 2nd: Axial coding 3rd: Selective coding Deductive content analysis using final set of 32 codes	Provide way for participant voice to be conveyed Map language indicative of preschool teacher general beliefs about early literacy Surface any new concepts or themes; confirm identified themes
Phase 2			
Video-stimulated recall interview	30-45 min 1:1 semi-structured interview is completed with each teacher focused on video of teacher teaching literacy lesson	Inductive content analysis of teacher responses to researcher-generated questions to identify emergent themes.	Provides recorded events with which to examine how individual beliefs may be expressed

		Saldaña coding methods: 1st: Open coding 2nd: Axial coding 3rd: Selective coding	Provides further salient comments and detailed explanations that directly convey preschool teacher's voice. Further expands how teacher may have articulated beliefs
Phase 3			
Semi-structured interview wrap up	Interview questions in this phase informed by previous 2 phases; member checking on concept map and VSR interviews	Inductive content analysis of teacher responses to researcher-generated questions to identify emergent themes. Saldaña coding methods: 1st: Open coding 2nd: Axial coding 3rd: Selective coding	Provides further salient comments and detailed explanations that directly convey preschool teacher's voice. Further expands how teacher may have articulated beliefs Provides opportunity for member checking

Phase One. During the first scheduled interview session, each preschool teacher was asked to construct a concept map of their pedagogical beliefs about early literacy at the start of the interview. Each participant was given approximately 20 minutes to construct their concept map. A semi-structured oral interview was then conducted with teacher. See Appendix A for the interview guide for this interview.

Phase Two. Phase two interview questions were pre-formulated, however, participants were asked if they wanted to share any thoughts or questions from the first interview, and I reserved the right to ask follow up questions as needed. Phase two interviews focused on the

teacher and me watching a pre-recorded video of the teacher facilitating a literacy lesson. This elicitation is called a video-stimulated recall interview (Calderhead, 1981). See Appendix A for the interview protocol for this interview.

Phase Three. In this phase, I conducted semi-structured face-to-face interviews (one in-person, two virtually) with each teacher. The interview questions in this phase were pre-determined with the same open-ended request of participants to share any thoughts or questions from the previous interviews. The interview questions built on those asked in the previous two phases of interviews. Questions included asking the teacher to describe how young children acquire literacy concepts, influencing factors on their early literacy beliefs, and their recommendations for professional learning. See Appendix A for the interview protocol for this interview.

Alternative Plans

At the present time, a global pandemic known as COVID-19 is significantly disrupting the operation of schools and in-person instruction. Schools in this school district, including the preschool program that is part of my study, have been closed since March 13, 2020. It is still unclear when schools will fully reopen. The ability to procedurally plan out a step by step research process can be challenging during a global pandemic, but I developed contingency plans in the event I had to adjust. This study took place when teachers and students were not present together in a physical school building. Synchronous (live) learning sessions were limited to one hour per day via web-based platforms, such as Google Meet and Zoom. I was able to implement data collection methods via in-person, physically distanced interviews following all health and safety protocols. Teachers engaged in construction of concept maps as they would have in the

absence of a pandemic. Teachers utilized pre-recorded videos of them teaching a literacy lesson for the video-stimulated recall elicitation. In one of the videos, no students were involved. In the other two videos, a small group of students were included via a web-based platform.

All class sizes were reduced to ten students per class at the start of this school year. This is a change to the expectation that a teacher may have recorded themself teaching in a physical classroom with as many as 20 students physically present in the learning environment.

In addition, I was prepared to conduct all interviews via a web-based platform, such as Zoom or Google Meet, however, only two interviews needed to be completed in that manner.

Data Analysis

Following Saldaña's (2016) first and second cycle coding methods, I first engaged in open coding. I took the textual data and broke it up into discrete parts or codes. I then drew connections between my codes. This is known as axial coding. In the third step, which Saldaña calls the "trinity technique," I completed a round of selective coding and selected two central categories that connect all the codes from my analysis and capture the essence of my research. Nine interview transcripts were coded along with each participant's concept map making 12 possible files across the sample. Frequency data for each code was collected using NVivo software.

I researched the use of NVivo as a data analysis tool. I paid for and completed two online training modules in NVivo to obtain an NVivo certified user badge. I chose this data analysis tool because it allowed me to look at codes across individuals, but more importantly, across elicitations as I collected data in three phases. Barton (2015) borrows from Johnson and Weller's

(2002) definition of elicitation techniques as "research tasks that use visual, verbal, or written stimuli to encourage participants to talk about their ideas" (p. 180).

Like the recursive and dynamic nature of the research design outlined above, the data collection and data analysis process was also recursive and dynamic (Merriam, 2009). The narrative data I obtained from each phase of the data collection process was analyzed inductively after all phases were completed. Concept maps were coded deductively using the 32 codes I distilled from the initial 141. I started with an inductive process during the first cycle, because I wanted participant voice to be front and center in my data analysis. How preschool teachers make and express meaning as part of their learning process was the foundation of my study. Once I analyzed participants' expressions of their beliefs, it then seemed appropriate to look for the presence of neuroeducation concepts in their expressions.

My inductive and deductive analyses of the data resulted in three main concept categories, Preschool Teacher Beliefs about Early Literacy, Conditions for Student Learning, and the Teacher Learning Process, comprised of 32 codes that were synthesized and regrouped from an initial list of 141 codes.

Coding Concept Maps

I deductively coded the concept maps using my synthesized list of 32 codes and categories. I decided to code each concept map separately and fully before moving on to the next one as it seemed to be easier to apply codes to a single artifact and mentally stay within that artifact the whole time. I felt this might lend itself better to determining any nuances of the individual artifact and comparing them to each other for similarities and differences.

The process of constructing a concept map involves metacognition and self-reflecting on one's own thoughts, beliefs, and experiences. The participant strives to label their thinking with language, including words and pictures. One participant almost exclusively used pictures. Another exclusively used words, and the third used a combination of both (more words than pictures).

After coding all 3 concept maps, I noticed that I used 4/6 codes from the Teacher Learning Process/Influencing Factors category/theme. I did not use "Coaching" or "Theory to practice enactment experiences." I used 8/10 codes from the Teacher Beliefs/Conditions for Student Learning/Teacher Beliefs about Literacy categories/themes. I did not use the two codes from the Teaching vs. Learning sub-category, which were "Evidence" and Literacy planning."

Decision Rules

Decision rules for selection of study design and methods as well as axial and selective coding cycles were developed in an effort to be systematic and help determine patterns and themes in the data. Frequency and saliency were factors used to identify primary themes and illustrate findings within each theme. I developed specific decision rules after I completed first cycle open coding using NVivo frequency data. They were:

1. As noted in Chapter 2, Pajares (1992) defined belief as "an individual's judgment of the truth or falsity of a proposition, a judgment that can only be inferred from a collective understanding of what human beings say, intend, and do". Kagan (1992) defines teacher beliefs as "implicit assumptions about students, learning, classrooms, and the subject matter to be taught". For the purposes of my study, I used both definitions as a basis for my selection of elicitation methods, analysis of the data collected, and my interpretation of the findings. The use

of concept maps, video-stimulated recall, and open-ended, semi-structured interviews supported my interest in gathering richer, more authentic responses from participants and making more insightful inferences of what preschool teachers might *say*, *intend*, and *do* (Pajares, 1992). My analysis and interpretation of the data attempted to discern what *implicit assumptions* preschool teachers might have about *students*, *learning*, and *early literacy* (Kagan, 1992).

2. First cycle codes were grouped or renamed based on similarities

3. Codes having a frequency of 10 or more references in the data across 5 or more participant files were identified as themes, because this indicates a concept of importance to one individual (mentioned in all three phases and present in the concept map) and also to at least one other participant

My phased approach to data collection, which included the use of methods such as concept maps, video-stimulated recall, and semi-structured interviews allowed me to synthesize the results of all data analyses. This strengthened my study's trustworthiness, which is explained further in the next section.

Ensuring Trustworthiness

In this study, I investigated other people's constructions of reality, in other words, how they understand the world. I was the primary instrument of data collection and analysis. As such, my interpretations of other's reality were accessed directly through my observations and interviews. I was, therefore, closer to reality than if a survey or questionnaire had been inserted between me and the participants.

The quality of a qualitative research study depends on its establishment of trustworthiness (Lincoln & Guba, 1985). Achieving a level of trustworthiness can be challenging, but it is

possible. My study used Lincoln and Guba's (1985) operationalization of trustworthiness. There are four components – credibility, transferability, dependability, and confirmability.

Credibility

Among the techniques that support making a study's findings and interpretations more credible, my study utilized triangulation and member checking as needed (Lincoln & Guba, 1985, Mihai et al., 2017). Through my use of multiple and different sources (multiple participants) and methods (concept map, VSR, and semi-structured interviews), I was able to compare and cross-check the data gathered during all three phases of data collection and triangulate my findings and interpretations. In addition, after I analyzed the data and began to write up my interpretations, I shared portions of my reports with some of the study participants as needed to check for accuracy and plausibility. These are called member checks. For Lincoln and Guba (1985), this is "the most crucial technique for establishing credibility" (p. 314). If an investigator can obtain agreement from his participants on the accuracy of his findings and interpretations, readers are more likely to be convinced of the authenticity of the researcher's work.

Transferability

In the traditional sense, it is not possible to replicate a qualitative case study because there is more than one reality and human behavior is ever changing (Merriam, 1998). The component of transferability (known as external validity in quantitative research) is comprised of "thick description" to allow readers to determine for themselves whether a transfer of methods or findings can be considered as a possibility. The implication here is that I, as the researcher, want the readers of my study to conclude that the results are consistent with the data collected, that the

results make sense. Purposeful sampling is one way to improve transferability. In this study, I selected a small specific sample using standard sampling techniques, however, I was more interested in understanding a specific phenomenon in-depth than the generalizability of my study's results. This could be considered a limitation of this study, and I accept that. The point of this study was not generalizability. Nevertheless, I utilized thick description and purposeful sampling as strategies to increase transferability in the event that readers of this study are interested in similarities to their situations and potential transferability of findings. Lincoln and Guba (1985) state it is the researcher's responsibility to "provide the *data base* that makes transferability judgments possible on the part of the potential appliers" (p. 316, emphasis in original).

Dependability

Lincoln and Guba (1985) argue that a demonstration of credibility in qualitative research implies the presence of dependability. To strengthen this argument, they recommend developing a rigorous and detailed research design that can be followed independently by other researchers. This was one of my goals for my study design. As noted in this chapter, each phase of my study had clearly defined steps throughout. I also kept detailed records of all decisions and adjustments I made during the course of data collection and data analysis.

Confirmability

The primary technique for establishing confirmability is the confirmability audit (Lincoln & Guba, 1985). Keeping and summarizing my personal reflective journals and analytic memos is one strategy for maintaining confirmability. Lincoln and Guba (1985) give credit to Halpern (1983) for the concept of auditing in qualitative research. Collecting and storing information in

accordance with the norms of a fiscal audit characterize this component. Everything from raw data to journals and interview protocols are included here. These are all elements that I followed in my study.

Ethical Considerations

Following procedures approved by the University of Portland's Institutional Review Board, each interview was preceded by an informed consent process. All participants were given copies of the consent forms, and all copies of consent forms were kept by the researcher in a physical folder and on an electronic Dropbox folder, both of which were secured and accessible only by the researcher. The Dropbox folder required a password and a unique email address known only to the researcher. All participants' names were coded to protect anonymity. The purpose of the study was reviewed with participants, and the ways in which member anonymity was maintained was explained to them. I offered an incentive to study participants in the form of an honorarium in the amount of $100 each, which was paid at the conclusion of the data collection process.

Summary

This qualitative exploratory case study examined early literacy beliefs as expressed by three preschool teachers from a large urban preschool program in the Pacific northwest who have been exposed to a neuroeducation-based learning theory known as Arwood's (2011) Neuro-semantic Language Learning Theory (NsLLT). Participants were chosen through purposeful sampling and were asked to engaged in a phased process of inquiry. First, they constructed concept maps of their pedagogical beliefs about early literacy. Second, they reviewed a videorecording of themselves facilitating a literacy lesson in a process known as video-

stimulated recall (VSR). Each of these first two activities was accompanied by a one-to-one, semi-structured interview process I led that was designed to explore each of these teachers' beliefs. Open-ended questions were asked to surface aspects of these teachers' beliefs that would not otherwise be measurable through other means. In the third and final phase, a semi-structured interview, was completed with each participant. The concept maps and interview transcripts were then coded and analyzed for categories and emerging themes.

Chapter 4: Findings

The purpose of this qualitative case study was to understand how preschool teachers expressed their beliefs about early literacy within the context of learning about and implementing strategies of a neuroeducation learning framework known as Arwood's (2011) Neuro-semantic Language Learning Theory (NsLLT). This study aimed to contribute to the emerging research on educational applications of neuroscience, specifically how preschool teachers' beliefs may or may not change as a result of formal learning experiences and ongoing coaching. This chapter presents the results of this study in response to the principle research question that guided it. Findings are systematically reported by identified patterns and themes with supporting exemplars. Exemplars are drawn from the study's elicitation events or artifacts: concept map construction (CM); video-stimulated recall events (VSR); and open-ended, semi-structured interviews (SSI). Findings are described in relation to the primary Research Question based on richly detailed accounts of participants' expressions of beliefs via these events. The following research question guided this study.

RQ: How do preschool teachers describe their beliefs about early literacy as they implement neuroeducation-based strategies and interventions?

As I present findings from the data, this chapter will include sections addressing study participants' representations of their beliefs across all elicitation methods (concept maps, video-stimulated recall, and interviews), descriptions and attributions of any changes in participants' beliefs, and instances of the presence of neuroeducation concepts in participants' expressions.

The following data represents the importance of certain concepts and themes as suggested by the frequency of mentions across elicitation events. The main themes/categories I am going to present here are Preschool Teacher Beliefs, Conditions for Student Learning, and the Preschool

Teacher Learning Process. A table of my coding categories and how I operationalized them can be found in Appendix C, but I am going to focus on these three themes, as these represent the essence of my research focus and findings. Within each of these is a main sub-category. Under Preschool Teacher Beliefs is the main theme of *Beliefs about early literacy*. Under Conditions for Student Learning, the theme of *Learning requires context and must be meaningful* is prominent. Under the Preschool Teacher Learning Process is the main theme of *Influencing factors*. I will make some assertions about the data in each category/theme, provide evidence for each assertion, and interpret the evidence.

Preschool teachers, like all teachers, come to their work with a set of implicit assumptions about students and learning. They work with 3- and 4-year old children in what is usually a child's first formal school experience. The assertions, evidence, and interpretations presented in the next two sections are based on the expressions made by the three preschool teachers in my study - Jill, Cheryl, and Lisa. I will examine these three teachers' expressions of beliefs related to early literacy and how they view the conditions for student learning. In the subsequent sections, I will present what these three participants shared regarding their own learning processes throughout their careers, including past and present professional learning experiences. Several influencing factors surfaced in the course of sharing their beliefs and experiences. Some of these will be highlighted as significant findings along with connections to the neuroeducation learning framework within which these teachers have chosen to work.

Preschool Teachers' Beliefs

As I outlined in Chapter 1, the significance of this research is threefold. It affirms the importance of early childhood education, acknowledges the academic pressure on U.S. preschool

programs, and highlights the need to improve outcomes for vulnerable children. Two of this study's participants echoed these ideas in their belief expressions. The data indicate that these preschool educators are aware of persistent gaps in students' success in school and that a change in approach is needed.

In line with the significance of this study, Lisa shared feelings of discouragement about the persistent student achievement gap. She attributes the gap, at last partially, to non-meaningful experiences. Lisa goes on to say that children let us know when their learning experiences are not meaningful to them:

> It's absolutely discouraging and I think in terms of the idea of selling an idea or selling a program, it's also important to realize that when you're not meeting the needs of children, whatever shade of color they are, they are going to act in ways that are going to make it really difficult. …there were news stories about…these kids who were having these huge blowouts and really young ages. (Lisa, Phase 3 SSI)

She places the onus for a child's challenging behaviors on the curriculum approach, not the child. Lisa then implies that we have an obligation to act on that information, because everyone involved in this endeavor wants children to succeed:

> And so, I think the idea that knowing how a child thinks and being able to teach in a way that…all children want to learn, all parents want their children to learn, all teachers want all their children to learn, those three things are all true and yet…we have these consistent gaps over and over and over again. (Lisa, Phase 3 SSI)

In her Phase 3 interview, she acknowledged how difficult it is for teacher beliefs to change. “And I think about well, we have a pretty set way of thinking about how kids learn” (Lisa, Phase 3 SSI). Lisa then expressed hope that her new learning in neuroeducation (the NsLLT) might begin to reduce the achievement gap:

> Maybe this other information can help us close that up or shake that up a little bit because it's a little discouraging to feel like we consistently don't meet the needs of a certain portion of kids and what are we going to do about that, right? (Lisa, Phase 3 SSI)

As Lisa concludes her comments, the NsLLT appears to represent a promising practice for her and the field. Her use of the phrasing, “knowing how a child thinks,” may be a reference to Arwood’s (2011) NsLLT, which holds that it is important for adults to understand how the brain functions and learns within a neuroscience, cognitive psychology, and language acquisition perspective. Lisa expresses hope for its effectiveness, but also consternation that she may not succeed in understanding or implementing it, at least in the near-term:

> And so, the idea that there may be a way to understand children and to reach them in ways that will help them to learn and will help them to feel successful and will help them to feel like they're agents ... I mean, I don't know a single teacher who doesn't want that and who wouldn't want that. I think the tricky part, I mean I'm struggling with it right now. It's like I know just enough to be dangerous. I can't look at a child right now and say, ‘Oh, I know how that child learns.’…I feel like I'm years away from knowing that. (Lisa, Phase 3 SSI)

Lisa's comments demonstrate that while she knows all students are not succeeding, she is still looking for answers to solve that problem, even after 27 years of teaching and a multitude of formal and informal professional learning experiences.

The search for and acquisition of knowledge by these participants is a strong character trait of these professional educators. Based on the data collected here, there is an ongoing interplay between beliefs and knowledge in these individuals. "I know just enough to be dangerous" is a compelling reflection. Later in this chapter, in a section entitled Preschool Teacher Learning Process, I will share what these teachers say about their own learning processes.

Another study participant sees racial equity and social justice as part of the significance of studying and understanding teacher beliefs about early literacy in early childhood and mitigating the achievement gap. In her Phase 3 interview, Cheryl claims that literacy acquisition is an ethical responsibility and a social justice issue. She considers it a "human right:"

> When I think of literacy acquisition, I do think of it as... I don't want to state this too strongly, but it's a social justice issue. It's a human right, is how I see it. Everyone should have an opportunity to acquire literacy…My belief is that it's very, very important, and it's a human right to be able to acquire literacy and that it's not a level playing field. (Cheryl, Phase 3 SSI)

Cheryl situates herself in the center of this endeavor and considers it incumbent upon her, in her role as a preschool teacher, to know how to create the conditions for young children's successful learning. She shares specific beliefs regarding what those learning experiences should look like:

> I think of it in terms of a really immense responsibility that I have to provide. The way in which I provide opportunities for literacy acquisition has to be experienced-based, and it has to be in the environment and it has to be something I set up that I put forward, but children kind of have to arrive at it in their own space, or it's my agenda. (Cheryl, Phase 3 SSI)

Cheryl believes successful learning should be child-directed and experience-based. This seems an important feature of Cheryl's sense of responsibility within a framework of racial equity and social justice. Both Lisa and Cheryl express an awareness of the difficulty in meeting every child's learning needs and the moral imperative to find solutions to that challenge. Jill often quotes Maya Angelou to capture the same idea, "I did then what I knew how to do. Now that I know better, I do better." This is another example of the interplay between beliefs, knowledge, and practice.

Preschool Teacher Beliefs about Early Literacy

The previous section demonstrates why beliefs may be a powerful force in the acts of teaching and learning. My study's elicitation methods successfully encouraged participants to think and talk about their beliefs, and how those beliefs may change or evolve within a new learning framework. The following sections reflect the thinking and beliefs of the study participants related to early literacy.

Early Literacy is Broad. The literature review I conducted reflected a fairly specific definition of what constitutes early literacy, emphasizing elements such as reading and writing, however, this study's participants offered a broader perspective. The data show that all

participants expressed broad definitions of literacy while acknowledging some commonly held opinions of specific examples of literacy.

When asked to talk about the concept map each of them constructed in Phase 1, each participant offered their view on how they defined early literacy. Jill offered this definition, "So literacy is not just words, but also encompasses ideas….the ability to understand and exchange information and ideas and communicate. Literacy is just the foundational thing for everything" (Jill, Phase 1 CM). In two of her interviews, Cheryl shared her perspective on the purpose of literacy:

> The whole point is to get meaning from the text, meaning off the page. (Cheryl, Phase 1 CM) …anything as a component of literacy, whether it's how to hold a book or how to turn pages, so physical interaction with literacy, how to hold a pencil…and then there's learning vocabulary words. (Cheryl, Phase 3 SSI)

Lisa provided her perspective in the following way:

> I have a very broad view of what both early and literacy mean… Literacy…is often thought of as reading and writing…, but that feels way too narrow for me… [children are] beings that are making meaning out of things that are happening around them… children learn to read the world… reading isn't just about texts…anything could be a text. A tree could be a text, a piece of fruit, a plant, a human, a person, or their face, a building. …the purpose of literacy is to communicate ideas, to understand, and to be understood and to connect and to be part of society and community. (Lisa, Phase 1 CM)

The purpose of literacy seems to be embedded in the definition of literacy for these preschool teachers. Lisa's declaration that "anything could be a text" epitomizes an expansive view of early literacy. Lisa then expanded on her thoughts about early literacy by commenting on children's ways of knowing:

> And just another really strong belief that children are full of knowing, of stories, of ideas, of theories. No, they don't know how to read and write when they're young and when they're born. But that doesn't mean that they don't know. It doesn't mean that they don't have as many ideas and theories and things to say about the world as we do. And so it's really our job to help them learn to express themselves and to communicate and share their ideas. (Lisa, Phase 1 CM)

I have two interpretations of this quote. The first is that Lisa's comments show she believes in the young child as a human being with agency and thoughts of their own – "It doesn't mean that they don't have as many ideas and theories and things to say about the world as we do." They are not empty vessels that need to be filled with adult knowledge. Young children have stories to tell and theories about the world based on their lived experiences, and adults should honor and respect that. The second is based on my first interpretation and, although not explicitly stated as a NsLLT tenet, her statements align with the NsLLT framework. The teacher's or parent's job is to assign meaning to the young child's learning experiences. The teacher or parent is responsible for helping the child to acquire concepts through purposeful language acquisition strategies – "it's really our job to help them learn to express themselves and to communicate and share their ideas."

"Meaning making" is a theme that appears in every phase of each of these teachers' artifacts and transcripts. In the quotations above, it takes on a special quality as these three teachers are situating literacy away from what is commonly understood as "text" and situating it more in the "person" involved in the process. Lisa, in particular, went so far as to say, "everything can be 'read,' because everything carries meaning and learning to 'read' is meaning making." Of particular note, while Jill and Cheryl imply it, only Lisa's description overtly includes the concept of a person. She states, "[children are] beings that are making meaning out of things that are happening around them." The young students with whom these teachers work do not know how to read in the formal sense, but they spend most of their waking hours making meaning out of the people, things, and events in their environment. They are always "reading" or acquiring literacy, because they are continually engaged in "meaning making."

All three participants referenced the concept of "meaning" or "meaning making" with Jill adding in the final interview that "input needs to be meaningful" by which she meant "meaningful to the kid." Two out of three stated the purpose of literacy is to "understand" or "be understood" as part of communicating. This suggests these preschool teachers believe early literacy is about making meaning through social interaction. While Lisa mentioned the parts of language structures in her first interview, none of the participants suggested that teaching discrete skills related to syntax, morphology, and phonology should be a primary focus of early literacy. In her Phase 3 interview, Cheryl explicitly shared the following:

> We need to provide children with the whole picture of what concepts look like…Maybe that's an old belief of mine, but getting to the point where breaking apart the concepts into little pieces is not the best way to help children put them

> back together and access it. In fact, it's more creating a hurdle…that would have been hard for me to hear a year and a half ago; I would have stood by the letters. (Cheryl, Phase 3 SSI)

In this expression, Cheryl acknowledges a shift in her beliefs about an aspect of early literacy acquisition as recently as a year and a half ago when she states she would have found it difficult not to focus on letter sounds. Her reference to her current stance about picturing whole concepts seems to demonstrate a neuroeducation perspective based on the NsLLT.

In summary, definitions of early literacy contained specific features, such as words, reading conventions, and writing, but, just as importantly, included broader concepts, such as exchanges of information and ideas, understanding and being understood, making meaning, social connections, and presenting whole concepts with the learner as an agent in the process. It could be inferred, then, that these preschool teachers hold early literacy beliefs that encompass a broader range of developmental domains and demonstrate a more general perspective given the age of the children they teach and the nature of the learning environment. A thread of neuroeducation in the form of the NsLLT can be seen in all of these definitions.

Aspects of Literacy Acquisition. In describing their beliefs about literacy acquisition, participants offered a wide range of opinions. Lisa felt that "we" implement the teaching of reading and writing too early to the detriment of a child's natural curiosity and love of learning:

> I personally think…that we start the teaching of reading and writing way too early. And then if we could focus on these other pieces, the oral language, the sharing of ideas and theories, and knowing through different materials and expression, that children would still read and write. They would learn to read and

> write. It would be a lot less painful and a lot more joyful, and it would happen more smoothly. (Lisa, Phase 1 CM)

I initially interpreted Lisa's use of the word "we" to mean "the system" or American public education, but she could also mean curricula, fellow preschool teachers, district leaders, or our North American culture. Lisa's comments suggest that her beliefs about and approach to early literacy may differ from a larger societal mindset or directive.

Lisa has a strong belief that oral language is a pathway to literacy acquisition, because it focuses on the sharing of ideas and theories, including the children's. As she explained her concept map to me, Lisa advocated for a focus on what she called "oral literacy" over other elements. The key ideas behind her belief statement are 1) an adult assigns meaning to the child's learning, and 2) the skills of reading and writing do not need to be taught early on:

> Oral literacy is huge. I feel like almost maybe more important than all this. I feel like if oral literacy is strongly supported and children are supported to speak and to share their ideas and gain vocabulary and are spoken to in ways that expand their ideas and their vocabulary, the rest of their system, the rest of their physical system is ready to learn to read and write, it will move and advance incredibly quickly. (Lisa, Phase 1 CM)

This statement suggests to me that Lisa is close to a deeper understanding of the NsLLT and its Vygotskian roots. "Ideas" and "vocabulary" are more important than, say, naming, sounding out, and writing letters. Lisa captures an essential tenet of the NsLLT here – the whole is greater than the parts. A child can learn holistically, experience deeper learning, and be better positioned to learn the discrete skills (the parts) of reading and writing if the teacher works off of the child's

neurobiological learning system. If Lisa were to learn more about Hebbian learning principles, how and why neural circuits and networks are created, and the intentional act of facilitating language acquisition, I would expect that she could find herself translating the beliefs she just expressed using more specific neuroeducation terms.

The data also demonstrate that the study participants, through conversations with parents, see the home environment as a different context for literacy learning than the school setting. Parents are not always aware of research-based practices or innovative promising practices that are based on emerging fields of research, such as the NsLLT. These participants feel they must spend time informing parents and caregivers of these practices, so that parents understand why teachers are selecting certain learning strategies. Cheryl comments on this in her first interview:

> It's why in normal times, when I can meet parents in person, I spend a lot more time explaining the why behind what I'm doing and helping parents to see I'm not just doing this because and we're not just singing the ABCs and naming our shapes. That's not what preschool is about. I think that's the parent in me that's making sure that is happening in my professional space. It also can bring up conflict where I can empathize with a parent perspective, but I know the classroom side of the scenario. I get it. When you're at home and you have one only child, I get it that this works. When your child is in this space and there's 19 kids, we have to redefine. (Cheryl, Phase 1 CM)

Cheryl acknowledges her own dueling perspectives as parent and preschool teacher and uses that knowledge to help caregivers understand that school and home learning environments can be discernibly different. In the same way that she assigns meaning to her students' learning, Cheryl

strives to assign meaning when helping caregivers understand the brain-based nature of the learning environment she has created at school. Jill also speaks to the issue of parents requesting more practice with recognizing letter names and sounds in her second interview.

> Because it's the symbol, and it's a pattern. And it's not really about thinking…now I can use what I know from the neuroed to help the parents understand why it's not such a big deal…It's part of what we're doing. 'Don't worry, your child is practicing that, and if you want more stuff for home, sure.' There's no sense fighting them about it, if parents are comfortable doing it that way. (Jill, Phase 2 VSR)

Here, Jill recognizes the balance between helping parents understand a new idea while catering to parents' sense of familiarity and need to feel included in their child's learning process. Cheryl revisits the home environment again in Phase 3 when I ask her about potential influences on a child's acquisition of early literacy. She states, "A big part of that makes me think of home life…there's just no denying that what kind of literacy environment is in the child's home is going to play a role" (Cheryl, Phase 3 SSI).

The data above are noteworthy because the participants see themselves not just as classroom practitioners, but also as communicators of information, practices, and beliefs to parents and caregivers. Cheryl's focus on sharing the "why" behind what she is doing and her belief statement that preschool is not just about singing the ABCs and naming shapes (patterns) shows she is internalizing essential principles of the NsLLT, which moves beyond pattern levels of learning. Pillars of the NsLLT include a focus on purpose and learning within a social context. Cheryl's perspective most likely stems from her own lived experience as a parent as well as a

professional educator who is learning and implementing a new learning theory. She understands the differences between home and school contexts and the need to help parents understand the differences. The home environment will be discussed again in the next section.

In the next section, I will discuss the second major theme arising from the data – Conditions for Student Learning. All the study participants spoke about issues that may impact student learning in positive and negative ways. These belief expressions showed up in all elicitation events.

Conditions for Student Learning

The data show that preschool teachers feel there are certain conditions under which children are successful in acquiring literacy concepts. In Chapters 2 and 3, I provided a description of the neuroeducation framework, the NsLLT and the Neuro-viconic Education System (NvES), within which these participants are working. I have also explained some of the principles of this brain-based learning approach in other sections of this chapter.

Learning Requires Context and Must Be Meaningful

All three participants in all three phases of the data collection process highlighted the need for meaningful learning experiences and context. The data collected indicated that *learning requires context and must be meaningful*. This concept had the highest number of references and is a fundamental principle of the NsLLT and NvES. When discussing how and why she chooses certain storybooks, Jill reported she feels it is important to connect new concepts to what children experience in their own lives. For example, while a book about polar bears is interesting, being able to go outside, collect leaves, and do an activity around those leaves that they can see, touch, and smell is more relevant and meaningful. Jill stated the need for context

this way: “so trying to keep it relevant to what they can experience in their life. And that helps them find more meaning in it” (Jill, Phase 2 VSR). This may represent a point of intersection between Jill’s prior training in and knowledge about a whole language approach to learning and the NsLLT. Both whole language and the NsLLT view learning and language holistically. Learning is built upon the real experiences and background knowledge of the learner. Unlike whole language, however, the NsLLT incorporates the research disciplines of neuroscience and language acquisition and is embodied in explicit methods via the Neuro-viconic Education System (NvES).

Given these participants’ strong affinity for context and meaningfulness, I was curious to know what they believed about the parts of language structures, such as letter names and letter sounds. When I asked Jill whether she taught letter sounds and letter names, she answered in the following way:

> In context… Absolutely. And we do practice what it looks like. So with the children's names, this is what they look like…It has to be in context and it has to make sense. And it has to be where they can neurologically make sense of it and hook it to something else. So in the context of the play planning that Tools of the Mind does, then it makes sense if you have a child who wants to write that message, who knows that the drawing is a message… And now, the writing is also a message and I want my message to be seen and heard and I want other people to be able to read it. (Jill, Phase 3 SSI)

When she says they “practice what *it* looks like,” she means individual letter names and sounds may occur organically in the course of the instructional routine, i.e. writing a child’s name, and

she will show the child what that looks like. A child's name and drawing oneself are often points of focus in early learning programs as a way to build a sense of agency as well as early literacy. For example, recognizing one's name in print or writing one's own name are important milestones that parents and teachers celebrate. Jill offers that this is a contextualized way to incorporate the learning of letter names and sounds. When Jill mentions context, she may be reflecting one of the NvES's fundamental cornerstones that children learn through context. If Jill included the semantic features of event-based learning, this connection would be more pronounced. Connecting a child's drawings to their "writing" is part of early literacy in Jill's quote above. She contends that children learn that drawings as well as writings are messages and that they have meaning to themselves and others. This correlates with Jill's previously expressed beliefs about her definition of early literacy, which she sees as an exchange of information.

Earlier in this chapter, Lisa integrated some of her new learning about neuroeducation into her beliefs about the need for context in learning. During that same interview, Lisa expounded on what she meant by "context" by stating, "And then there's just these other pieces of just being surrounded by books, seeing people read, especially adults that are meaningful in your life, being read to" (Lisa, Phase 1 CM). In contrast to Jill's statement above where the learner is an active communicator, in this instance, Lisa portrays the learner as a vicarious observer whose direct experience might include being read to.

As confident as these participants appeared to sound when sharing their ideas about learning and literacy, there were times when they admitted some uncertainties. Lisa made the following statement related to learning, meaning, and context when explaining parts of her concept map to me. She said this after relating a story about her teacher preparation program that

prepared teachers to use a whole language approach to learning. In the midst of that explanation, she said that over the years, she made room for all strategies, including phonemic awareness, because “we don’t really know” [what strategies may work with an individual learner] (Lisa, Phase 1 CM). Lisa remarked:

> The thought of starting early literacy being like school literacy, in a classroom where all you’re doing is teaching the parts and you’re not bringing in beautiful literature and reading. That is off the charts unacceptable to me. But I don’t think I would sit here and say that there’s no place for learning the alphabet, even potentially for learning sounds. (Lisa, Phase 1 CM)

> [Regarding the teaching of letter names and sounds] I definitely have in the past. I haven't ever done a letter of the day or everything is about that letter but I have done everything from just try to bring it in in context as much as possible…, and this was more when I was in kindergarten, but we would start the year, we would explore all the names of the kids in our class and we would put out the names and talk about them in capital letters and look at the letters and really the main goal there being kids learning each other's names but also using it as a way to talk about letters. And same with a book. I had a big book, we might highlight a letter or something. So, trying to have it done in context as opposed to just, "Here's this letter," but I will say that in my last four years before I came to Head Start I felt a lot of pressure to do more of that, letters and sounds. There’s a woman named Nellie Edge. She has a sign language letter song and we would sign it every day and I would sometimes read alphabet books. (Lisa, Phase 3 SSI)

Lisa's experience seems similar to many other teachers' experiences at the preschool level. She believes that learning requires context and should be meaningful, so she plans lessons that provide context and meaning to the parts of language structures, like letter names and sounds, even though she was trained in whole language. Her recent experience of increasing pressure to do more teaching of letter names and sounds as a kindergarten teacher reflects what I wrote about in Chapter 1 about the Global Education Reform Movement, that is, the pushing down of "academic skills" and a "parts to whole" pedagogy from upper elementary to early learning without accounting for neurobiological systems or language function levels. In Piagetian terms, Lisa, like her participant peers, has *assimilated* many new learning concepts into her existing schema (knowledge), and her schema remained unchanged. In other instances, which I will describe later in this chapter, Lisa and the other participants are *accommodating* the new learning or situation because their current schema does not match and must change.

Cheryl provided another example of a situation that challenged her belief that learning must be meaningful. Tools of the Mind is a commercial curriculum adopted around 2016 by the preschool program for whom these participants work. Tools of the Mind claims to "meld Vygotskian theory with cutting edge neuroscience research." When describing a curriculum activity known as Make Believe Play Planning where students draw a picture of what they plan to choose and do during a period of "intentional make-believe play," Cheryl compared the suggested protocol offered by the curriculum to her previous approach to journaling before the new curriculum was adopted.

After providing paper and a writing instrument, the curriculum suggests the teacher prompt the students to draw what they plan to do during "intentional make-believe play," usually

selecting from a menu of predetermined “centers,” i.e. restaurant area, dress up area, blocks, etc. When the child finishes their drawing, the teacher then prompts the child to tell the teacher about their picture. Every child is expected to start their response with, “I am going to…” when talking about their picture. The student or the teacher draws a line for each individual word and then, if the child needs the scaffolding, the teacher writes the words for the child. This is an almost daily activity for teachers in this preschool program in which the study is situated. See Appendix D for an example. Cheryl explains her thinking about this learning activity and expresses several core beliefs about literacy in the process:

> The kids indicate with that robotic voice what's not meaningful to them, and I hear it now…“I…am…going…to…”…we really miss journals where we would get their stories, not just their play plan. We bring journals back in, and oh my god, every journal entry, I said, “Well, what's this? Is this your bedroom? Are these your toys?” The kids would go, “I…am…going...” Then we'd go, “No, what's happening?!” They've learned just a pattern that so clearly had no meaning behind it. I translate that now into young children who are learning how to read, but it's really word call and…robotic sounds because there isn't any meaning behind what they're saying out loud. So that makes me circle back to a strong principle belief that I have that we need to help educate parents of very young children what is the point of reading. Is it to say what out loud what's on the page? No, that's really not the reason we read. It's for getting meaning from the page and getting the concept behind that meaning. So that is now clear to me that breaking

> apart the words and looking at the letters individually and studying the letter sounds isn't going to get to that concept. (Cheryl, Phase 3 SSI)

Cheryl expressed several beliefs in the statement above, namely that individual letter names and letter sounds have no meaning, memorized learning is not meaningful learning, parents have a role in the process of helping their children learn to read, parents should understand the purpose of reading is to take meaning off a page, and the purpose of reading is to acquire concepts, not decode. The acquisition of concepts is a principle of the NsLLT.

Lisa also spoke about a Tools of the Mind activity, Message of the Day, in her final interview. This activity is generated by the teacher and presented to the class. Similar to the Make Believe Play Plan, the Message of the Day always starts with the words, "We are going to…" Each word in the sentence is underlined. Lisa joined this preschool program at the start of the 2019-2020 school year. She spent all of last year learning to implement the Tools of the Mind curriculum and is now one of the two teachers leading the two neuroeducation classrooms. Lisa echoed Cheryl's thinking that learning should be meaningful when she says the content should be "important to the child." Lisa also asserted that if the content is important to the child, what they learn will stay in long-term memory. Neuroscience has shown that when concepts become circuits and networks, they are stored in the brain's long-term memory. Lisa said neural growth is more likely to occur when learning is meaningful:

> And I think about that with Tools [of the Mind] and the Message of the Day... I think the process makes sense, it's just that the content in that piece for me is not as meaningful as it could be…I think it's important to have the content be important to the child because then I think they have more skin in the game. And

> so, I think the chance that they're going to be able to look back at that and have some idea what they were writing about and so, start to make those connections and grow those neurons I think is more likely. (Lisa, Phase 3 SSI)

I interpret Lisa's comments here to imply that the brain responds better to meaningful learning. Because Lisa is an adult who has already acquired complex language structures, the activities outlined in the curriculum make sense to her, but she doesn't see how they will result in meaningful learning for her students. Lisa seems to know the learning needs of her students and she can identify what type of learning experiences are most effective for her young learners. She appears to see the difference between what she needs and what her students need, because adults have higher cognitive and language levels than young children. When Lisa said she thinks children will "have more skin in the game" if the content is important to them, she was likely expressing a belief that children should have some agency in their learning and they should focus on larger concepts rather than the less meaningful discrete parts of language structures that seem important to adults. Adults already have those structures and assume the learning of the parts will lead to an understanding of the whole. From an NsLLT perspective, this assumption is incorrect and Lisa seemed to agree.

Social Interaction. All three participants talked about how literacy acquisition involves social interaction. This includes adult to child and child to child. This is a Vygotskian and Brunerian way of looking at the construction of meaning in human terms and involves communication or the use of language. Unlike other learning theories, the NsLLT explicitly uses language acquisition, and the social relationships implied therein, as a critical lens through which to view the learning process.

I noted the study participants' emphasis on the social aspects of literacy acquisition as a condition for student learning earlier in this chapter. This next section provides examples of how two participants focused on the concept of an adult assigning meaning through language and play, which is a central tenet of this neuroeducation framework.

In Phases 1 and 3, Jill spoke at length about the exchange of information between adults and children and between children themselves. In this first quote, she made a statement of belief about literacy. "To become literate generally requires other folks and a reason" (Jill, Phase 1 CM). In Jill's view, there are two or more people involved and there is a purpose to their exchange. In Phase 3, she continued with an explanation of her belief accompanied by a rationale:

> [Literacy acquisition should be facilitated as] interactions not as deliveries. An interaction is contingent upon the response of another person. So that contingency is critical. I say something, you say something. I realize you don't understand. I say something to clarify, you say something. I know you still don't understand. I draw you a picture to help you understand, or I paint you something, or I show you something, or I take you somewhere, or I tell a story about me to help you understand. You respond and in your response I see do you understand what I'm talking about. It's not linear so it's really difficult for me to think of all the things that go into that, and then explain it sensibly or succinctly. But it's like the learning of a new language. It doesn't happen in a line. It's the Piagetian stages but they aren't stages, they're cycles and circles and then Arwood's model that goes back and forth, back and forth. It's fluid, it's not a static process. (Jill, Phase 3 SSI)

Jill borrowed phrasing from Dr. Arwood to explain her belief, such as "I say something, you say something." Her perspective here is primarily adult to child or teacher to student. Drawing is part of the NsLLT and NvES. When Jill said, "I tell a story about me to help you understand," she is probably referring to the NvES strategy of telling an "I Story." Toward the end of her explanation, Jill mentioned the difficulty in remembering everything and explaining it clearly. This seems to be part of the challenge of learning the NsLLT as an adult and understanding it at the conceptual and formal levels. The back and forth, circular process that Jill relates above is likely a reflection of the NvES's Neurvana feedback model that is represented by a Neuro-Viconic Hourglass with spiraling levels of development and outcomes. It is the same process through which adults learn as do children within this learning framework.

In her final interview, Lisa focused on the importance of people in the child's environments to encourage the child to have agency, "to interact, to explore, to be your own person" (Lisa, Phase 3 SSI). She felt this was critical to literacy acquisition. Lisa also mentioned social interactions when she stated the most appropriate way for children to acquire literacy concepts is through play. The perspective she offered here is a bit different than the one Jill just offered, but, I would assert, equally as important. In a shift from the "more proficient other" assigning meaning, Lisa focused on peer to peer interaction through play:

> I think the first and most important being play. I feel like play is crucial for young children in particular, just experiences, interactions, chances to explore. And I think play creates language. I think play creates stories. I think play creates social interactions, so I really think it all comes back to that. But those other things I think are also crucial, so I think interactions, talking, I think literacy is a social ...

> it's not a social construct but it's gained in social ways…through both interactions with adults who are modeling and offering examples of things and planning things but also just through social interactions with other peers, siblings, I mean really anybody. I think it's constructed through talking, interacting. (Lisa, Phase 3 SSI)

Lisa seems to be channeling Vygotsky in her comments above when she referenced the social construction of meaning through language whether it be between adults, between adults and children, or between children. All forms of social interactions seem to be integral to the acquisition of literacy in Lisa's view.

As all of the participants mentioned, *social interaction* is a key component of meeting the requirement that learning be *meaningful* and have a *context*. There is a connection here between the concepts of contextualized, meaningful learning experiences and social interaction that is at the heart of Arwood's (2011) NsLLT and NvES. All three educators in my sample expressed their beliefs about the acquisition of early literacy by young children in these terms and, in the course of describing their own adult learning processes, state they must also experience learning in contextualized, meaningful, and socialized ways. This is a tenet of the NsLLT – someone else is always assigning meaning to our learning.

Home Learning Environment

As shown in previous sections, study participants emphasized the significant influence that the learning environment may have on a child's acquisition of literacy, particularly a child's home life. In particular, Jill referenced the importance of the child's mother, her socio-economic status, education level, and language level.

> Home is number one…(Jill, Phase 1 CM)…the social situation of the child, the emotional situation makes a difference to the neurological development…especially the mother, and the mother's socio-economic situation, the language development of the mom, the education level of the mother, all those things. (Jill, Phase 3 SSI)

Jill appears to view the home as the most influential learning environment for the child and the child's mother as the central figure in that sphere of influence.

Cheryl also mentioned the influence of parents' literacy level as an influential factor in children's development. She shared, "A big part of [a child's literacy acquisition is]…home life. I've borne witness to a lot of maybe lower literacy level parents interacting with their preschool child, and how that can be a limitation to their vocabulary" (Cheryl, Phase 3 SSI). Cheryl may be referencing studies showing how parents' level and use of language at home may have an impact on children's language levels.

The data above demonstrate these preschool teachers' awareness of and engagement with the home learning context. These participants view the home as a potentially significant influence (positive or negative) on a child's development. As I wrote in the Aspects of Literacy Acquisition section, at times, these participants have experienced a level of dissonance with their enactments of neuroeducation-based strategies in the classroom and what home caregivers may express or request related to their child's learning.

Children's Neurobiological Learning Systems

Two participants commented on the neurobiological learning systems of children and the importance of proper functioning of the sensory receptors as *conditions for student learning*. In

describing a portion of her concept map, Jill stated she thinks about learners' sensory systems and if they are functioning properly. She went into some depth describing her concept map drawing of the neurological processes involving sensory input and the movement between the Piagetian cognitive stages of sensory input and preoperational learning:

> The internal process is the brain structure. So, what's going in the ears, what's going in the eyes... Those input things, and of course, the hands, skin, all those other receptors, nose. But primarily through the eyes and the ears. So, are those structures hooked up? Are they working? Are they working symbiotically or is something going on?…If a child's not understanding, is something going on with the brain? Do we need medical intervention? Is there something going on with receptors? Sometimes it's obvious, a lot of times it's not. In zero to five, sometimes we're not really sure what's happening…they slide, sensory to preop and back again, back and forth, back and forth, back and forth. (Jill, Phase 1 CM)

She appears to imply that knowledge and awareness of each learner's neurobiological system helps her as an educator decide whether there may be barriers to a student's learning. Some of the information Jill shared is part of some of the graduate level neuroeducation courses at a local university, but especially a course titled Neuroscience and Learning. Jill completed this course. Lisa and Cheryl have not, but some of the neurobiological information is included in the neuroeducation workshops that all three have attended or are attending now.

In answer to my question about factors influencing children's acquisition of literacy in her final interview, Jill shared her thinking about environmental input and neural development:

> It begins before they're born in the language that they hear, and the cadences, and patterns, and the sounds, and they're picking that up as their neural development is happening…If they are developing in a neurotypical manner then as they go along the input that they're receiving makes a big impact on how their development goes…how they've developed is really a product of their own biological structure, and the ways in which…the outside world is interacting with that input, with that biological structure. (Jill, Phase 3 SSI)

I view these comments as evidence that Jill has assimilated her learnings about the neurobiological learning systems of children into her knowledge of how children grow and develop. There is an integration of biological, cognitive, and behavioral knowledge happening here. Lisa also incorporated some of her recent learning in neuroeducation into her concept map and shared the following, "There's so much in terms of environment and context and neurobiology, their own personal neurobiology" (Lisa, Phase 1 CM). Even though Lisa is new to the NsLLT, she appears to be including the language of the learning theory into her thinking and description of her beliefs.

A Mysterious Unseen Process. In the course of explaining their concept maps, Lisa and Cheryl shared their beliefs on the process of learning to read. What they stated was not what I expected given their years of formal education, years of experience, and direct observations of student learning. Lisa shared her belief that "there isn't any one way that people learn to read" (Lisa, Phase 1 CM). She referenced a conversation she had with a reading specialist who

> …felt like reading was a mystery and that even having…gone to school to learn about reading and how people read, they still just felt like it happens for people

> and sometimes it feels magical. And sometimes it's really hard and it's not magical at all." (Lisa, Phase 1 CM)

The process of learning to read, and the brain functions that accompany it, are not readily visible to the average observer. While we now have sophisticated imaging technology to see the brain "in action," a classroom teacher cannot see neurons firing and wiring together during story time. They cannot see the occipital lobe send a signal to the cerebral cortex during learning experiences at school. Even though we have decades of research investigating how one learns to read, it appears as if educators are still frustrated when a child struggles with the process, and others are surprised how easily it comes to some. Participants' expressions in this section about the mystery of acquiring literacy may represent a gap between research and practice; between neuroeducation and the classroom.

Cheryl also referenced a feeling of "you know it when you see it" when discussing aspects of early literacy materials and how literacy is acquired. In this next quote, she focused on text, in this case children's books:

> One of them is when a children's book is written properly, the cadence and the language of a book. I know to be true, there are magic books that are written so well for children that I don't want to change a single word. I don't want to speak any of my meaning to the story. I just want to keep the perfect text. [My assistant] and I talk about that all the time. We recognize magic book. Don't change a word. (Cheryl, Phase 1 CM)

This belief expression instills much power in books and leads me to think some preschool teachers see text literature as an impactful feature in children's learning. Children may learn

more from one book versus another depending on how it is written and, perhaps, on how it is read or interpreted by the teacher. She implies that "perfectly" written books are more effective at helping children acquire literacy, because the teacher's meaning (perspective) is not included.

In this next quote, Cheryl shifted to the child as active learner and related the role the NsLLT has played in her understanding of why children seem to respond to neuroeducation-based strategies the way they do:

> I go to neuroed and I'm like, well I always knew that was some sort of wow-capow magic, kids are engaged, and it's because they're doing what matters to them. They're making connections that's relevant to them to build new thinking. That's why neuroed's definitely right smack in the middle of all of this [concept map]. (Cheryl, Phase 1 CM)

A neuroeducation learning framework seems to have clarified how important it is for learning experiences to be meaningful and what "meaningful" means in neurobiological terms.

The expressions by all three participants about reading and the process of learning to read are striking in light of the high level of formal education these participants have achieved and their many years of teaching experience. In terms of formal education, Jill has completed the most coursework and workshops related to the NsLLT. Cheryl has participated in almost as much formal learning, but has not completed the Neuroscience and Learning course. Both Cheryl and Lisa have recently received more frequent and intensive coaching. A participant's ability to discuss brain function and language acquisition would appear to demonstrate a teacher's integration of their learning about NsLLT into their thinking about early literacy. In Jill's case, her formal coursework learning seems to show up more in her expressions of beliefs.

I would expect students of the NsLLT to incorporate their knowledge of brain function into their thinking and literacy planning. Even so, many brain functions still remain a mystery, even to scientists; and, while educators utilize many different strategies and observe students improving in their ability to read, the data here suggest that it is still challenging for educators to articulate how literacy is actually acquired. In the data from this study, concepts such as "mystery" and "magic" arise alongside "meaning making," "social interaction," "neurobiology," and "neural development." While many of the participants' expressions aligned with the NsLLT, I expected participants to use more NsLLT terms than they did. I will discuss the implications of this in Chapter 5.

Contradictions

Many U.S. teachers feel that teaching letter names and letter sounds is an important element of early literacy. Many curricula include guidelines and activities related to the teacher of letter names and sounds. The NsLLT acknowledges that all concepts start as perceived patterns. It recognizes that breaking the whole (words or ideas) into discrete parts (letters and phonemes) is an aspect of the western cognitive psychology approach to learning. The NsLLT, however, endorses a holistic approach to facilitating the acquisition of early literacy concepts that does not include a "parts to whole" approach. The NsLLT recommends a "whole to parts" approach where children are supported in moving between pattern level learning and conceptual learning through the use of language and semantically rich visual strategies.

I have already shown how participants described conflicts or disagreements with what "the system" might require compared to what participants believe should happen. In addition, study participants also expressed contradictory beliefs or practices within their own thinking.

During the video-stimulated recall task, when asked if she teaches letter names and sounds, Jill initially indicated she does not teach those as part of literacy instruction.

> Robert: You said most of your students probably don't know their letters. Is that an important part of how you think about literacy and literacy acquisition at preschool?
>
> Jill: No.
>
> Robert: Okay, and why not?
>
> Jill: No. I think that it is a separate thing from literacy. It's learning the sound symbol system. I really think, after 30 years of working in this business, there's a time when kids are ready for it. And there's a time when they're not. And if you push when they're not, it's not meaningful, so it needs to be meaningful. (Phase 2 VSR)

There is an attribution here of an educator's discernibility of developmentally appropriate practices based on experience, and a belief that the sound symbol system is distinct and separate from how this teacher defines literacy. This could also be a reflection of Jill's grounding in a whole language approach to learning.

Jill went on to say that parents request homework related to learning letter names and sounds, so she will provide that to parents in seeming contrast to Cheryl. She stated that learning letter names and sounds is "really important, but it's just one piece of that puzzle" (Phase 2 VSR). Later in the final interview, Jill, in answer to the same question stated the following:

> Robert: Do you teach letter sounds and letter names?
>
> Jill: In context…Absolutely. And we do practice what it looks like. (Phase 3 SSI)

This appears to represent some level of cognitive dissonance this teacher feels regarding this aspect of early literacy. All three participants in this study have quite a bit of preservice and inservice professional learning experience. They have received, or are presently receiving, expert coaching in several different theoretical frameworks and approaches to learning. Assimilating and accommodating new learning into one's own schema and practice appears to be a complex affair that includes a certain level of disequilibrium.

Preschool Teacher Learning Process

A natural outcome of the responses to my interview questions was study participants' reflections on their own learning process throughout their careers. This was a major theme in the data. The act of learning is a constant for educators as learners themselves and as the focus of their work with students. This section will focus on the process of learning for these educators. I will highlight findings from the data related to various influencing factors.

Influencing Factors

In this section, I will demonstrate the significant impact of several factors influencing these participants' learning process over the course of their careers. These will include the role of research and formal education, perceived shifts in beliefs, and theory to practice enactment experiences.

Presence of Neuroeducation/NsLLT. Since I was examining beliefs within a neuroeducation context, I utilized principles from the Neuro-semantic Language Learning Theory (NsLLT) and the Neuro-Viconic Education System's (NvES) as a framework for identifying the presence of these in participants' statements. In Jill's response to the question, "To what extent do you think your concept map represents a neuroed model?" she responded, "I

think it scratches the surface…I haven't internalized it enough to satisfy me" (Phase 1 CM). Jill implies that there is a process of internalization that occurs when working toward proficiency. This sounds like Piaget's assimilation and accommodation theory where the learner is integrating new information into their schema or their schema is changing. Jill expressed this feeling several times and in other ways throughout the interview process:

> The neuroed has made me think more. (Phase 1 CM)
>
> I need to keep working on it. (Phase 1 CM)
>
> I feel like I'm in my toddlerhood with my understanding. (Phase 1 CM)
>
> I'm in the midst of learning that language. So as I learn it, I need more practice.
>
> And I need more time to apply it. (Phase 3 SSI)
>
> Because I know better,…I should do better. But I also have to feel confident
>
> enough to try it and feel confident enough to make mistakes. (Phase 3 SSI)

Jill appears to say she does not yet completely understand the NsLLT, and her path to confidence is to practice applying the strategies over time and being comfortable making and learning from her mistakes.

The other two participants expressed similar sentiments when responding to the question about their concept maps, such as, "I'm not there yet" (Cheryl, Phase 1 CM) and "I don't feel like I've reached the mountain top…I know that there's more to know and I would like to find out more" (Lisa, Phase 1 CM). While all of the participants referenced NsLLT concepts and tenets in their interviews, they all also realize at varying levels that they are aware of what they may not know.

The data suggest that these participants try to use a variety of strategies and interventions to help students be successful, because it can be difficult to discern which methods work for each student. Cheryl, however, expressed a strong feeling that the NsLLT may not just be another tool in the toolbox:

> The child is functioning based on their experiences up to the time they were in this room, and we meet them there, we build on it, we add language, we expand…That's everything about this neuroeducation approach. It's not another piece that we can use to be better teachers, it's a paradigm shift to everything that's happening here…because that's who they [the students] are. That's where they are, that's where they come from, that's their life experiences, and learning to adjust my approach…Obviously I don't have this all the way refined, but to me, it's the most important component of this. *It is the best way to teach literacy. It may be the only way* [emphasis added]…All of those things that we teach are important, but that bigger picture of you are doing exactly what you're supposed to do based on who you are and we're going to teach from there, that's what I think all pre-service and inservice needs. That's the shift that needs to happen. (Phase 3 SSI)

In this statement, Cheryl seems convinced the NsLLT is the right approach to early literacy acquisition based on what she has learned about the learning needs of children. In the next sections, I will present additional evidence for the role of research and formal education as influential factors in the learning process of professional educators.

Role of Research. Study participants often cited how new learning within the context of research may be shaping their beliefs and practices around early literacy. In Cheryl's comments below, she expresses a core belief that has not changed in over 20 years, however, the meaning behind her belief that learning is holistic, rather than sequential, has changed based on the neuroeducation research she has studied, been coached in, and attempted to implement:

> I believe that it's very holistic. It isn't a step one, two, three, four approach. It is multiple opportunities to engage with literacy is how they acquire it. I would have probably given that same answer in the mid-90s in the context of whole language, but what I mean by holistically is really different now that I'm studying neuroed. Now I'm thinking of that holistic learning as multiple points of access to anything as a component of literacy, whether it's how to hold a book or how to turn pages, so physical interaction with literacy, how to hold a pencil. (Phase 3 SSI)

Cheryl now refers to multiple points of access, a phrase used by practitioners of the NsLLT and NvES, to describe a form of scaffolding and working off of the neurobiological learning systems of students. In the quote above, Cheryl describes how she views the "learning process" now versus earlier in her career.

In the next statement, Cheryl discussed the "content of learning" and how understanding the NsLLT has helped her think of ways to present literacy in her classroom now that she knows "how the brain sees the shape of a word:"

> I understand that more now with the scientific theory of how the brain sees the shape of a word. There's multiple points of access to it, whether it's in the book or in the classroom or on the page as reference. That's one way that my environment

> will look very different when we get back to the classroom because I'm going to put that everywhere. We used to do it in all languages too, which is also an interesting concept of, and this is what it looks like in English and this is what it looks like in Spanish and Chinese. Those are things that are percolating going forward. (Phase 3 SSI)

It appears in this case that Cheryl's schema is potentially changing and accommodating this new learning. While she had a "print rich" classroom in the past, her future plans include identifying where and how she can help her students experience concepts in multiple ways in the learning environment. Her use of the idea "percolating" seems to be an apt analogy for the cognitive dissonance she may be experiencing and working through.

In her final interview, Lisa expressed similar changes in how she talks about certain learning concepts and the labels she uses to describe them as a result of learning about the NsLLT:

> So this comes from the little bit of neuroed that I've had so far of just thinking about reading and writing ... How we intake and output, different sensory inputs. And I think I would have said previously that the way that we read the world is through our senses, but I don't know that I would have differentiated quite as much between visual versus auditory versus I don't know…there's a lot of questions for me about what we take in and what we put out in terms of eyes, our hands, our ears. (Phase 1 CM)

What is present in this quote is a recognition that the explanation of a concept she believed (sensory input is an initial step in the learning process) is being challenged with new knowledge,

i.e. there are several types of neurobiological learning systems that a learner can have – auditory, visual, motor. Lisa explicitly admitted to feeling out of balance when she commented, "With neuroed I would say that that is a part that I am feeling confused and unsure about at the moment" (Phase 3 SSI). This statement shows that Lisa may not know what to do yet with her new learning. As a result, she may be experiencing a bit of cognitive disequilibrium. This is an important step in the process of a potential change in paradigms.

Like Cheryl's statement about her belief in a holistic learning process, Lisa stated she feels her beliefs may be changing based on her new learning, but perhaps not her "core beliefs." While she is open to new ideas and theories, she still senses affirmation of current theoretical frameworks (cognitive psychology, input-output learning) when colleagues' share their experiences of student outcomes:

> I feel like my beliefs keep changing is the funny thing. Maybe not my core beliefs, like what's really at the deep core and what feels most important but there's just new information coming out, new information coming to me that I didn't know before so I feel like it's important to ... but it's not a fixed area. I'm not sure anything is but just to always be open to ideas. I'm very interested in the neuroed, I'm excited about what I'm learning and at the same time we had a PLC yesterday and [another teacher] shared about something she did in class that was great with the kids. That's also impactful in my thinking of all the potential ways that I can engage and help children learn literacy and just in general. So, yeah I think just consistently being open to ideas. (Lisa, Phase 3 SSI)

What I notice here is that while these preschool teachers are open to and often seek out new knowledge, it can cause disequilibrium in their thinking, confirm what they may already know or believe, or have no effect at all. In her anecdote, Lisa said reading about new research and engaging in new professional learning opportunities impact the way she thinks about teaching and learning. At the same time, she admitted that listening to her colleagues, who may be operating within another learning approach that may contradict the NsLLT, was also influential to her thinking. In the next section, I will discuss participants' perceived shifts (or not) in their beliefs and practices as a result of this disequilibrium.

Perceived Shifts in Beliefs and Practices. The data indicated that several participants seemed to integrate the new information they were learning about neuroeducation through current or old lenses (perspectives). A paradigm shift seems to require a certain level of cognitive conflict or dissonance in the learner to result in a change in the learner's schema. In some instances, implementation of NsLLT principles is providing evidence for and affirming these teachers' currently held beliefs or previous practices. Cheryl's specific comments about it happening in a "backwards" way illustrate this phenomenon. She remarked, "I know something to be true in practice, and then I find it in theory and go, 'Oh, that's why,' up to and including my recent work at [local university]" (Cheryl, Phase 3 SSI). Here, Cheryl stated that a practice might be affirmed later after she discovered a theory supporting the practice. Her learning from graduate level courses or workshops in neuroeducation at times helped her see the reasons why some of her practices resulted in positive student outcomes or why she believed a practice was effective.

In some instances, if the NsLLT validated what participants believed, they were willing to try it or continue learning about it. Cheryl shared her perspective on how learning about the NsLLT affirmed some of her beliefs and previous practices and provided an explanation:

> Everything I pick up in the neuroed classes, it's speaking to all these things that I know as truths, and I'm going, 'oh, that's why,' like the making connections things. I go to neuroed and I'm like, well I always knew that was some sort of wow-capow magic, kids are engaged, and it's because they're doing what matters to them. They're making connections that's relevant to them to build new thinking. That's why neuroed's definitely right smack in the middle of all of this [concept map]. (Phase 1 CM)

Here, cognitive dissonance and disequilibrium are not present. Cheryl stated that neuroeducation affirmed the fact that learning requires context and should be meaningful to the child. This is a belief she apparently already had. It does not speak to any new beliefs or practices that she may be confronted with in her learning of the NsLLT.

In her final interview, Cheryl extended her comments on how the NsLLT has given her theoretical and scientific understanding of certain instructional practices and learning processes as well as language to explain her beliefs and practices. She ends on a note of disequilibrium, however:

> I'm going to say it's a combination…much of the work I've done there has helped me put theory and science and language to things that I already did in practice, but maybe didn't have my why, other than I know what works. I know when kids are engaged and talking about personal connections to whatever we're doing.

> Anytime a child in my classroom could say I'm making a connection, I've been doing that in preschool for years, but then having this neuroscientific perspective of there's really a reason in the brain why that's working. That's maybe the biggest component I see where I'm like, now I've got theory and science behind practice. On the flip side of that, there are definitely things in working with the neuroed program that has been a really difficult shift for me. I also fall into the cognitive psych practice. (Cheryl, Phase 3 SSI)

Cheryl reflected on her increased understanding of brain function in the learning process and seemed to appreciate having that new knowledge to confirm some of her beliefs and practices. She then admitted there are other components of this new learning that are challenging her. Cheryl did not say it was challenging her belief system. She said it was challenging some of her practices, which she described as “cognitive psychology” in nature.

It seems natural that this dissonance would occur given the lack of alignment between the NsLLT (whole to parts) and the typical cognitive psychology (parts to whole) approach to learning. They are very different. What is interesting is that Cheryl seems to be saying that practices she perceives as based in cognitive psychology, practices in which she currently engages, present a challenge for her in her process of learning about neuroeducation which seems to affirm many of her beliefs.

In her final interview, Jill shared that she is adding NsLLT strategies into her teaching approach.

> Because I realize I don’t need to dump all my practices, the same way I’ve never dumped my practices when we get a new curriculum. You take what works for

> your students in their situation at the time. And then you meet them where they are. Because it's about respecting the learner. (Phase 3 SSI)

Jill seems to be taking the "adding tools to my toolbox" approach to assimilating her new learning. She implies she might stop doing some things based on new information, but she might keep other practices. Jill appears to have experienced the adoption of new curricula in the past, so she is familiar with this situation. Different things might work for different students at different times. In Jill's opinion, taking this approach shows respect for the learner. An educator who makes the paradigm shift over to the NsLLT may not agree with this perspective. An educator working completely within the NsLLT may state that an educator cannot work in two different paradigms and be true to them both. They may also say the NsLLT meets every learner where they are based on an understanding of their unique neurobiological learning systems and use of NvES strategies. This kind of educator may argue this shows the learners greater respect, because it honors the right of each student to participate in an environment of communicative thoughtfulness.

As I described above, Piaget theorized that learners assimilate or accommodate new learning into their schemas. When they assimilate, new information is integrated into the schema, which does not change. When they accommodate, the schema changes due to the new information. Participants in this study seemed to relate both of types of experiences within this neuroeducation context. Lisa shared a particularly compelling statement about teachers' ability and willingness to shift their mindset. This may explain why assimilation may be the more frequent outcome rather than accommodation. "I think it's hard to create a paradigm shift if people are happy in the paradigm they're in" (Lisa, Phase 3 SSI). This implies quite a few things,

some of which are manifested in the data above. An acceptance of the current paradigm or resistance to paradigm change could indicate these preschool teachers' acceptance of current student outcomes, the willingness to believe that their current practices are effective enough and grounded in research, or that the curriculum or teaching approach is not the reason for students' lack of success. It also suggests that in order to change these preschool teachers' beliefs (and practices), a professional learning experience, whether it's formal or informal, must introduce disequilibrium and cognitive dissonance into the teacher's mindset or thinking. The next section provides examples of moments when this study's participants seemed to see a correlation between implementation of NsLLT-based interventions and strategies and positive student outcomes.

Evidence of Student Growth. During the construction of concept maps, video-stimulated recall tasks, and semi-structured interviews, participants highlighted some examples of a potential correlation between implementation of neuroeducation-based strategies and improved student outcomes or growth. Cheryl related the following story about a student who has demonstrated minimal expressive communication all school year, but, when she drew him as an agent with thoughts in a picture while he watched, he used more language to label his thinking. Cheryl used NsLLT strategies of drawing, representing agency, and tagging the visual with language to assign meaning:

> Like [student], I can't get him to talk for anything, and I just started, I said, "It's your turn. This is you, [student's name], and this is your hair. Here's what you're thinking about." I mean, full sentences, "I thank my mom and my dad and my big brother and my toy, Pikachu." I mean, it was this whole... You can't see by the

> recording what happened with the whole class, but I think even just hearing the level of response that I got,…their responses were so rich, and it was like they were so conceptually present. It was front and center on their screen... Both my EAs said, 'Oh, I could totally see it today.' It didn't come and go. (Cheryl, Phase 3 SSI)

In this story, Cheryl felt several of the students' responses were "richer" and more conceptual in nature as a result of using these NsLLT strategies.

In the final section of this chapter, I will highlight a compelling finding regarding the role of the instructional coach. This preschool program contracted with an independent expert in neuroeducation as part of a comprehensive professional learning plan that included a series of three neuroeducation workshops delivered throughout the school year, written materials purchased from a private agency, and a series of four facilitated professional learning community (PLC) meetings.

Theory to Practice Enactment Experiences: Coach as Bridge. All three study participants have received direct coaching from an expert coach familiar with the NsLLT and NvES. This preschool program also has two instructional coaches who provide support to teachers regarding the Tools of the Mind curriculum, Positive Behavioral Interventions and Supports (PBIS), the Learning Experiences and Alternative Program (LEAP) for Preschoolers and Parents, and other teaching and learning initiatives. During the study, Lisa and Cheryl received almost weekly coaching support from Carole Kaulitz, a lifelong practitioner and consultant in the field of education. Carole has a background as a Speech-Language Pathologist, an Autism/Behavior Consultant, a Deaf/Hard of Hearing Education Specialist, and a Multi-

Disabilities Specialist. Carole is a neuroeducation expert in both the NsLLT and NvES. As a contracted coach with this preschool program, she has conducted coaching and consultation to all study participants during the past year and a half via web-based meetings and phone conversations. The classroom EA was also included whenever possible. This has continued even after the conclusion of the study.

During the 2020-2021 school year and given the virtual learning environment due to COVID-19, Lisa and Cheryl have been sending Carole videos of their synchronous learning sessions with students as well as teacher-developed artifacts and student work samples. Carole has also observed some live learning sessions facilitated by these two teachers. She has provided targeted feedback on all of these things as part of these preschool teachers' efforts to apply theory (the NsLLT) to their practice. In addition, Lisa and Cheryl had access to Dr. Arwood and other expert NsLLT coaches during several NvES workshops and neuroeducation PLC sessions. Of note, Dr. Bonnie Robb, an active teacher who has fully implemented the NsLLT and NvES for at least ten years, facilitated one PLC session during the course of this study.

All participants in this study noted the interactions with an expert neuroeducation coach were instrumental in reflecting on and potentially changing their beliefs and practices. Without prompting from me, Jill made a statement in her final interview about teacher mentors and how those relationships should be established:

> Every teacher needs a mentor of their choice. Not a mentor of someone else's choosing, because that doesn't always work. And so there's how do you set up opportunities for people to choose someone they want to work with? And how do

> you know that those people that are chosen are delivering good thinking. It's very complicated. (Phase 3 SSI)

Jill appears to recognize that the teacher/coach relationship is one that a teacher needs to enter voluntarily and with some choice in the matter. She also acknowledges the complex nature of finding and developing competent coaches. While these participants did not choose Carole, Dr. Robb, or Dr. Arwood, they seemed to have positive experiences with all of them.

Use of Precise Language. All study participants commented on how coaching is changing the way they think about and use language during learning experiences with children. When asked how coaching support may have influenced her thinking or instructional practice, Cheryl shared the following about her word choice and use of language in the classroom. Cheryl also stated the coach prompts her to use certain words instead of others:

> Absolutely. Especially my teacher speak, the words and vocabulary I'm using, absolutely…Carole has been helping me…with my teacher talk...it's kind of important…to practice and to be recording and to replay what I'm saying…there's this practical application of 'you said this, instead say this.' There's lots of that going on, which it just takes time to transition and make sure I'm using those careful words. (Cheryl, Phase 3 SSI)

Word choice is critical in the NsLLT and NvES, because words are actually ideas and concepts. They convey specific meanings. If teachers want children to acquire those concepts, teachers need to be aware of the language levels of their students and use language that will help their students form accurate pictures in their heads. This will enable their young learners to accurately

use language to label their own thinking and to remember how to think and write about those concepts.

Jill echoed the influence of coaching in the area of intentional language use in her final interview. She used NsLLT language to describe her attempts to scaffold the learning experience and ensure it matched the learners' learning systems:

> So with Carole, one thing she really was able to do was...help fine tune my language, my oral language. Because my oral language doesn't always match something I was drawing for the students. So, if I'm trying to help [my students] add another layer of understanding through drawing something,…tagging it, and discussing it with them…, I need to make sure my language is really precise. (Jill, Phase 3 SSI)

This echoed Lisa's statements about the importance of oral language. Jill then shared a specific example of a word choice (*watch* vs. *look*) and why it mattered which one she chose.

> And that was for things like, not *look* at my mouth, because I still keep doing that. *Watch*. So *watch*, because *look* is something else, so *watch* is use your eyes. So use your eyes to *watch* my mouth so you can see what I'm saying. And so we practice that and practice that. Just very specific and the children understood it because it was more precise. And it made more sense to them neurologically. *Watch*, use your eyes to *watch*…What do you *watch* with? Your eyes. So that was really helpful just trying to do things like that…There were a few things like that, that she helped us understand. (Jill, Phase 3 SSI)

The coach is portrayed here as a key influence in helping educators understand theory and know how to put theory into practice.

Lisa also stated Carole helped her focus on her use of language and its potential impact on students' learning. Lisa's educational assistant (EA) is included in the NsLLT and NvES professional learning experiences. Lisa stated her EA has been helpful in applying their new learning in the classroom. Immediately following a NvES workshop, they engaged their students in creating individual picture dictionaries, which is a strategy to support concept acquisition. Lisa related how both the coach and her educational assistant are helping her change her practice:

> My experience with Carole is absolutely impacting my work with children and…my work around children's literacy, acquiring literacy. I think Carole specifically has been helping me with my language. The actual words that I'm saying and how those do or don't impact the children…I started to understand and to notice more about my language and the impact that it might have. I'm still a long way off from really being able to hear it the way that probably a four year old hears all the words that I'm saying but that's been really helpful…And actually [my EA is] helping too because [my EA's] brain works very differently than mine does…We did our first picture dictionary which is very exciting. (Lisa, Phase 3 SSI)

The data suggests the influence of the coach may extend beyond the teacher in some situations. When a teacher's educational assistant is included in the professional learning experiences and receipt of coaching, there appears to be an added benefit of the teacher and EA being able to help

each other continue the theory-to-practice enactment that may be less fully realized if the teacher is alone in the endeavor.

In the next quote, Cheryl adds that coaching has reinforced her belief that connecting new information to learners' prior knowledge is important:

> I think maybe the greater impact with the coaching is taking that concept that children need to connect something that they already know to anything new that's being presented. I worked with that before, but now I feel like I've taken that and it's just exploded into every facet of everything. (Cheryl, Phase 3 SSI)

Based on where teachers may be in the process of a paradigm shift, individual teachers may assimilate and accommodate learnings that differ from colleagues receiving similar coaching. In this case, Cheryl appears to be capitalizing on an idea she is ready to operationalize – connecting new information to students' prior knowledge. In Cheryl's words, "it's just exploded into every facet of everything."

It appears as if Carole, as the neuroeducation coach, has helped shift these teachers' awareness and practices. Whether their beliefs were changed remains to be seen, but these participants hint at a foundational shift in some aspects of their beliefs about learning and early literacy. During the course of the data collection process, there were moments when participants acknowledged the benefits of coaching and then qualified their gains by identifying a limiting factor as Jill did in her discussion of her concept map:

> I mean, I feel like I'm in my toddlerhood with my understanding. And last year, there was practice opportunity, and I took advantage of Carole. And I did learn a lot. But given the group [of students] that I had, there was a lot more caregiving

> [of the students, i.e. toileting and other self-help needs, emotional needs]. (Jill, Phase 1 CM)

So, the availability of ongoing expert practice-based coaching may not always overcome perceived barriers to implementation and belief change, which, according to Jill, is sometimes predicated on the opportunity to practice new learning. Barriers to practicing may include one's own understanding of the new concepts and strategies and the learning needs of the students.

In her final interview, Jill added that her prior knowledge and understanding of a whole language approach led her to assume that the NsLLT was a version of whole language. After a conversation with Dr. Bonnie Robb, however, Jill's understanding of this potential connection was clarified. Jill then commented on her view of the nature of the teacher/coach relationship as well as the metacognitive nature of reflecting on one's own beliefs and practices:

> I keep thinking the whole whole language thing was a huge influence. And when I asked Dr. Robb about that she said, "Yeah, it is." I kept thinking this is whole language. She said it is, but it [whole language] is not enough. That's not enough. It needs to go further. And so that makes a lot of sense to me…So they [coaches] are partners in that learning with me. And that's like I'm showing my metacognitive thinking, I'm thinking about my thinking right now. (Jill, Phase 3 SSI)

The data indicate the teacher/coach relationship can be a thought partnership that has the potential to clarify assumptions and support a teacher's reflective process. The state of cognitive disequilibrium appears to require the support of a supportive coach in order to successfully navigate a paradigm shift and put theory into practice, but this, too, may not be sufficient.

Lisa posited that accessibility to expert coaching may not be enough to shift beliefs and practices. In addition to having her questions answered by a coach, she would also like to be able to observe the NsLLT in practice:

> I feel like seeing it in action is ... watching Dr. Robb [via a video clip during a PLC meeting] was incredibly helpful. I want to do, more than anything is go spend a day in her classroom because I'm having trouble understanding the flow of how it would work in a whole day, so that feels really important to me. And then the coaching I think is also invaluable because there's just so many places that it's just like so many questions I have. (Lisa, Phase 3 SSI)

Peer observations, or believable vicarious experiences, appear to be an important component of accommodating new information for Lisa. Several times during the elicitation process, Lisa shared she likes to see the big picture, because it helps her to envision what it might look like in her own learning environment. Seeing a full day of NsLLT instruction might help her to integrate the theory into her own beliefs and practice. Individual strategies or portions of routines are not enough. Lisa would like to view the whole construct at work over the course of an instructional day. Interpreting Lisa's comments through a NsLLT lens, her learning system prefers to see the whole shape of an idea or concept. Her learning as a professional preschool teacher must be contextualized to be meaningful. A critical feature of the NsLLT and NvES is the use of visuals to convey ideas and concepts in meaningfully accessible ways. The next section discusses the nature of those visuals and how they should be considered and created within an NsLLT context.

All Visuals Are Not Created Equal. This section illustrates another area that neuroeducation coaching has potentially helped shift preschool teachers' beliefs and practices

related to early literacy. In the NsLLT, the creation and use of visuals is grounded in all three disciplines of cognitive psychology, neuroscience, and language acquisition. It is an intentional process that focuses on maximizing the assignment of meaning through the use of "rich" language. This means that visuals should contain the semantic features of who, what, when, where, why, and how, and include "because" and "so that" language when possible and appropriate based on the learner's needs. The NvES utilizes "event-based" pictures in the language acquisition process.

Each study participant related how Carole's coaching has impacted their thinking about visuals. Lisa talked about how she has changed her thinking about visual schedules:

> And then I feel like Carole's also helped enormously with just the drawing, the visual schedule, the ... not just to draw but why we're drawing, what's important to put in the drawing so that it has more impact, similar stuff to what Dr. Arwood...I mean, I do feel like the work is really complementing each other. (Lisa, Phase 3 SSI)

Here, Lisa seems to be connecting NvES workshop learning to Carole's coaching. This is also a reference to the bridging of Dr. Arwood's theory into practice and the importance of understanding the purpose of the visual. Jill provides a similar example related to learning expectations:

> And then also helping me to draw out expectations for individual students…So I was doing that all year in different little books that I was making for each student…So there was one particular child who would go get his book, if I was reminding him of something and he would do it on his own. He opened to the

> page that showed him using a quiet voice with his friends, which was the words coming out of his mouth were small. So when we did that together he understood that that meant quiet voice because his words were small not large. And that's something that I showed them again and again, when I drew with them. And the friends smiling and looking at him, because he wasn't hurting their ears. So basically there was one drawing of that whole thing. So she [Carole] showed me how to split that apart for several of the kids. That particular child didn't need…more scaffolding than that. But another child did and so she showed me a different way of framing that physically on a larger paper so that he could really see the sequence of things he needed to do, and that was really helpful with him. (Jill, Phase 3 SSI)

Here, Jill shared that she learned more about scaffolding visual drawings for her students based on NsLLT principles. She learned they needed to be framed in a sequence of boxes where everyone in the frame is grounded and there are visual relationships between the agents, actions, and objects in the drawings. Cheryl adds her experience of improving her use of visuals by giving them purpose:

> Because some of my kids are ready for that…They write their name on a paper and hold it up because that shows me that they're here, and that validates their presence, which is really interesting. Because that's always been a thing where I've had to nag kids to sign in in the morning…And even when we got started here [virtual learning], I'm like, "Get the paper, write your name, hold it up for me." Carole advised us to give it purpose, to put language to it, that the reason

> you write your name on this piece of paper and hold it up so I can see the shape of your name, and I can see who's at school today. (Cheryl, Phase 2 VSR)

Carole Kaulitz and Dr. Bonnie Robb, acting as instructional coaches, appear to be providing a bridge between research and practice and between workshop learning and enactment or implementation. Jill shared how she usually implements theory into practice, but then explained how Carole challenged her to try several things at the same time:

> So, I tend to try one thing and see how it works before moving on to something else. So, with her [Carole's] encouragement, I was trying more things at the same time. And so, I think part of the influence of Carole and the whole neuroed is not being afraid to really be messy in the process. Because what do I want to do as a teacher? I want to be perfect right now. I want the drawing to make sense…No, it didn't really work that way. So I'm encouraged to do more trial and error. Because I know better, so I should do better. But I also have to feel confident enough to try it and feel confident enough to make mistakes and own that with the kids because they deserve that. (Jill, Phase 3 SSI)

It is clear that Jill, as well as Lisa and Cheryl, set high expectations for themselves as educators. This is true of many professional educators. The data suggest that self-efficacy and a sense of self-confidence seem to be important factors in shifting one's paradigm. Teachers seem to have varying levels of tolerance for risk-taking.

Formal Learning Is Not Enough. This last section on Theory to Practice Enactment Experiences highlights the fact that these study participants feel that it requires more than formal learning experiences to shift beliefs and practices. Lisa's statement below, in response to my

question about what influences have shaped her beliefs about literacy acquisition, reflects a combination of expert coaching, formal learning opportunities, access to research, leadership, lived experiences, and peer-to-peer observations and discussions:

> Well, right now Carole [coach]. A huge part of what's influencing my understanding of early literacy, I think it's really all of the work with neuroed, you [the researcher] included. But I think it's a combination of formal learning and mine has been Bank Street and Erikson [Institute], so both pretty progressive places of education. And then my work with Reggio and lots of formal reading and thinking there. And now neuroed, so there's that piece the formal ed piece and then there's also just the experience piece. I think just work with numerous children over the years and watching what works and what doesn't work and what works for some doesn't work for others so just the cataloging of all of that as well as learning from other teachers for sure…And just having discussions, watching, observing, getting ideas and trying them out. I think it's all wrapped up in my understanding of how children gain literacy. (Lisa, Phase 3 SSI)

The experience of change appears to be multifaceted. The concept of coaching, however, was a prominent theme in the data and a significant finding. The role of the coach is integral to the teacher learning process. It will be one of the core features in Chapter 5 in terms of implications for the field and suggestions for future research.

This chapter presented the individual and collective experiences of these study participants. The findings convey their particular experiences and viewpoints which offer opportunities to develop further understanding of the process of belief change in preschool

teachers within a context of implementing neuroeducation-based strategies and interventions. These findings will be discussed further in Chapter 5.

Chapter 5: Discussion

The purpose of this qualitative study was to explore how preschool teachers expressed beliefs about early literacy within the context of implementing a neuroeducation learning framework. For more than two decades, an achievement gap in a variety of student outcomes has persisted between White students and students of color (Darling-Hammond, 2014; NCES, 2019). During the same time, there has been an effort to translate and apply neuroscience research findings and theories into educational practice (Bowers, 2016a, 2016b; Bruer, 1997; Horvath & Donoghue, 2016; Howard-Jones et al., 2016). At a local level, this effort includes a large urban preschool program's establishment of two research classrooms that are now immersed in a neuroeducation learning framework. Exploring preschool teachers' beliefs about early literacy offers unique insights into the formation and evolution of teacher beliefs and practices, especially when those teachers are engaged in professional learning experiences and are attempting to shift paradigms of learning.

The in-depth findings of the case analyses of the three participants were reported in Chapter 4, following a case study approach (Yin, 2003) whose qualitative research design is "an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (Merriam, 1988, p. 21). I aligned my study design with Merriam's (1998) constructivist epistemological view that "reality is constructed by individuals interacting with their social worlds" (p. 6). The themes derived from the key findings of this study are discussed in this chapter and focus on preschool teacher's beliefs in three areas: first, the nature of preschool teachers' beliefs about early literacy; second, conditions for student learning; third, the nature of the teacher learning process. In this chapter, I will discuss what the study's findings mean and

how they connect to the literature. Each of these themes addresses some aspect of the research question that guided this study.

The principal question that guided the research was:

RQ: How do preschool teachers describe their beliefs about early literacy as they implement neuroeducation-based strategies and interventions?

The findings in Chapter 4 were presented as analytical categories, but they are not discrete categories. To successfully address the research question I am investigating, I will, at times, focus separately on preschool teacher beliefs, conditions for student learning, and the teacher learning process. At other times, I will integrate my discussion of one or more categories, because these categories are often integrally connected and difficult to separate. This was one of my discoveries in the data collection and analysis processes.

This chapter also includes sections on significance of the findings, implications for practice, recommendations for further research, and limitations of the study.

Significance of the Findings

Factors influencing preschool teacher beliefs about how and what early literacy skills preschool children acquire can vary widely and result in varying effects on student learning and student outcomes (Brown et al., 2012). I was interested in understanding the evolution of early literacy beliefs of preschool teachers who received formal training in, and who were implementing, strategies and interventions of Arwood's (2011) Neuro-semantic Language Learning Theory (NsLLT), a model of neuroeducation. This unique group of educators presented an opportunity to study in-depth what Patton (1990) describes as information-rich cases. I wanted to discover, understand, and gain as much insight as possible about the links between

preschool teacher beliefs about early literacy and their experience with a neuroeducation-based learning theory.

Pajares (1992) defined beliefs as the judgment of the truth or falsity of a proposition, and Kagan (1992) further refined the definition of teacher beliefs as implicit assumptions about students and learning. All three of this study's participants gave rich descriptions of their beliefs about students and learning. They also revealed implicit assumptions about students and learning.

Teachers' beliefs about teaching are integral to how teachers develop goals and define teaching practices (Nespor, 1987). Teacher beliefs and practices have been posited to have an impact on student outcomes (Lynch & Owston, 2015; Schachter et al., 2016). Some of the data collected in this study demonstrated teachers' enactments of their beliefs and new learnings, as well as their observations of how these enactments impacted student outcomes.

In this study, the focus was teachers' beliefs, however, teachers' knowledge also plays a role in initiating and supporting potential changes in one's beliefs. My data collection and analysis are situated in the space between beliefs and knowledge, a space where the tacit (beliefs) are becoming explicit. I reached this conclusion after much reflection and completion of the data analysis. Even when I thought I was asking about beliefs, the way that my study participants responded demonstrated this phenomenon. This is supported by and manifested in my elicitation methods and what the participants shared in their interviews.

Expressing a belief is not the same as asserting an experience. Much of what the participants shared in this study sounded like beliefs, however, in the course of reviewing the text of the transcripts, the participants often made assertions when relating an experience. For

example, Lisa, in her phase 2 interview, described a moment when a couple of students seemed to produce more complex drawings after Lisa told and showed students how to draw themselves in their pictures, an NsLLT strategy grounded in the concept of agency. Prior to this event, she had not considered drawing herself or having the students draw themselves in the pictures that are part of the curriculum's graphics practice activities. These activities typically just involve the drawing of shapes, however, learning that seeing oneself in the picture aids in labeling our thinking with language gave Lisa inspiration to implement something new. She stated, "It brings up some interesting things for me. I do think I got more…in-depth drawings from the children…(child's name)'s picture is incredible" (Lisa, Phase 2 VSR). Lisa shared this was new for the students and attributed the change to the new NsLLT strategy she learned at a workshop just a few days prior and introduced to the students. It is interesting to note that Lisa never stated a belief, per se, but implied the experience was causing her to rethink how she could elicit more complex drawings (literacy) from her preschool students. This shows one way in which new learning has the potential to shift teacher beliefs and practices through making those beliefs and practices clearer, putting them into perspective, or sometimes contradicting them. In the story that Lisa shared, it was clear that drawing was already a part of her repertoire, however, the added knowledge of how to visually and meaningfully represent a child's sense of agency in a drawing, how this may result in increased language function (more in-depth drawings), and why this is important in early literacy acquisition is giving Lisa more to think about.

In my view, Lisa made an assertion about an experience. She reported that implementation of a new strategy may have resulted in more in-depth or complex drawings by her students. Lisa went so far as to describe one student's drawing as "incredible." While she

stated the experience gave her food for thought, she did not say her beliefs had changed or that she gained a new belief, although it would appear as if her beliefs might be impacted if this experience was repeated or was manifested in more of her students.

The difference between an experiential assertion and a belief expression is an important distinction given the power of teacher beliefs and the difficulty in measuring belief change. This is why I chose the data elicitation methods of concept map construction and video-stimulated recall, in addition to semi-structured interviews, for my study. By providing participants the opportunity to construct and describe a drawing of their thinking, analyze their own videotaped performances, and answer open-ended questions about their thinking, I was able to hear differences in their tone of voice and observe their facial expressions and body language when discussing their experiences and their beliefs. I observed study participants in the midst of cognitive disequilibrium as they added items to their concept maps and shared how their beliefs may have changed over time based on new ideas. I was able to make more informed inferences based on my observations and direct interactions with the study participants during the elicitation processes. My study design answered Pajares' (1992) and Kagan's (1992) call to move beyond surveys and questionnaires to better detect underlying meaning in context. As noted in Chapter 2, Ashton (2015) summarized the invitation to educational researchers of teachers' beliefs by asking researchers to:

> seek carefully conceptualized, integrated, and validated understandings, by focusing on teachers' context-specific beliefs and their interconnections to other beliefs and behavior. They should use open-ended interviews, observations, and related think-alouds to determine consistencies and inconsistencies between what teachers say, intend, and what

> they do; reactions to dilemmas that challenge core beliefs; creations of concept maps that identify the connections between educational and personal beliefs; and most important, explorations of the beliefs that lead to motivations and behaviors that affect students' learning and well-being. (p. 39)

Preschool teachers' beliefs are often tacit and complex. At times, assertions hold beliefs within them. My more complicated and time intensive data collection methods allowed me to make more meaningful and context-based inferences of participants' statements and actions about early literacy within a neuroeducation-based learning framework.

Preschool Teachers' Beliefs About Early Literacy

The research literature was specific about definitions of early literacy. Early literacy is oral language, writing by drawing, curiosity about print (Cooper & Kiger, 2009). Participants cited these specifics as part of their knowledge, but then held forth on their beliefs that early literacy is much broader. According to one participant, "children learn to read the world" (Lisa, Phase 1 CM). Jill and Cheryl also expressed much broader views of early literacy than are studied or defined in the literature. All three of this study's participants expressed a belief that learning requires context and should be meaningful. This mirrors Cooper's (2006) approach to helping children construct meaning in the domain of literacy. If these three teachers' views are indicative of how other preschool teachers think about early literacy and literacy acquisition, then preschool teachers' views could be much broader and more contextualized than what researchers typically study. This is important because the teachers' conceptualization of literacy has implications for research and, ultimately, for teaching, which I will discuss below.

Often, research studies focus on discrete skills-based notions of literacy acquisition (NCFL, 2009; NRP, 2000). My data shows a different viewpoint of some preschool teachers. Teachers in the natural learning environment in the act of interacting with an individual child or group of children may come to see literacy acquisition in more holistic ways. While these preschool teachers do describe conducting skills-based activities, such as a letter sounds activity, their descriptions of their beliefs about and approaches to early literacy in general seem to reflect a preference for a more holistic and contextualized approach.

As noted in Chapter 2, a whole language approach views literacy acquisition as a holistic process involving social construction of meaning and focused on comprehension. Whole language did not include the explicit teaching of phonics, partially contributing to a rise in approaches advocating for the teaching of discrete skills and parts-to-whole approaches. The participants in my study seem to be experiencing some tension and pushing back against (within themselves at times) the resurgence of what feels like an expectation to teach discrete skills and deliver a parts-to-whole approach to literacy acquisition. Perhaps it is because they were grounded in a whole language approach in their teacher preparation program, or perhaps it is a result of their learning that the NsLLT advocates for a whole-to-parts approach. These teachers also have many years of experience observing how young children learn. They know there is a distinct difference in the learning process for three- and four-year old children compared to ten-year olds. This means these preschool teachers act upon their beliefs, knowledge, and experience as well as to system or curricular expectations. This is important because many studies show that teachers' beliefs and practices do not always align (Buehl & Beck, 2015; Joyce & Calhoun, 2015).

While this study's participants expressed a certain level of confidence and competence throughout the data collection process, these participants mirrored the results of other studies when they expressed uncertainty or an "all-inclusive" attitude about best practices around early literacy acquisition (Hindman & Wasik, 2008; Lynch & Owston, 2015). These teachers seem to enthusiastically embrace the principles of the NsLLT; they report that the NsLLT provides them with the "why" behind many of their beliefs and practices. At times, though, the participants described the process of literacy acquisition as mysterious and magical. They stated they try to use everything they know about strategies and interventions to meet the learning needs of every child, because it is difficult to know with certainty what strategies might work.

Walter and Lippard (2017) found that Head Start teachers with more education held more developmentally appropriate beliefs. All three of this study's participants hold masters degrees and some have acquired additional certificates. All three appear to be well-grounded in developmentally appropriate practices. This suggests that even with years of experience and high levels of education, teachers may still see some children who are unsuccessful in preschool. My discussions with these teachers showed that each of them wants every child to succeed, but they do not always know why some do not. It is not as simple as saying these preschool teachers do not know which strategy works or which is best. These study participants are highly educated and highly motivated. My data suggest that what shifts the learning process may be unknowable.

Researchers such as Jones et al. (2000) and McMullen et al. (2005) have studied preschool teachers' beliefs about developmentally appropriate practices. The National Association for the Education of Young Children's position statement on developmentally appropriate practices is widely endorsed by early childhood education professionals in the U.S.

and is assumed to have far reaching impact on curricular beliefs and practices throughout the world (McMullen, 2005; NAEYC, 2020). As noted in the next paragraph, the nationally and internationally recognized publications of the National Reading Panel and the National Early Literacy Panel promote an "if, then" mindset about skill acquisition. It could be assumed that if teachers just followed all these guidelines and used the right practices, students would acquire literacy. If this were the case, why does an achievement gap persist, and why are this study's participants still searching for answers? This is not how these experienced educators think about literacy acquisition after decades in the field, even within the promising practices of the NsLLT and NvES.

Conditions for Student Learning

Many studies support the idea that literacy development is critical for reading and language acquisition (Arwood, 2011; Arwood & Robb, 2008; Brown, 2014; Delpit, 2012; Fantuzzo et al., 1997; Mashburn et al., 2008; NCFL, 2009; Socol, 2006). Study participants echoed this importance, but were emphatic that the learning process have context and be meaningful. These preschool teachers also stated meaningful context is provided within the arena of social interactions. What is interesting to note, however, is the literature on early literacy (NCFL, 2009; NRP, 2000) has a decidedly skills- and intervention-based focus authored by university-level researchers.

My study illuminated a significant finding that understanding the contextualized experience of the preschool teacher requires research methods that account for teacher beliefs and take a holistic, integrated approach to literacy acquisition. My findings support the idea that these preschool teachers seem to know and understand the skills-based or text-based approach to

early literacy, but they believe an integrated, holistic approach is the key to meaningful conceptual learning. They situate early literacy in the *learner* who is involved in the process more often than they do the *text*, as Jill did when she expressed that children's drawings and writings are messages they want others to see and hear (Jill, Phase 3 SSI). This is important, because teachers are responding to contradictions in system level structures and the research literature, which sometimes conflict with what they think young children need. Perhaps these participants' perspective on literacy follows that of Rosenblatt (1978), who proposed the meaning of a text does not reside exclusively within the text or within the reader. Instead, Rosenblatt suggested the meaning of a text occurs as a result of the *transaction* between the reader and the written word. The transaction between the reader and the text suggests a reciprocal, mutually defining relationship (Rosenblatt, 1986) between the reader and the text.

According to this study's participants, the home learning environment is probably most influential on young children. Most parents use their own school experiences as a template for their hopes and expectations for their own children (Lortie, 1975). This means their expectations may not always align with innovative learning approaches in the public preschool setting. This is important because these preschool teachers feel responsible for establishing and maintaining strong relationships with home caregivers. They want parents to understand and support the learning experiences that happen at school. Most parents are unfamiliar with emerging research in the area of neuroeducation; these teachers spoke of needing to educate parents about why letter names and sounds may not be emphasized at school. Teachers see the importance of having parents support learning at home that matches what is occurring at school, but also to have what is occurring at school make sense to families when the match in understanding may be absent.

Teacher Learning Process

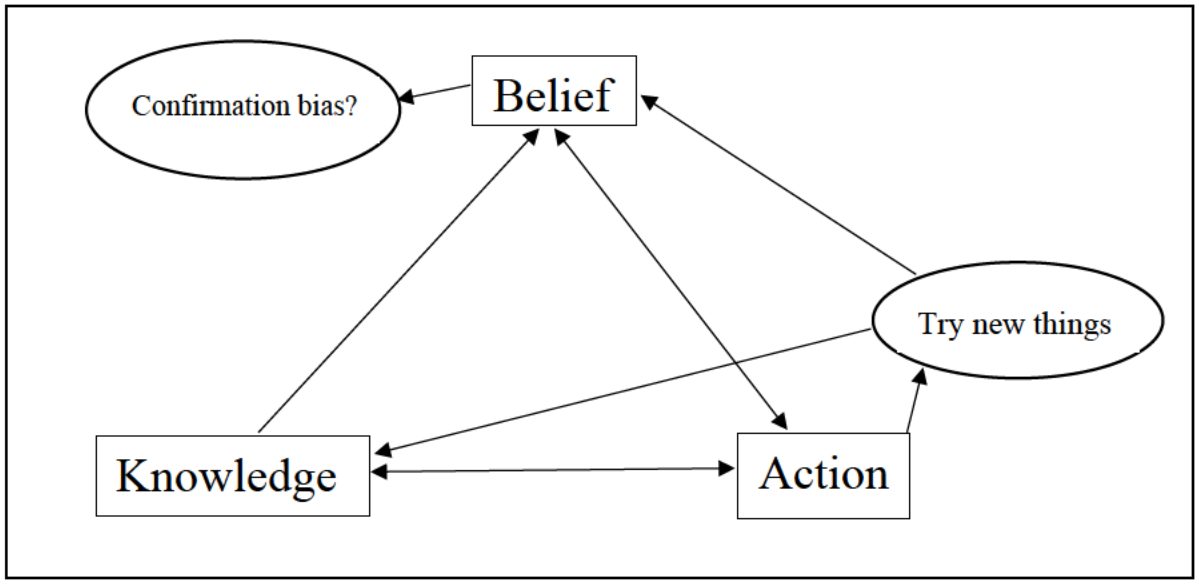
McLeod (2018) explains Piaget's (1977) theories of assimilation and accommodation when learners are presented with new information. They either assimilate the new learning into their schema (their understanding of abstract concepts) and the schema remains unchanged or their schema changes to accommodate the new information. I was interested in identifying where these preschool teachers' beliefs about early literacy came from, particularly in relation to the NsLLT. What did teachers "take up" in the process of learning about a transdisciplinary theoretical framework about learning and did any of their beliefs change as a result of that learning and enactment experience? Teacher experience, formal education, and learning about research seem to be important components of what appears to be a heuristic process of discovery for them.

In some instances, if the NsLLT validated what participants believed, they were willing to try it or continue learning about it. This aligns with an email correspondence I had recently with Dr. Arwood on December 21, 2020 and January 4, 2021 and what my literature review revealed about teacher beliefs (Buehl & Beck, 2015; Kagan, 1992; McLeod, 2018; Nespor, 1987; Piaget, 1977). Arwood and Piaget speak explicitly about humans' desire for cognitive equilibrium. We tend to *assimilate* new learnings into our current world view. If a paradigm shift is to occur, however, where our world view changes and *accommodates* to the new learning, "conceptual learning requires conflict that challenges what we know, forces us to ask questions, or even try a new assignment of meaning" (Arwood, 2020, personal communication). The conclusion seems to be that cognitive dissonance and working through that conflict is the key to

changes in beliefs. Figure 3 below is a visual representation of my understanding of this process, built from the analysis of participants' contributions.

Figure 3

Heuristic Process Teachers Experience During New Learning



These elements seem to interact with each other in no predetermined sequence, but they inform each other as part of a teacher's learning process. The arrows indicate potential influencing patterns, some of which are mutually informing. Based on my data analysis, it seems to be an ongoing reciprocal relationship, that may or may not involve cognitive dissonance, which appears to be an essential component of belief change. The teacher learning process may not involve cognitive dissonance or disequilibrium if an educator easily assimilates new information into their schema without disruption, i.e. if the information affirms the person's beliefs, if the information is not "new," or if action is taken based on new information but there is no perceived effect. At times, cognitive dissonance can arise and yet the person's motivation to act is reduced if the information is perceived to affirm something already believed or known.

Cheryl's comments in Chapter 4 are good examples of the presence and non-presence of disequilibrium. Cheryl stated that neuroeducation affirmed the fact that learning requires context and should be meaningful to the child. This is a belief she apparently already had. It does not speak to any new beliefs or practices that she may be confronted with in her learning of the NsLLT. This is important, because if a learning theory requires a paradigm shift to maximize student learning, is Cheryl going to be able to make that shift?

In her final interview, Cheryl extended her comments on how the NsLLT has given her theoretical and scientific understanding of certain instructional practices and learning processes as well as language to explain her beliefs and practices. She ended on a note of disequilibrium admitting an awareness of situating herself within a paradigm (behaviorism and reductionism) that may be in contrast to the NsLLT.

The rich data from this study and my own personal awareness indicate that teacher beliefs and the teacher learning process seem to be inextricably linked to each other. They are connected in ways that make them difficult to parse out in terms of data analysis. When I learn something new, and it makes me uncomfortable, it may be easier to disregard it and fall back on the familiar set of beliefs and practices that appear to produce satisfactory results, at least for most students. If most students are progressing at rates that seem appropriate, as measured by a teacher observation assessment instrument, and if we think there may be other conditions for student learning that are not being met, i.e., impaired sensory receptors or deficient home environment, then it is highly plausible we may elect to remain in a space of cognitive harmony.

Similarly, if taking in new knowledge results in a confirmation of our previously or currently held beliefs, we may find no reason to implement a novel strategy or intervention.

Rationalizations of this nature make the student achievement gap more difficult to eliminate. This has implications for professional learning experiences and for research.

Another important finding from this study is the influential role of the instructional coach. This means the coach can be an entry point and support for the dissonance and disequilibrium teachers may experience when engaged in new learning. This has important implications for the teacher learning process and for future research. This study's participants, however, saw their own learning process and the process of belief change as multi-faceted and complex. My data analysis demonstrates that, for these three preschool teachers, no single activity or experience can really carry the burden of paradigm change. It may require a combination of formal learning, access to research, coaching, PLCs, and believable vicarious experiences. Like these preschool teachers' call for learning to have a context and be meaningful, teachers' own learning process must also have context and be meaningful. Lisa proposes that peer-to-peer observations, or believable vicarious experiences (Grierson & Gallagher, 2009), are probably the most powerful experiences a teacher can have in the learning process. Even receiving coaching is less contextualized than these peer-to-peer observations, because the process if focused on the individual teacher.

Another finding is that these preschool teachers saw value in knowing how the brain functions in the learning process. This means that teachers may benefit from having access to this information through formal learning opportunities. This is important because this knowledge appears to provide these educators a "why" for their beliefs and practices and could inform how they plan and facilitate learning experiences for young children. As illustrated in Figure 3 above,

knowledge could be an impetus for trying something new in the classroom, which could then influence these teachers' beliefs about how early literacy may be acquired.

What teachers do with their new knowledge depends on their disposition, motivation, and ongoing support. In the case of two of this study's participants, they are leading a pilot implementation of the NsLLT in their preschool classrooms. They volunteered for these roles and committed to completing a comprehensive professional learning plan and to receiving coaching in the learning framework from an expert practitioner. The finding here is that these preschool teachers will utilize research and implement interventions to some extent with or without ongoing support and encouragement, however, implementation and deeper learning will increase and endure with the addition of ongoing coaching support and involvement in a professional learning community (PLC). This, in turn, could shift a preschool teacher's beliefs in the long-term, because they will have internalized and enacted the new learning while simultaneously observing the new learning's effects.

Presence of Neuroeducation in Expression of Beliefs

There are very few studies on teacher beliefs and neuroeducation (Pickering & Howard-Jones, 2007; Serpati & Loughan, 2012), and some are related to neuromyths or are dissertations (Alekno, 2012; Kim & Sankey, 2018; Sarrasin et al., 2019; Thul, 2019). This is the first study I am aware of that investigates preschool teachers' beliefs about early literacy within a neuroeducation learning framework.

Elements of the NsLLT and NvES appear to have been assimilated or accommodated into the schema of this study's participants to varying degrees. In Chapter 4, I noted that Jill discussed aspects of neurological or brain function with some depth when discussing her beliefs

about reading. Lisa touched on sensory input in her concept map but expressed a need for more understanding. This shows that these participants have incorporated new complex concepts into their knowledge and belief systems.

No participants stated there is only one way to facilitate literacy acquisition, although Cheryl hinted at the strength of the NsLLT in her Phase 3 interview by saying, "It is the best way to teach literacy. It may be the only way" (Cheryl, Phase 3 SSI). None of these participants are proficient enough in the NsLLT to make a definite pronouncement, nor is there enough empirical data to show that the NsLLT is the best way. Two participants stated that learning to read is somewhat mysterious or that there are complex processes at play that are challenging to understand, which could be a reflection of the fact that we cannot see actual brain processes at work in the classroom. There is a noticeable absence in the mainstream early literacy literature of the emerging field of neuroscience.

Implications for Practice

In Chapter 4, study participants echoed my concerns about the academic pressures placed on U.S. preschool programs and the need to improve outcomes for vulnerable children. The conditions within which students learn must be considered whether that is in the home, in a school facility, or in the community. Statements by this study's participants about the importance of the home environment and the nature of the learning experiences at home, in school, or in other community settings lead me to believe these could be more widely held beliefs among preschool teachers. Stronger connections between the school and home environments could be a consideration for preschool programs. González et al. (2005) have written about the concept of "funds of knowledge" where teachers engage with families to co-construct knowledge. This

Vygotskian and sociocultural concept is based on the premise that people are competent and have knowledge that has been accrued through life experiences.

The implications for practice focus on determining ways to capture the holistic nature of the teaching and learning processes at the preschool level. Preschool teachers may possess broader conceptions of early literacy that differs from that represented in the literature. These participants appeared to be willing to adapt a theory, curriculum, or materials to fit within their belief systems about early literacy acquisition. They all believe learning requires context and should be meaningful. They all attempted to assimilate strategies and interventions, i.e. letter names and sounds, that did not align with their beliefs in an effort to make them more meaningful.

If the theory or research, i.e. NsLLT, validates what teachers believe, they may be more willing to try it or continue learning about it. Those responsible for developing and delivering professional learning experiences should keep in mind the power of beliefs. These experiences should include opportunities for teachers to feel some disequilibrium and dissonance between what they know, believe, and do and what new research findings are demonstrating in terms of how children's brains function in the process of learning. At the same time, these experiences need to help teachers make connections to their prior knowledge and give them opportunities to see what the new learning looks like in practice.

Teacher professional learning opportunities could incorporate workshops in neuroscience, neuroeducation, and language acquisition. We must continue to bridge the research to practice gap. This preschool program has offered coaching in this neuroeducation framework since January 2020. I have observed how well Carole, NsLLT/NvES Coach, establishes and

maintains relationships with staff, however, coaching remains a challenging endeavor. The prospect of teacher beliefs changing seems to increase if educators have access to adequate translations of research, effective professional learning experiences, and ongoing support from an expert coach, however, this may not be enough.

We know that teaching is a sophisticated orchestration, and we know that bringing in something new takes time to organize it within our structures and mindsets. Taking in new perspectives, procedures, and information is a complex endeavor. Believable vicarious experiences (Grierson & Gallagher, 2009) may offer more powerful learning experiences for educators. As Lisa implied, seeing is believing:

> I feel like seeing it in action…was incredibly helpful. I want to…go spend a day in her classroom because I'm having trouble understanding the flow of how it would work in a whole day, so that feels really important to me.

These vicarious experiences could be in the form of lab or demonstration classrooms (Cranston, 2019; Fantuzzo et al., 1997; Gibbons et al., 2017; Madden, 2012). These types of classrooms and observational experiences could offer a place for teacher colleagues to observe theory in practice. This study's data highlight the importance of thinking beyond standard professional learning experiences and instructional coaching in order to shift beliefs and practices.

Implications for Research

This study's data shows there are potential misalignments between research structures and foci and preschool teachers' lived experiences. We have to find ways to contextualize educational research, or we may find it an ongoing, frustrating challenge to make educational

research usable. The paradigms within research, i.e. behaviorism, western cognitive psychology, the NsLLT, that are interacting with the learning paradigms that exist in the field and within preschool teachers are, at times, contradictory.

I have discussed paradigms here that exist both in practice as well as research. If research has a narrow focus for what it studies and preschool teachers have a more expansive view of early literacy, then there is a potential misalignment in how research can study and inform the field. It seems important for researchers to contextualize their studies in the same way that preschool teachers contextualize their beliefs and practices. There's an exponential effect that comes from the alignment of those two. If research paradigms cannot be contextualized, there may be barriers to educators' shifting beliefs and practices. How do we keep things whole for teachers' learning if preschool teachers see early literacy as a holistic process?

Concepts maps and VSR seem to allow for a greater degree of authentic, richer, and holistic expressions of beliefs by participants. Cheryl remarked that our Phase 3 interview, which was conducted virtually instead of in-person and was a traditional one-to-one interview was slightly more challenging for her in terms of listening to the interview questions and formulating coherent responses. A strictly auditory approach, as is the case in most traditional semi-structured interviews, and a singularly solitary act of reading, interpreting, and providing a written response, as is the case in a traditional survey, could limit a participant's expression. An interactive process that includes an artifact that is a representation of the educator's own thinking or own practice, however, gives the participant something uniquely relevant to them to manipulate, create, reflect on, and discuss.

This study's data suggests that teachers have to think in holistic ways when facilitating the learning of children and when engaging in professional learning experiences (the teacher learning process). This is not typically how research and professional development approach the teaching and learning processes, however. Research and professional development initiatives appear to favor a parts-to-whole approach, which perpetuates a push to make things discrete. This study's preschool teachers then seem to spend time and effort translating discrete strategies and interventions into a holistic contextualized learning environment as evidenced by Lisa's comments above. Isolating variables may work well in the clinic or lab setting, but classrooms do not have the same controlled conditions as a clinic or lab. Finding something out in a lab and finding something out in context are two different things. Given the holistic nature of these teachers' thinking and the learning environment, researchers could study teachers and their processes holistically in the school environment. This could be accomplished via large scale studies using elicitation methods similar to those in my study.

Coburn and Stein (2010) acknowledge the failure of research-based knowledge to "scale up" broadly as a central challenge in education. One idea is to move research out of the laboratory, clinic, or university office and into classrooms. Researchers and preschool teachers could collaborate as partners in action research. Bryk et al.'s (2015) application of improvement science theory could provide a template. This could help researchers study variables in context and could help teachers understand and apply theoretical frameworks in meaningful ways with children. There are limitations to this, because highly contextualized work makes it difficult to see patterns or what may be idiosyncratic or an enactment of theory. Case studies have to be aggregated and analyzed for patterns. Flyvbjerg (2001) argues that the social sciences have never

been, and never will be, like the natural sciences, either in the generality of explanatory theory or in the ability to predict. Flyvbjerg proposes a perspective he calls “phronesis,” which sees context and values as critical to understanding human action. Phronesis combines case knowledge with values or praxis so that the knowledge is used. Flyvbjerg (2006) argues that experts (in this case experienced preschool teachers) rely on context-dependent knowledge and experience as the heart of their expert practice. A phronetic case study approach could allow the field to better understand the nature of teachers’ beliefs by studying them within the context of their work. Lisa’s comment, “I know enough to be dangerous” comes to mind.

In this study, the context included a neuroeducation-based learning framework. Neuroscience research related to language acquisition and currently represented in the literature is emergent (Dreyer & Pulvermüller, 2018; Egorova et al., 2016; Garagnani & Pulvermüller, 2016; Pulvermüller, 1999, 2005, 2012, 2013, 2018; Stahl et al., 2016). There is also an active theoretical and translational debate between educational neuroscience and cognitive psychology (Bowers, 2016a, 2016b; Bruer, 1997; Dubinsky et al., 2019; Horvath & Donoghue, 2016; Howard-Jones et al., 2016). Given the progress in bridging potential neuroeducation applications and theoretical frameworks, additional studies examining preschool teacher beliefs would be beneficial to the field. The NsLLT, as embodied in the NvES, is one such theoretical framework that holds promise in meeting the neurobiological learning needs of all students (Arwood, 2011; Arwood & Meredith, 2017, Arwood & Rostamizadeh, 2018; Robb, 2016).

My qualitative study reflects what can be learned when research methods move beyond traditional surveys and questionnaires. I discovered more about teachers’ tacit beliefs through the construction of concept maps and video-stimulated recall (think aloud) tasks. The professional

educators in my study were able to share their thinking with me through drawing, writing, and reflective oral expression within a socially interactive context.

The role of the instructional coach surfaced as a significant influencing factor in the teacher learning process, and, therefore, the process of belief change and belief evolution. The coach and the act of being coached can serve as an insertion of dissonance in a teacher's belief system as they work to assimilate or accommodate new learning into their schema. This was an unexpected finding and, in the course of writing this chapter, caused me to conduct a literature search using the terms "neuroeducation" and "instructional coach" to see what studies existed on these two combined variables. My search produced no results. I, therefore, recommend further studies on the role of the instructional coach and its impact on preschool teacher beliefs within neuroeducation contexts.

The sample in this study represented a unique group of preschool teachers in terms of their level of education and their access to the emergent field of neuroscience and neuroeducation as well as their willingness to implement new strategies. My three participants were highly educated, lifelong learners, who appear to continue to seek out new information and were open to emerging fields of research, new findings, and new ideas. Not all preschool teachers in the U.S. have the same level of education or the same access to new research. It would be beneficial to seek out preschool teachers from other parts of the U.S. and internationally who may have different levels of education, different backgrounds, and familiarity with other models of neuroeducation. Case studies of preschool teachers with varied backgrounds, years of experience, and levels of education would provide further important

insights into the formation and evolution of their belief systems, especially if robust elicitation methods, such as concept maps and video-stimulated recall (VSR) are utilized.

My findings confirmed that beliefs are extremely challenging to measure. They also confirmed that more robust elicitation methods are needed.

Limitations of the Study

The qualitative methods of this study afforded research opportunities to examine participants' beliefs about early literacy within a neuroeducation context, however, this study was not without limitations. The study was limited to the perceptions of those who work in a specific preschool program in the Pacific Northwest, and who have familiarity with a unique transdisciplinary learning theory based in neuroscience and language acquisition. I sought preschool teachers who were familiar with this learning theory and who were in the midst of implementing neuroeducation-based interventions and strategies. And yet, I now have this deep integrated look into the belief systems of a group of preschool teachers. Preschool teachers have not been included in this dialogue to the level that this study has been able to accomplish due to a) the use of standard elicitation methods (surveys and questionnaires) and b) the lack of studies within the context of a neuroeducation-based learning approach.

This study's participants represented relatively similar levels of education and pedagogical groundings. It is possible that these volunteer participants are naturally inclined to the influence of new learnings and reflecting on their belief systems. And yet, I did not have access to a large pool of study participants, because there are few preschool teachers familiar with or well-versed in a neuroeducation model of learning.

Instruments that involve self-reporting are subject to participants' biases in how they see themselves and how they may express their beliefs. I actively sought out my own and my participants' subjective views of learning (Peshkin, 1988) while seeking to ensure trustworthiness (Tufford & Newman, 2012).

The NsLLT is unique and not widely used. It is worth investigating how to increase its transferability, so that it can be studied in other contexts, such as in other preschool programs. Longitudinal studies of the two demonstration classrooms that Lisa and Cheryl lead would add value to the extant literature. In addition, a larger study looking at its use in the classroom setting across grade levels would be helpful.

A pandemic known as COVID-19 spread across the globe starting in January 2020. By March 2020, this pandemic resulted in the complete closure of schools in this large urban area of the pacific northwest. As of the writing of this dissertation, schools remain closed in the community where the study was conducted. The original plan of this study was to interview preschool teachers in the midst of in-person instruction with a full enrollment of students in their classrooms. COVID-19 prevented the usual learning environment of preschool teachers from occurring. Instead, these teachers were forced to facilitate learning experiences via a 100% online learning format. In addition, all professional learning and coaching in which these preschool teachers participated was also conducted in completely virtual formats. The COVID-19 pandemic is having an indelible effect on teachers. Its impact has weighed on people's minds and disrupted everyday routines. This disturbance was an ongoing challenge for all involved in this study in terms of the normal routines of a classroom teacher, typical social interactions with colleagues and children, data collection, and emotional well-being.

While I was not the direct supervisor of the preschool teachers in my study, my positionality as Director of the program may still have had an influence on how the participants responded during the three phases of interviews. This may impact the reflections and contributions of the participants. I hired one of the participants in summer 2019. I took neuroeducation courses with the two other participants. Two of the participants are the lead teachers in the new demonstration classrooms that were established in fall 2020 as part of a city grant. It is possible that these teachers felt more inclined to participate in this study as a result of their selection to be teachers in these classrooms even though participation in both the demonstration classroom and this study were voluntary. While my relationships with all three participants afforded a level of ease and familiarity, I worked diligently to create some distance with previous shared experiences. Throughout the data collection process, I contemplated whether participants' descriptions of their beliefs were influenced by beliefs I already had about the NsLLT. During one interview, a participant stated she left some details out in her concept map because she assumed I already knew many of the concepts.

My knowledge of the theoretical framework of neuroeducation may have created an unintentional bias in terms of looking for changes in teachers' beliefs related to this learning theory. In addition, the interview guides I developed may also include some biases or may unintentionally lead the participants to answer in a certain way. I addressed this by piloting my interview questions and asking other people, including my dissertation advisor to review the questions and provide feedback.

Conclusion

This chapter presented the findings relative to the purposes of the study as well as the research questions designed for this study. It is clear that preschool teachers' beliefs are a powerful construct and an influence on how preschool teachers think about their work and enact what they know. This study endeavored to add to the extant literature on preschool teachers' beliefs about early literacy within a neuroeducation context of change as I could find no research addressing this specific topic. Some preschool teachers express their beliefs about early literacy within a neuroeducation framework in various ways depending on the elicitation method. When constructing concept maps, some preschool teachers use drawings to convey their ideas. Some use only words. This seems to be influenced by how much formal learning one has had in neuroeducation. During a video-stimulated recall task, the preschool teachers in this study used stories as their focus and expressed their beliefs using a mixture of learning theories, including the NsLLT. The two teachers who recently attended a NsLLT workshop just prior to the video-stimulated recall task discussed changes in their literacy practices they were implementing as a result of the recent neuroeducation workshop. During a comprehensive semi-structured interview, two participants stated that the NsLLT has given them the "why" or meaning behind what they are doing. All three preschool teachers reported that receiving coaching had the biggest influence on the language they use during learning facilitation. They all stated they now see the importance of being intentional in their language use with young children. Two also stated they now use more drawings as a result of the coaching.

My impression is that preschool teachers' core beliefs about early literacy do not change over time, but, throughout their careers, some intentionally seek out new learning, which, in turn,

causes them to consider changes in their beliefs and practices. They express feelings of cognitive dissonance after the new learning. The participants in this study did one of three things as a result. One tried new strategies, accepted some coaching, and eventually paused attending NsLLT workshops and receiving coaching, saying she needs more practice in order to fully implement the learning framework. Another is immediately implementing new strategies, receiving ongoing coaching, and is shifting from integrating new information through old lenses (confirming prior beliefs and practices) to shifting her paradigm. The third and newest to the NsLLT is immediately implementing new strategies, actively receiving ongoing coaching, and experiencing a combination of cognitive disequilibrium, confirmation of prior beliefs, and a shift in mindset as a result of student outcomes.

This combination of elicitation methods resulted in a body of data that included rich descriptions and visual representations of some preschool teachers' beliefs about early literacy. Over three phases, these participants expressed a wide array of beliefs and feelings about how literacy is acquired, how it should be supported/facilitated, and how the promising practice of the NsLLT has shaped their beliefs and practices.

Riley and Terada (2019) quoted Dr. Pamela Cantor, MD, in an article on bringing the "science of learning" into the classroom. Dr. Cantor noted:

> The 20th-century education system was never designed with the knowledge of the developing brain. So, when we think about the fact that learning is a brain function and we have an education system that didn't have access to this critical knowledge, the question becomes: Do we have the will to create an education system that's informed by it?

These findings suggest that preschool teachers can access the emerging field of neuroscience research and its applications to education through various forms of professional learning experiences and ongoing practice-based coaching. This study's participants demonstrated that aspects of their beliefs about early literacy have been affirmed as well as challenged by Arwood's (2011) Neuro-semantic Language Learning Theory. The NsLLT's integration of three research disciplines (cognitive psychology, neuroscience, and language acquisition) is unique and can be understood and effectively put into practice by preschool teachers under the right conditions.

By exploring the expressions of preschool teachers' beliefs about early literacy within a neuroeducation context in a large urban preschool program in the Pacific Northwest of the U.S., this study contributed to new knowledge of the formation and evolution of teacher beliefs and the theoretical framework of the Neuro-semantic Language Learning Theory (NsLLT) and the promising practice of the Neuro-viconic Education System (NvES). Through a robust set of elicitation methods of concept map construction, video-stimulated recall, and open-ended reflective dialogue, preschool teachers described their conceptualizations of early literacy, how it is acquired in young children, how it can be facilitated in learning environments, and what their own personal influences and needs were (and are) as professional educators engaged in the learning process. Synthesis of the participants' descriptions resulted in a richer understanding of the nature of preschool teachers' beliefs about early literacy within a context of change. The results of this study endeavored to influence the nature of educators' preservice and inservice professional learning experiences and create broader awareness of a unique translation and educational application of a learning theory based in neuroscience and language research. It also

strived to provide an impetus to the field of educational research to use more robust qualitative elicitation methods in order to obtain richer, more authentic data about teacher beliefs and to shift from studying discrete parts of literacy and instead see the process of teaching and learning in a more holistic way.

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Appendix A: Interview Protocols

Phase 1: Concept Maps Interview Protocol and Guiding Questions

My name is Robert Cantwell. I am a doctoral student investigating how preschool teachers' beliefs about early literacy evolve within a context of implementing neuroeducation-based strategies. This series of interviews will help me understand how beliefs may change over time and the factors that may influence those changes. This research is important because teacher beliefs play a critical role in the decisions they make about instructional practices, which, in turn, could have a significant impact on student outcomes.

Building Rapport and Trust

Begin the interview with a brief check in with the participant and review the purpose of the interview (Merriam, 1998; Taylor & Bogdan, 1984).

- To understand your beliefs about early literacy in preschool
- This interview should take approximately 45-60 minutes
- With your permission, all interviews are video and/or audio recorded for later transcription. This is so I don't have to frantically take notes and will enable me to concentrate on you.
- Participation is voluntary and confidential – do you still want to participate in this interview?
- Do you have any questions before we begin?

Entering the Interview

Today is the first interview in a series of three interviews. Today will be focused on thinking and talking about your beliefs about early literacy in preschool, and how you represented those in a concept map. A concept map is a way to represent a person's beliefs, knowledge, and understandings of a particular concept or group of concepts (Mihai, Butera, & Friesen, 2017; Novak & Cañas, 2008). It is not a test and will not be graded in any way. Thank you for constructing yours about early literacy. I'm looking forward to talking with you about how you created your map, and how you interpret it. Do you have any questions before we begin?

Guiding Questions

An interview guide is a list of questions the interview intends to ask. Semi-structured interview questions are more open-ended and "assume that individual respondents define the world in unique ways" (Merriam, 1998, p. 74).

1. When you sat down to create your concept map, walk me through what you were thinking. How did you get started? How did you resolve any challenges or confusion in creating your map?
2. Imagine you could go back in time for a moment, before you ever took any professional development. It could be your first year as a teacher. If you made a map then and again now, and we were looking at them side by side, what would we notice about what was the same and what was different? What might have led to those changes you've just described?

3. How might you as a first-year teacher have drawn this map? Were there turning points or experiences that would have shaped your map at different points, i.e. first year experienced no neuro experienced with neuro?
4. This conversation has brought out some ideas about how your understandings of early literacy have evolved at different points. How would you summarize that shift over time? (See timeline handout at end of this document)
5. I see that (literacy concept) is represented in your map. Tell me about why you included that?
6. To what degree would you say this map (the one you just created) represents a neuroeducation (Arwood, 2011) lens on literacy? (Where? How? What would need to change to strengthen that representation if they said it was low?)

Exiting the Interview

Finish the interview by allowing the participant to have the last word (Yin, 2017):

7. "Is there anything else that you would like to share?"

- Thank the participant for their time, ask if they would like to be contacted with the results of the study, and provide contact information in the case they would like to follow up.

Phase 2: Video-Stimulated Recall (VSR) Interview Protocol and Guiding Questions

Building Rapport and Trust

Begin the interview with a brief check in with the participant and review the purpose of the interview (Merriam, 1998; Taylor & Bogdan, 1984).

- To understand your beliefs about early literacy in preschool
- This interview should take approximately 45-60 minutes
- All interviews are video and audio recorded for later transcription
- Participation is voluntary and confidential – do you still want to participate in this interview?
- Do you have any questions before we begin?

Entering the Interview

Today is the second interview in a series of three interviews. Today will be focused on thinking and talking about your beliefs about early literacy in preschool as you watch a video recording of yourself facilitating a literacy lesson in your classroom. Watching a video recording of yourself is a research-based way to examine your thinking after a learning experience (Calderhead, 1981; Reitano & Sim, 2010). This is not a test and you will not be evaluated in any way. As we watch the video, either of us can stop the video to comment on, or ask questions about, what is happening in the video. Do you have any questions before we begin?

Guiding Questions

An interview guide is a list of questions the interview intends to ask. Semi-structured interview questions are more open-ended and "assume that individual respondents define the world in unique ways" (Merriam, 1998, p. 74).

1. How did you go about deciding what video segment we should watch?
2. Tell me about the literacy lesson we're going to watch in this video.
3. If researcher stops the video,
    When you chose to do "x", what was going through your mind?
    Why did you decide to do "x"?
    Why did you initiate or respond in that way?
    How and when did you learn to do "x"? (refer to timeline if needed)
    When did you start doing that type of practice? (refer to timeline if needed)
4. How typical is this lesson? If not typical, what features would be included in a typical lesson?

Exiting the Interview

Finish the interview by allowing the participant to have the last word (Yin, 2017):

5. "Is there anything else that you would like to share?"

- Thank the participant for their time, ask if they would like to be contacted with the results of the study, and provide contact information in the case they would like to follow up.

Phase 3: Semi-structured Face to Face Interview Protocol and Guiding Questions

Building Rapport and Trust

Begin the interview with a brief check in with the participant and review the purpose of the interview (Merriam, 1998; Taylor & Bogdan, 1984).

- To understand your beliefs about early literacy in preschool
- This interview should take approximately 30 minutes
- All interviews are video and audio recorded for later transcription
- Participation is voluntary and confidential – do you still want to participate in this interview?
- Do you have any questions before we begin?

Entering the Interview

Today is the third, and final, interview in a series of three interviews.

Guiding Questions

An interview guide is a list of questions the interview intends to ask. Semi-structured interview questions are more open-ended and "assume that individual respondents define the world in unique ways" (Merriam, 1998, p. 74).

1. In our first interview, we discussed your definitions of early literacy through the concept map you created. Today, we're going to dive deeper into your understandings about how children develop in literacy. Before we do, do you have anything you've thought of since we talked before that you'd like to say about your map?
2. From your perspective, how do preschool children acquire literacy? What factors might influence how a child acquires literacy?
3. What influences shaped your beliefs about literacy acquisition? Thinking about your experiences with Arwood's (2011) Neuroeducation model, how have those experiences impacted or changed your beliefs about early literacy? Thinking about your experiences receiving coaching from a neuroeducation coach, how have those experiences impacted or changed your beliefs about early literacy?
4. Thinking about what you just said about how children acquire literacy, and about the "typical lesson" we discussed when we reviewed your video, how do you think the acquisition of literacy concepts should be facilitated/supported?
5. Do you teach letter names and letter sounds? Why or why not?

Exiting the Interview

Finish the interview by allowing the participant to have the last word (Yin, 2017):

6. "Is there anything else that you would like to share?"

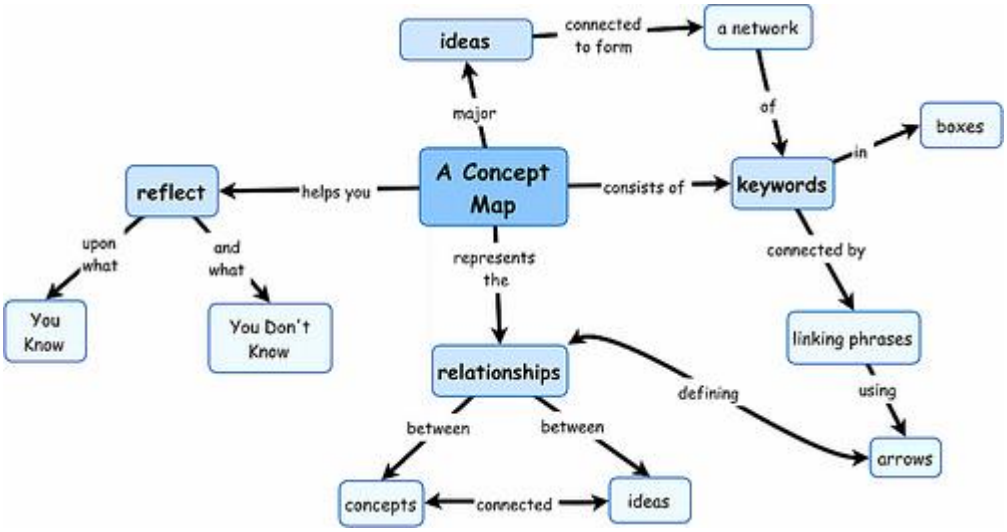
- Thank the participant for their time, ask if they would like to be contacted with the results of the study, and provide contact information in the case they would like to follow up

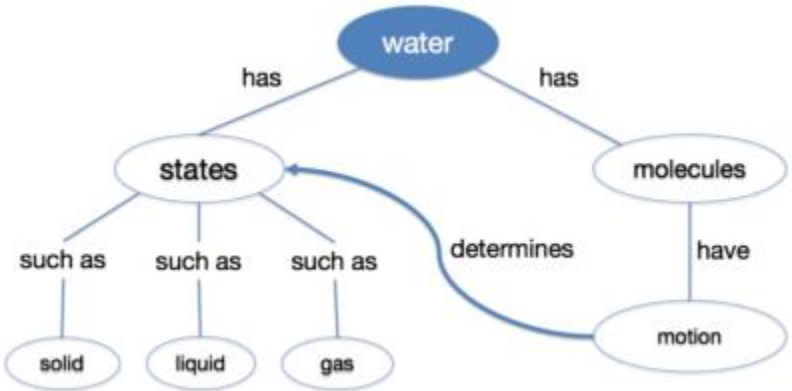
Appendix B: Concept Map Definition and Example

Definition

A concept map is a graphic organizer that organizes and represents knowledge, commonly including a central concept with related components, indicated by connecting lines (Mihai, Butera, and Friesen, 2017, p. 328).

Examples





Appendix C: Codes, Categories, Code Definitions

Preschool Teacher Beliefs about Early Literacy	
Adult introspection	Learning to read is a hurdle
ASPECTS OF LITERACY ACQUISITION	Literacy is emotional
Developmentally appropriate	**Multiple paths to learning to read**
Impact of reading on people's lives	Parents have different beliefs
Language acquisition	Purpose of literacy
	Reading is a mystery
Conditions for Student Learning	
Barriers to learning	Role of play
Learning environment's effect on literacy acquisition	Role of teacher
LEARNING REQUIRES CONTEXT AND MUST BE MEANINGFUL	**Scaffolding_Multiple points of access**
	Social interaction
	Teaching vs. Learning
Teacher Learning Process	
Coaching	Role of leadership
Elements of changing beliefs and practices	Role of parenting experience
Impact and influences of others	**ROLE OF RESEARCH**
Knowledge of students	**PERCEIVED SHIFTS IN BELIEFS AND PRACTICES**
Level of education	**Role of teacher experience**
Role of formal education	Teacher's prior knowledge_experience
	Theory to practice enactment experiences

Bold ALL CAPS = 40 or more references in 9 or more files
Bold = 10 or more references in 3 or more files

Code Definitions

Name of Code	Definition
Barriers to learning	Code used when participant describes potential barriers to student learning
Coaching	Any reference to the act of coaching or receiving coaching within the context of learning a new theory and/or implementing interventions/strategies in the classroom
Elements of changing beliefs and practices	I used this code for the first time on p. 12 of Lisa's phase 3 interview when she described her experience as a teacher at Opal. She described the size and mindset of her team and the leaders there. These seemed to be elements, in Lisa's mind, of important elements in changing beliefs and practices.
Impact and influences of others	Code used when a participant describes external influences on their own thinking, beliefs, and practices
Knowledge of students	Code used when a participant referenced how knowledge of their students' learning strengths and needs informed their thinking
Learning environment's effect on literacy acquisition	Used when factors are identified that may effect the acquisition of literacy concepts
Learning requires context and must be meaningful	Code used when participant described children's need to have context or background knowledge during the learning process to increase understanding and meaning. This phrase is an NvES/NsLLT tenet.
Level of Education	Code used to mark comments in answer to the interviewer's questions about a participant's highest level of education attained. This code should be combined with the code "role of formal education", which I added later
Perceived shifts in beliefs and practices	Used to capture instances when participants engaged in making comments about perceived shifts in their beliefs and/or practices around early literacy. Some coded references relate to participants' comments about their performance during the

Name of Code	Definition
	interview process, especially during the concept map construction and VSR.
Role of formal education	I use this to refer to participants' responses to questions about what has influenced their beliefs or why they included what they did in their concept map. This code also captures information about participants' formal education experiences.
Role of leadership	Code used when a participant discussed the role and potential impact of educational leaders in the teaching and learning process, especially as it relates to educators' professional learning
Role of parenting experience	I use this to refer to participants' expressions of their parenting experience when responding to questions about what has influenced their beliefs or why they included what they did in their concept map
Role of play	used when participants share their beliefs about play within the context of learning
Role of research	Used when participants' comment on the role of research in teacher beliefs, knowledge, and practice
Role of teacher	Used when a participant described the role of the teacher in relation to student learning
Role of teacher experience	I use this to refer to participants' expressions of their professional experience when responding to questions about what has influenced their beliefs or why they included what they did in their concept map
Scaffolding_Multiple points of access	I use this code when participants talk about scaffolding, adding layers to someone's understanding, or talk about creating multiple points of access
Social interaction	This code marks when participants describe children's learning as a social or interactive process

Name of Code	Definition
Teacher beliefs about literacy	This broad code is used when participants appear to be describing their beliefs about literacy
Adult introspection	I use this when adults apply their language and cognition to what they think children are thinking and feeling. Assumes that children have the same language level and language function.
Aspects of literacy acquisition	This code marks where participants discuss what they believe to be components or aspects of early literacy
Developmentally appropriate	Used when a participant describes what they think or feel is appropriate for children at a certain age
Impact of reading on people's lives	code used to mark when a participants describes the impact of being able to read on people's lives
language acquisition	I use this when a participant expresses ideas related to the third lens of the NsLLT - language acquisition or language function
Learning to read is a hurdle	Code used to mark participants' comments about the challenges of learning to read
Literacy is emotional	in vivo code from Lisa's comments when she was describing her thinking of literacy
Mulitiple paths to learning to read	Code used when participants describe their belief that there is not one way a child acquires literacy
Parents have different beliefs	used when participants discuss their beliefs and experiences about parent perspectives
Purpose of literacy	this describes comments related to the purpose of literacy or reading
Reading is a mystery	Code used when participants commented on the difficulty in truly knowing how people learn to read
Teacher's prior knowledge_experience	Lisa referenced the importance of tying new learning to teachers' prior knowledge and experience in her phase 3 interview

Name of Code	**Definition**
Teaching v Learning	Used when a participant adopted a particular perspective when sharing thoughts on how literacy is acquired through various strategies and interventions and due to certain influencing factors
Theory to practice enactment experiences	Used anytime a participant referenced an event when they have used theory in practice or described factors in supporting or preventing shifts in beliefs

Appendix D

Sample Tools of the Mind Make Believe Play Plan

Retrieved from https://toolsofthemind.org/learn/what-is-tools/ on February 14, 2021.