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Kindergarten Teachers' Perceptions of Barriers English Language Learners Face in Mathematics

Martha A. Franklin
Walden University

Walden University

COLLEGE OF EDUCATION

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Martha Franklin

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Eric Riedel, Ph.D.

Walden University
2013

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Abstract

There is a disparity of mathematics achievement between native English speakers and English language learners (ELL). This study sought to understand the barriers ELL kindergarten students faced in being successful in mathematics. The purpose of this qualitative, instrumental case study was to explore kindergarten teachers' perceptions regarding English language learner's access to the mathematics curriculum and instruction. The conceptual foundation for this study drew from social development theory, which contends social interaction using language is necessary for cognitive development such as learning mathematics concepts. Individual interviews of 8 kindergarten teachers were conducted to understand kindergarten teachers' perceptions of the barriers ELLs face in accessing the math curriculum. The interviews were recorded, transcribed, and categorized using typological analysis. Answers to the interview questions were segregated into the categories of professional development, needs of students, and base mathematics program materials. The central finding was that the base program was perceived as a barrier for ELLs. Evaluation of the existing mathematics curriculum for effectiveness is recommended. This study may contribute to social change by increasing educator and stakeholder awareness of the barriers ELLs face in accessing the mathematics curriculum. This study also provides guidance to policymakers and educators information to develop culturally competent mathematics instruction, thereby assisting ELL students in overcoming barriers to learning mathematics.

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ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

Dedication

To my God and Advocate: I asked you to help me move this mountain, and I woke up with a shovel. It was a lot of work, blood, sweat, and tears, but You were right there with me the whole way. I want you to know I recognize that I could have never done this work without Your intervention. Now, I ask that the purpose in our work together be fulfilled. Let's move on to the next journey!

This research study is also dedicated to the two most important men in my life.

To my son, John Dillon Bruce: You have been a source of support and inspiration for me. Thank you for being flexible on all the stay-at-home Saturdays. I love you, John!

To my husband, Jim Pandol: You gently nudged and encouraged me to grow beyond my dreams. Thank you for being the wind beneath my wings. I love you, Jim!

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To those teachers who participated in this study: Thank you for giving your time and effort to provide a voice for all teachers. The sharing of your wisdom and experience could have a great impact for positive social change.

To Walden University: I would never have had the opportunity to pursue my dream without the online classes and quality instructors. I thank all people at Walden, from course developers, instructors, fellow doctoral candidates, writing center tutors, to tech support.

To my doctoral committee: Thank you to Dr. Margaret Rowe, Dr. Theresa McDowell, and Dr. Thomas Cavanagh. Each of you were instrumental in the development of my learning and my research study. Peggy, you were there in the beginning when my ideas were bouncing around in my head. Thanks for helping me with clarity and focus. Theresa, you helped me fine tune my points and gave me many practical ideas. Dr. Cavanagh, thank you for your expertise in methodology. Your influence guided me to put my study together in a meaningful way.

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Section 1: Introduction to the Study

Introduction

English language learners (ELLs) comprise approximately 25% of the student body in California classrooms in preschool to Grade 12 (California Department of Education [CDE], 2009). This subgroup historically has not performed as well as English proficient students in the area of language arts and math (CDE, 2009). State departments of education, districts, and schools are under pressure from high-stakes accountability testing due to sanctions for underperforming schools and rewards to achieving schools from the U.S. Department of Education (USDE; 2006 , 2009, 2011a). The USDE pushes schools to raise the achievement scores of all students under the No Child Left Behind (2001) Act. When searching for literature, I found few studies seeking to gain teachers' perspectives on factors ELLs face in learning math.

In this qualitative research study, I sought to understand teachers' perceptions of the barriers ELLs face in accessing the math curriculum. Earlier researchers have emphasized the important role language plays in math achievement (Diaz, 2008; Mix, 2008; Sarnecka, Kamonskaya, Yamana, Ogura, & Yudovina, 2007). Other researchers have found early mathematical foundations affect later math achievement (Duncan et al., 2007; Jordan, Kaplan, Lucuniak, & Ramineni, 2007; Jordan, Kaplan, Ramineni, & Lucuniak, 2009; Lucuniak & Jordan, 2008; Mazzocco & Thompson, 2005). Students who had low math achievement in kindergarten had low math achievement in first grade, second grade, and third grade and students who had proficient and high math achievement in kindergarten maintained high achievement on up through later grades

(Jordan et al., 2007; Jordan et al., 2009). Because early math achievement and language play important roles in later math achievement, gaining an understanding of kindergarten teachers' perceptions of the factors that create barriers to ELLs' access of the math curriculum is the central quest for understanding in this qualitative case study.

First in this section, I provide a problem statement about the gap of math achievement between ELLs and English only (EO) students. Next, I describe the purpose of the study. After that, I define the research questions encompassing one overarching question and three support questions. Then, I explain social development theory, which is the theoretical framework of the study, and show how it relates to this qualitative research study. Following, I offer definitions of terms, delimitations, and limitations of the study. I end this section with a description of the significance of this qualitative research study and how it adds to the body of knowledge of professional literature.

Problem Statement

National and state math scores show a disparity of achievement between English speaking students and ELLs. The gap of achievement widens between the two groups of students as the grade level increases (CDE, 2009, 2010; U.S. Department of Education, 2010). Research shows the gap of achievement is evident as early as kindergarten (Duncan et al., 2007; Jordan et al., 2007; Jordan et al., 2009; Lucuniak & Jordan, 2008; Mazzocco & Thompson, 2005). Kindergarten math achievement is a good indicator of the child's math success or failure (Duncan et al., 2007; Jordan et al., 2007; Jordan et al., 2009; Lucuniak & Jordan, 2008; Mazzocco & Thompson, 2005). It was my intent through this qualitative case study to understand what the stumbling blocks are for ELL's

math success in kindergarten. Some barriers to math achievement, not exclusively kindergarten, have been identified through surveying teachers with multiple choice surveys, short answer surveys, and a focus group (Aragon, 2009; Batt, 2008; Bunch, Aguirre, & Tellez, 2009; Fuller, 2004; Gándara, Maxwell-Jolly, & Driscoll, 2005; Hernandez, Herter, & Wanat, 2008). Thick rich descriptions from kindergarten teachers in this study provided fuller comprehension of the scope of the obstacles kindergarten ELLs face when attempting to access the math curriculum. The difference in math achievement scores between English speaking students and ELLs appears to display an inequality of access to the math curriculum. Identifying and understanding the barriers ELLs face in accessing the math curriculum is a step towards dismantling those barriers so all students have equal opportunity for math achievement.

Number Sense

National Council of Teachers of Mathematics (NCTM) acknowledge number sense is "one of the most important accomplishments for young students" (NCTM, 2006, p. 5). Kindergarten students have number sense when they connect counting the number sequence to quantity, know the relationship of quantity between numbers, and understand numbers can be broken into smaller parts and reconstructed whole again. Understanding these ideas with smaller numbers extends to larger numbers and knowing place value in following grades. The number sense students develop in kindergarten build the foundation for constructing number understanding in future years.

Nature of the Study, Research Questions, and Research Objectives

I designed this qualitative case study to explore, discover, and understand kindergarten teachers' perceptions about the barriers ELLs face in learning mathematics. Another objective of this study was to provide a venue for kindergarten teachers who work with ELLs to voice their views. I realized both of these goals.

My goal for this qualitative case study was to interview 5 to 15 kindergarten teachers. I invited 21 kindergarten teachers to participate in this research study; nine teachers accepted, and eight participated. Each participant met the requirement of having at least 30% of his or her students identified as ELLs. In this qualitative case study, I used typological analysis to analyze and generalize responses to the research question.

Research Questions

What are kindergarten teachers' perceptions of the barriers ELLs face in accessing the math curriculum? Specific topics investigated were:

1. What are the factors related to ELL students' successes and struggles in kindergarten mathematics curriculum and instruction?
2. In what aspects do kindergarten teachers perceive they are prepared in meeting their ELL students' struggles in mathematics?
3. What additional resources, support, or professional development do kindergarten teachers perceive they need in order meet the challenges of providing ELLs access to mathematics curriculum?

Participants were interviewed individually using five open-ended questions that allowed them to express their ideas and opinions about the barriers ELL students face in accessing the mathematics curriculum. I discuss the research design in greater detail in Section 3.

The focus of this case study was to contribute to the research literature in regards to ELL education and early mathematics education. Thick and rich descriptions of kindergarten teachers' opinions and perceptions about ELLs' barriers to math education is an area of research not found in recent reviews of literature. Teachers interact daily with students during the school year. Every day they have opportunities to design, modify, observe, and reflect on students' learning, the effectiveness of curriculum, and teaching strategies. Kindergarten teachers and their perceptions are an uncultivated source of knowledge for curriculum designers and administrators.

Purpose of the Study

The purpose of this case study was to explore and understand kindergarten teachers' perceptions of the barriers ELLs face in accessing the math curriculum. I interviewed kindergarten teachers whose class demographics contain at least 30% enrollment of ELLs. I tailored questions around themes discovered in previous research by Aragon (2009), Batt (2008), Bunch, Aguirre, and Tellez (2009), Fuller (2004), Gándara, Maxwell-Jolly, and Driscoll (2005), and Hernandez, Herter, and Wanat (2008). The goal of this qualitative research study was to expand upon previous research to seek fuller comprehension of the difficulties ELL students must overcome in order to access the math curriculum equally.

Conceptual Framework

The theoretical framework of this study was social development theory (Vygotsky, 1978). Social development theory holds that social interaction is fundamental for developing cognitive processes. According to Vygotsky (1978), social interaction precedes development. Another theme in social development theory is called the zone of proximal development (ZOPD), which is the distance between students' capacity to perform a task under adult supervision or with peer guidance and their capacity to do a task independently (Vygotsky, 1978).

Vygotsky's (1978) social development theory maintained that humans use speech to internalize concepts such as constructing math concepts. If language is a barrier to learning concepts, as it is for ELLs, then internalizing mathematical concepts is slowed. If, according to Vygotsky, social interaction precedes development, then opportunities for students to interact with others about math enhance mathematical concept development. An ELL student's ZOPD in English language development is identified on the California English Language Development Test CDE, 2002). The CELDT is a required test for students who speak a language other than English to determine their level of English proficiency (CDE, 2010). Guiding ELL children to use math language that is just above their CELDT level will improve mathematical development (Vygotsky, 1978).

Social development theory and ZOPD relate to the research question in that it is unclear how math language or the use of math language is a barrier for those students to gain access to the math curriculum. It was a goal of this qualitative case study to investigate kindergarten teachers' perceptions of language and mathematics in regards to

ELLs. In California, teachers are expected to know the CELDT level of each of their ELLs (CDE, 2002). Teachers in California must also know language structures and vocabulary needed to advance children at each level (CDE, 2002). A strategy for developing student mathematical understanding may be to use students' interactions with each other in guided math conversations (Bresser, Melanese, & Sphar, 2009; Walshaw & Anthony, 2008).

I chose and reviewed existing literature through the lens of social development theory. The first part of the literature review describes accountability pressures teachers are under to provide all students access to the core curriculum. The second part of the literature review compares six previous studies which investigated teachers' perceptions of challenges and preparedness in supporting ELLs. The literature reviewed in relation to the research questions about math content are foundational mathematics content, cognitive development, influences on mathematical development, mathematical teaching-learning paths, standards curriculum and assessment, early childhood professional development, and recommended future directions.

Operational Definitions

Cardinality: A concept of understanding the quantity in a group (NCR, 2009) and not necessarily attaching a spoken or written symbol to it yet. When two balls are hidden and then one is found, and a toddler continues to search for the other ball, then that toddler is said to have cardinality of that number (Sarnecka & Carey, 2008). I use this term to illustrate in my study that very young children do develop math concepts before

entering kindergarten. ELLs entering English only kindergartens have cardinality of small numbers but do not have the English labels.

English language development (ELD): A label for instruction for students whose second language is English (CDE, 2002). ELD is taught as a separate subject to ELLs. Teachers interviewed in this study hold special certifications to provide ELD instruction and are required to teach ELD for 30 minutes each day.

English language learner (ELL): For the purposes of this study, I define an ELL as a child enrolled in the California school system whose first language is not English and who also has limited English proficiency as measured on the CELDT.

Explicit instruction: A method of preplanned purposeful instruction and interactions of teachers with students (National Research Council, 2009). Teachers in this study received professional development training in a method of explicit instruction called Direct Interactive Instruction. Teachers discussed the impact of explicit instruction on ELLs.

Mathematics teaching-learning path: Significant steps along a route of mathematical understanding on a certain topic. Each step along the route builds upon the previous understanding (NRC, 2009).

Number sense: Interconnected knowledge and understanding of magnitude, relationships, and operations of numbers (NRC, 2009). The foundation of number sense concepts are developed in kindergarten.

Assumptions, Limitations, Scope, and Delimitations

The focus of this qualitative case study was limited to the mathematics curriculum because it is underemphasized by parents and preschool teachers (Barbarin et al., 2008; Frede et al., 2007). Parents' attitudes about the importance of literacy preparation outweigh the importance of math when parents were asked open-ended questions (Barbarin et al., 2008). Parents think mathematics is simple, so they do not emphasize it with their preschoolers (National Research Council (NRC), 2009). In addition, a study of New Jersey preschool teachers reported teachers showed little support of children's mathematical development and did not use mathematical terms often in their instruction (Frede et al., 2007). Forty percent of the preschool classes observed in Frede et al.'s (2007) study were rated as good or excellent in quality in the Early Childhood Environment Rating Scale. Even in preschool classrooms deemed high quality, mathematics teaching and learning is comparatively uncommon (NRC, 2009). Other research (Farran, Lipsey, Watson and Hurley, 2007) showed a limited amount of timed devoted to the subject of mathematics in preschool curriculum. Math education of young children is underemphasized in early education classrooms (NRC, 2009). Other researchers have considered the importance of teachers' attitudes and beliefs about their roles and students in their classroom (Fang, 1996; Kagan, 1992; Stipek, Givvin, Salmon, & MacGyvers, 2001). In this qualitative case study, I desired to gain understanding of kindergarten teachers' perceptions of the barriers ELL students face when accessing the math curriculum.

The first school experience for many ELL children is often the kindergarten year despite other opportunities to enroll in early childhood programs like First Five, Head Start, and state-funded preschools which are available to low-income and language minority families (NCR, 2009). Kindergarten teachers are therefore the first formal observers of many ELLs' attempts in interacting with a math curriculum. This qualitative case study limited participants to include only kindergarten teachers because kindergarten is the earliest opportunity most formal teachers have to observe ELLs, and it is the grade where the gap of math achievement between ELLs and EOs is smallest.

While kindergarten teachers provide math instruction to all students in the classroom, the extent of this qualitative research study is limited to examining their perceptions of the barriers in instructing ELLs. ELLs are held to the same standards as their English speaking counterparts (CDE, 2001; NCLB, 2001) and have the added challenge of learning English at the same time. As described in the introduction, ELLs make up 25% of the students in California classrooms and have historically performed below English speakers on standardized tests (CDE, 2009). If changes to ELL instruction are implemented without understanding the views of the kindergarten teachers, it could lead to resistance (NCR, 2009). My goal for this case study was to understand kindergarten teachers' perceptions about factors that create barriers to ELLs' accessing the math curriculum in order to influence changes to curriculum or classroom practice. My goal was for teachers' views to be expressed and understood by those who decide education policy and curriculum.

The methodology chosen for this research study was a qualitative case study. I used individual interviews to collect data. This case study collected responses to questions about ELLs from eight kindergarten teachers. The participants' work places are located in a large valley covering an area of 22,500 square miles. Within this valley are 10 metropolitan areas that have populations between approximately 165,000 to 2 million people, but much of the valley is rural and agricultural. Ideally, participants would have been randomly selected throughout the valley in order to achieve a good breadth of the views of kindergarten teachers. Instead of random selection, I relied on a local education agency for contacting kindergarten teachers for the interviews. According to Creswell (2007), this sampling strategy saves effort but at the expense of information and credibility.

This case study is also limited to data analysis and interpretation by me and is sure to include biases in some form. In section 5, I discuss my background and experiences which could have influenced the interpretation of the data. In a brief synopsis for now, I have 25 years of experience as a public school educator. Most of my experience has been in the primary grades, including kindergarten, and working with ELLs. Part of my experience as an educator was a position as an academic math coach where my job was to provide professional development for teachers. I have my own knowledge of curriculum, early childhood development, ELLs, and teacher professional development, which adds to the perspective of this study.

Significance of the Study

According to the U.S. Census Bureau (2009), non-English speaking households comprise 39% of the population. ELLs are a subgroup whose scores did not meet California's statewide accountability system's Adequate Yearly Progress (AYP) growth target. The AYP is the "measure by which schools, districts, and states are held accountable for student performance under Title I of the No Child Left Behind Act of 2001" (Education Week, 2004, Adequate Yearly Progress, para. 1). A subgroup is a category of students whose scores are specifically examined for growth. My goal for this qualitative case study is to understand teachers' perspectives of the barriers ELLs face in math in order to change the path for those students who may not be as far along the number sense learning path when they start kindergarten as their peers with middle-income, European American, and English-speaking backgrounds. The reason for the focus on number sense is that number sense is the best predictor of later math achievement (Jordan et al., 2007; Jordan et al., 2009). Since 81.1% of children go to kindergarten (USDE, 2007), this study focused on kindergarten curriculum and not preschool curriculum for a wider effectiveness.

According to the California mathematics standards, teachers are expected to differentiate instruction so each child has access to the curriculum (CDE, 2006). State approved mathematics programs are required to offer lesson adaptations, suggestions, and additional materials to provide ELLs access to the curriculum (CDE, 2001). The California math frameworks indicate that teachers are to differentiate instruction for ELLs but do not specify what materials teachers are to use to supplement instruction (CDE, 2006). In this qualitative case study, I sought to gain understanding of kindergarten teachers' perceptions, challenges, and professional development needs in using state-adopted math materials. If the teachers chose not to use the provided ELL materials, I wanted to understand why and to know what the teachers were using to supplement their instruction. If the teachers were using the state-adopted math program, I desired to know and to understand what aspects of the program were helpful or challenging. Insights gained from this qualitative case study could possibly impact publishers or professional development providers so kindergarten teachers could be more effective in their math instruction to ELLs.

Summary and Transition

ELLs make up at least one fourth of the population in California schools. ELLs have scored consistently lower on math achievement tests than EOs despite increases in overall test scores. The gap in achievement still remains. Some studies have inquired of teachers their greatest challenges and professional development needs in serving ELLs in their classrooms. While these studies have identified some major themes, they do not go into depth. Kindergarten is the starting point for many ELL learners. One key to unlock

the puzzle of why there remains an inequality of achievement in mathematics between English speakers and ELLs is to understand kindergarten teachers' perspectives of the barriers ELLs face in accessing the math curriculum.

The next section begins the literature review by describing accountability pressure teachers are under to raise achievement scores for ELLs. Included in Section 2 is a review of six studies in which researchers have inquired teachers about their challenges, experiences, and professional development needs in teaching ELLs. Five of these studies focus on ELL content strategies only and do not focus on a particular subject area. One study focuses on ELLs and mathematics instruction but not at a particular grade-level. The third part of the section includes a review of literature about the development of young children's math concepts and how language plays a key role in that development.

Section 3 on methodology follows the literature review. I explain and justify the qualitative research design chosen for this study. I describe the context and setting for the case study and give details about the criteria for selecting the participants. I also discuss data collection procedures and how I analyzed the data.

Section 4 begins with descriptions of how I collected and analyzed the data. I include explanations about how I tracked the data and detail how understandings emerged from the data. I discuss one discrepant case in the data as well and describe patterns, relationships, and themes found in the data.

Section 5 contains discussions, conclusions, and recommendations for this research study. The section begins with an overview about how I conducted the study. I review the research questions as well as provide a brief summary of the findings. I

discuss interpretation of the findings and their implications for social change. I make recommendations for action and further study. I also provide a reflection of my experiences of the research process and a concluding statement about this qualitative research study.

Section 2: Literature Review

Introduction

In order to address the research questions presented in this qualitative case study, I reviewed relevant literature regarding teachers' perceived challenges and perceived preparedness in delivering grade-level curriculum to ELLs. I also reviewed recent research in young children's math learning. The purpose of this qualitative case study was to discover kindergarten teachers' perceptions of challenges, preparedness, and needs for additional support in providing ELLs access to the California mathematics standard curriculum.

This section includes a review of literature divided into three distinct areas. The first part of this section describes accountability pressures that districts, schools, and teachers are under to close disparity of achievement between mainstream students and students with special needs such as ELLs. The second part of this literature review describes, compares, and analyzes literature from six previous studies which investigated teachers' perceptions of challenges and perceptions of preparedness in supporting ELLs. The third part includes a literature review concerning young children's mathematical development for background understanding of the connection between language and mathematical concept development.

I found many sources by searching databases including Teacher Reference Center, ERIC, Education SAGE, and Education Research Complete using the key words *teacher* and *English learners*. I then applied related words in the abstract with the option to find them in scholarly-peer reviewed journals between the years 2005 and 2010. The

addition of the word *kindergarten* to the search engine revealed three results. I deleted the word *kindergarten* and added *math* to the key words, and the results revealed 18 sources. Using the keywords *kindergarten, math*, and *English learners* with all the same criteria as above revealed no results in the databases. Databases are like search engines in that both allow searching for certain criteria. Databases are purchased by libraries and are reviewed by librarians. I used the Walden University library database for this study.

A similar search for dissertations published within the last 5 years using the key words *teacher* and *English learners* revealed 126 results. The addition of the word *kindergarten* narrowed the results to seven. Deleting the word *kindergarten* and adding the word *math* to the search revealed eight results. Using all four words and phrases *teacher, kindergarten, math*, and *English learners* produced two results in the dissertation search.

There were no results in peer reviewed journals when I searched the databases for the key words *teacher*, *kindergarten*, *math*, and *English learners*. I found two results in the search for dissertations when using the same key words. Saturation was difficult to achieve because the key words together proved to be too limiting to attain enough literature to review. I found more results when I deleted one or more of the key words, thus reducing the restrictions.

I reviewed literature describing teacher's perceptions for supporting ELLs in all subject areas at various elementary grade-levels. I also reviewed research investigating young children's mathematical development and learning. Included in the research literature review are studies describing the connection between language development

and mathematical conceptual development. While the area of teacher perceptions regarding ELLs is not an unexplored area, recent research showed a lack of rich, thick qualitative descriptions of teachers' perceptions of challenges and perceptions of preparedness in supporting ELLs.

Literature Exploring Teachers' Perceptions

Background in Accountability Pressure

State Departments of Education are under pressure from the USDE to raise student achievement due to high stakes accountability resulting from No Child Left Behind Act (NCLB) (USDE, 2006, 2009, 2011a). NCLB is a federal law passed aimed at standards based education reform (Education Week, 2004). According to NCLB all students are to be performing at grade level by 2014 (USDE, 2011a). Proficiency at grade-level is determined by a formula based on state test scores for each school and district called Adequate Yearly Progress (AYP; USDE, 2011a). Smaller groups of students are categorized based on language, income, ethnicity, and disability, which are called subgroups. Subgroups, if not proficient, must meet growth targets called Annual Measurable Objective (AMO; USDE, 2006, 2011a). English learners are one of the subgroups identified (USDE, 2011a). Intended to pressure schools and districts to comply with NCLB, the federally required state accountability system must provide rewards and sanctions to schools that do not meet the AYP targets and AMO targets (USDE, 2011a). An example of rewarding based on test scores is when the USDE (2009) awarded California close to 6 million dollars with Teacher Incentive Fund Grant (TIF) to use for two specific districts that made achievement goals. An example of sanctions is when the

USDE (2009) sent a letter to the California Department of Education threatening to withhold 1 million of federal funds if certain regulatory requirements to raise difficulty of tests were not met. The USDE accountability of high stakes testing makes it necessary for states to identify local education agencies who are in need of improvement (USDE, 2006). States are given authority through NCLB to take control of a school that does not make growth towards getting out of Program Improvement(PI) Pstatus (USDE, 2011a).

Through another grant given by the USDE titled the Statewide Longitudinal Data Systems Grant, California developed the California Longitudinal Pupil Achievement Data (CALPADS; USDE, 2009). CALPADS is a system of tracking individual, classroom, school, and district test data. This tracking system makes it possible for administrators to check individual teacher's classroom test scores over several years, making it easier to single out and apply pressure to teachers whose classes have low scores.

Longitudinal data of student and class test scores can give information about which students are performing proficiently on state tests and which ones are not; however, such data does not explain why students are performing as they are or what is needed to improve scores. Teachers are held responsible through reported state test scores for providing students with knowledge and skills in order to meet the grade-level standards (Gándara, et al., 2005). Gándara et al. (2005) stated, "Yet seldom are teachers invited to share their experiences and their concerns with those who shape education policy" (p. 6). It is the goal of this qualitative research study to find out from teachers what the challenges are in getting ELL students proficient in math by the time they leave

kindergarten and to provide a venue for those teachers to voice their professional development and resource needs in depth.

Previous Research

The literature review for this qualitative research study describes six studies where researchers have asked teachers about their challenges, experiences, and professional development needs in teaching ELLs. The researchers in these studies used teachers' responses to surveys, open-ended questions on surveys, written responses to assessments, and a focus group to collect data (Aragon, 2009; Batt, 2008; Bunch, Aguirre, & Tellez, 2009; Fuller, 2004; Gándara, et al, 2005; Hernandez, et al, 2008). The major themes from these studies were that teachers report challenges from lack of parent support, insufficient English language development materials, the range of language needs in a classroom, and the professional development needs related training in strategies for meeting these challenges. While the researchers have identified these themes through quantitative and qualitative methods, in-depth descriptions by teachers about these themes have not been the focus of previous research.

Comparing Six Studies

Comparing purposes and data collection instruments. The central purposes for six these studies were to discover teachers' perceptions of preparedness in meeting the needs of ELLs, to identify challenges in meeting those needs, and to discover what are the professional development needs of teachers of ELLs (Aragon, 2009; Batt, 2008; Bunch et al., 2009; Fuller, 2004; Gándara et al., 2005; Hernandez et al., 2008). Batt (2008), Fuller (2004), and Gándara et al. (2005) used rated survey questions to investigate teachers' perceptions. Batt (2008) and Fuller (2004) included open-ended questions with their survey where participants could write responses. Bunch et al. (2009)

used teacher candidates' written responses from a teaching proficiency assessment called Performance Assessment for California Teachers (PACT). Hernandez et al. (2008) investigated teachers' perceptions of challenges and needs in instructing ELLs; the researchers gathered data using five small focus-group sessions. The literature search did not reveal any studies of kindergarten teachers' perceptions about meeting the needs of ELLs using in-depth interviews. In this qualitative research study, I aimed to describe in detail kindergarten teachers' perceptions about meeting the needs of ELLs in mathematics.

Comparing participants. The reviewed studies gathered data from teacher candidates (Bunch et al., 2009; Hernandez et al., 2008), novice teachers with less than 2 years of experience (Fuller, 2004), experienced elementary teachers in the classroom (Aragon, 2009; Batt, 2008; Gándara et al., 2005), paraprofessionals, administrators, and bilingual education coordinators (Batt, 2008). None of the studies reviewed specifically targeted an understanding of the perceptions of kindergarten teachers

Comparing study locations and number of participants. The studies reviewed were conducted in three states: California, Arizona, and Idaho. Four out of the six studies reviewed gathered data from participants in California (Aragon, 2009; Bunch et al., 2009; Fuller, 2004; Gándara et al., 2005). One study's participants were from Idaho (Batt, 2008) and the other's from Arizona (Hernandez et al., 2008). In the largest study, Gándara et al. (2005), surveyed 5,300 California educators from 22 school districts of various sizes. Though not randomly selected, the teachers reflected the state's demographics for gender and ethnicity. Batt's (2008) study gathered data from 161

participants who attended a bilingual educator's conference. The participants in Batt's study included 102 classroom teachers, administrators, curriculum developers, and paraprofessionals. The other studies reviewed had smaller survey samples ranging from 29 to 99 participants (Aragon, 2009; Fuller, 2004; Hernandez et al., 2008). Bunch et al. (2009) studied the fewest number of educators with eight participants. Due to the depth of description desired for this qualitative research study, I sought between 5 and 15 kindergarten teachers to participate in interviews. Kindergarten teachers were limited to a large southwestern state due to my proximity and to consider common state standards, which provided better comparisons of the responses within the predetermined categories.

Comparing subject areas in teacher responses. Bunch et al. (2009) focused on teachers' perceptions, challenges, and needs for providing instruction to ELLs in the area of math. The other studies asked teachers their perceptions, challenges, and needs for providing instruction to ELLs in all subject areas. Responses from teachers in the other studies were mostly in regards to literacy instruction. Studies investigating teachers' perceptions about ELLs were difficult to find. Literature searches focusing on kindergarten teachers' perceptions of ELL needs and mathematics yielded no results. In this study, I focused questions for kindergarten teachers in the area of mathematics.

Comparing teachers' perceptions of ELL training. Gándara et al. (2005) discovered that the more training and preparation teachers received, the greater confidence teachers had in meeting the needs of their ELL students. The teachers' desired professional development were training in knowledge of strategies for helping English learners access the curriculum and instruction on literacy and language acquisition

(Aragon, 2009; Batt, 2008; Bunch et al., 2009; Gándara et al., 2005; Hernandez et al., 2008). Fuller (2004) found that novice teachers felt workshops most helpful while on the job as opposed to preservice workshops. The most useful professional development training in English language development reported by novice teachers was collaboration with mentor teachers and academic coaches. The open-ended questions on Fuller's survey revealed participants viewed workshops provided by the school district as important to their preparation as their formal school training. Also identified in Fuller's study as helpful training for working with ELLs was on the job training and mentoring. Some participants identified colleagues, coaches, and school site bilingual education coordinators as helpful resources. Gándara et al. (2005) also found that the more training teachers received, the more they could analyze resources and the positive and negative aspects of materials intended to meet the needs of ELLs.

Bunch et al. (2009) investigated teacher preparedness for working with ELL students in the classroom by examining responses teacher candidates gave on the Performance Assessment for California Teachers (PACT). PACT is an assessment created and then approved in 2007 by the Commission on Teacher Credentialing as an alternative assessment for teacher candidates to show proficiency in Teaching Performance Expectations (PACT, 2011). The PACT requires candidates to submit various types of documentation such as video clipped lessons, lesson plans, student work samples, and written descriptions and analysis (Bunch et al., 2009). One of the competencies to master in the PACT assessment is, "know and can apply theories, principles, and instructional practices for English Language Development leading to

comprehensive literacy in English" (Commission on Teacher Credentialing, 2010, para. 6).

Bunch et al. (2009) collected data from the reflection portion of the PACT from eight teacher candidates who chose a math lesson for their teacher event. Bunch et al. focused on discussions regarding the challenges of math instruction to ELLs and what supports the candidates found helpful. The researchers used qualitative coding methods to analyze and categorize candidates' written reflections on the PACT. The categories for the strategies the candidates used involved (a) using a variety of representations in math lessons to make vocabulary comprehensible, (b) providing structures for mathematical discourse and vocabulary use, (c) using of a variety of engaging participation structures, (d) connecting to students' prior knowledge, and (e) using the students' native language as a support (Bunch et al., 2009).

The teacher candidates reported challenges in delivering lessons to ELLs were due to poor behavior on the part of the students and that the students were unfocused and unmotivated. The other challenge was explained as instructional structures inhibiting learning such as poorly developed lessons or poor classroom management. Teacher candidates' views of ELD training in Bunch et al.'s (2009) study were different than the novice teachers' views in Fuller's (2004) study. Teacher candidates' reflections on preparation to teach ELLs focused on student attitude, class management, and practical resources like visual aids (Bunch et al., 2009). Novice teachers in Fuller's (2004) study reflected on the usefulness of on the job workshops and mentoring by colleagues and

coaches. Perhaps the differences are due to background knowledge gained through experience.

Comparing studies' findings in challenges. In the following section, I provide details about the studies' findings about challenges faced by teachers.

Parental support. These studies identified parent support and parent communication as major challenges to providing ELLs equal access to curricula (Batt, 2008; Bunch et al., 2009; Gándara et al., 2005; Hernandez et al., 2008). Families new to the country may not have the same cultural focus on a child's education as parents in the United States (Hernandez et al., 2008). Parents may not know how to support their children's literacy development at home (Gándara et al., 2005; Hernandez et al., 2008). If there is a willingness and desire to help children with homework, parents most likely do not have the language or literacy skills needed to help their children (Gándara et al., 2005; Hernandez et al., 2008). Sometimes parents new to the country do not use the supports in place, such as Healthy Start Program, that act as a resource for health issues such as glasses for reading (Hernandez et al., 2008).

Range of language needs. Another challenge for teachers was meeting the needs of ELLs due to the range of English language proficiency among ELL students (Gándara et al., 2005; Hernandez et al., 2008). Range of language proficiency is identified by students' score on the CELDT. Each range has its own nuances of language instruction to address (CDE, 2002). In California, a classroom may have students who are newcomers to the United States and speak little English but may or may not have had instruction in their native language. The same classroom may have socially proficient English speakers

who lack academic skills and language (Gándara et al., 2005). Teachers felt there was not enough instructional time to address each range in their classroom adequately (Gándara et al., 2005; Hernandez et al., 2008).

Other supports desired. Other supports desired from teachers with ELLs are more English language development support materials (Aragon, 2009; Batt, 2008; Fuller, 2004; Gándara et al., 2005). Materials desired include curriculum resources for developing English in ELLs (Aragon, 2009; Batt, 2008) and assessment tools (Gándara et al., 2005). Another result from Batt's (2008) study was that educators' desired more ELD specialists to perform consults, assistance, and resources.

Comparison of recommendations. In the following section, I compare the recommendations of the various studies.

Recommendations for teacher preparation. Recommendations to support teachers in instructing ELLs include access to supportive materials, teacher networking for the purpose of helping with ELL instruction, additional adults to assist teachers in the classroom, and language development. Gándara et al. (2005) recommended the development of a storehouse of existing English language development materials to assist teachers. They recommended assembling a statewide conference to address the issues raised by teachers. They also recommended providing teachers paraprofessional help to support students' understanding of content or to monitor part of the class while the teacher works with ELLs in small groups. Other researchers recommended Spanish language classes for teachers so they could gain insights about the difficulties learners

faced when learning another language and to support learning by enabling communication with students (Aragon, 2009; Batt, 2008).

Most of the studies recommended including sheltered English methods of instruction in teacher preparation programs (Aragon, 2009; Batt, 2008; Gándara et al., 2005; Hernandez et al., 2008). Hernandez et al. (2008) also recommended literacy instruction methods for all students and specifically for ELLs. Aragon (2009) recommended teacher candidates be prepared with a strong understanding of content and training in effective strategies to deliver content to all students including ELLs in teacher preparation courses. Batt (2008) agreed with the recommendation that teacher candidate programs include pedagogical strategies of content along with training on strategies to meet the diverse language levels in a classroom.

Batt's (2008) recommendations warrant the development of teacher preparation courses designed for preservice teachers to understand second language acquisition. Aragon (2009) and Batt (2008) also recommended that teacher candidates take Spanish classes so prospective teachers can understand what it is like to learn another language. Batt's (2008) rationale for this recommendation is that 20% of the participants the study had never tried to learn a second language, an experience that would help teachers identify with ELLs better. Batt argued that even though teachers may not become fluent in a second language, the teacher is able to identify with and appreciate the ELL student's culture.

Recommendations for in-service teachers. In-service teachers should continue professional development in sheltered English instruction and English language

development (Aragon, 2009; Batt, 2008; Gándara et al., 2005). Aragon recommended in-service teachers participate in professional development that brings about a teacher's cultural awareness of students. Gándara et al. echoed the need for teachers to identify culturally with their students. They recommended that teachers participate in teaching exchange programs. Aragon also recommended that ELD professional development be embedded in the daily lives of teachers instead of primarily in workshops or classes.

Recommendations for parent support. Hernandez et al. (2008) made recommendations for parent support and parent education programs designed specifically for immigrant families. The rationale for this recommendation was immigrant families are less likely to have access to books and learning resources at home. Hernandez et al. recommended the school office be the liaison to coordinate efforts between migrant families and schools.

Recommendations for ELL education policy reform. Most of Gándara et al.'s (2005) recommendations centered around changes for improvement in policy for ELL instruction. Gándara et al. recommended the governor of California and the legislature organize a state-wide summit to address the specific needs of English learner education. They also recommended that policy makers focus on changes in teacher preparation programs, changes in teacher professional development, and incentives to retain experienced teachers of ELLs. Next, Gándara et al. recommended a clearinghouse of materials for assessing and instructing ELLs be made available as a resource for teachers. In addition, they recommended a package of ELL program and school evaluation tools be developed for the purpose of assessing the effectiveness of ELL education. Finally, they

recommended a rigorous research agenda to discover the characteristics of the most effective ELL programs and how current approaches to ELL instruction can be improved.

Review of Literature about Young Children's Math Learning

Foundational Mathematics Content

Major tasks in number sense for young children are counting, relationships, and operations (CDE, 2006; NCTM, 2000; NRC, 2009, 2001) The NRC (2009) document describes the *number core*, which is a group of concepts young children need to develop and understand about numbers. Number core contains the following concepts: (a) a number communicates the quantity, (b) the number list, which involves the spoken word and the written word, (c) connecting the quantity and number list by 1:1 object counting and recognizing the special status of the last number counted means the quantity, and (d) the connection of the "number word list and the written symbols in the base 10 place-value system" (NRC, 2009, pp. 2-4).

The *relations/operations core* in the NRC (2009) document is described as how quantities are related to each other. Describing a quantity as *more than*, *less than* or *equal to* another quantity is comparing two or more quantities. The relations/operations core uses comparing quantities, combining quantities, and separating quantities in the context of story problems. These problems or situations involve the operations of addition, subtraction, multiplication, and division (Carpenter, Fennema, Franke, Empson, & Levi, 1999; NRC, 2009).

Cognitive Development of Math Learning

Cognitive developmental psychologists mapped out number knowledge and its starting points (NRC, 2009). Infants are able to distinguish quantities of small numbers, discriminate between more and less, and recognize addition and subtraction changes. This knowledge appears to be shared by all humans regardless of race or culture (Brannon, 2002; Brannon, Abbot, & Lutz, 2004; Cantlon & Brannon, 2006; Dehaene, 1997; Dehaene, Dehaene-Lambertz, & Cohen, 1998). This is a major change from previously held views which are mostly based on the work of Piaget's (1965) theory of conservation of number and the stages of cognitive development. *Conservation of number* is the understanding that the quantity of objects remains the same despite the objects being moved in different configurations (Piaget, 1965).

Previous Beliefs

Educators widely accepted that children's success at the Piagetian conservation task was necessary before any understanding of number could exist in the child (NRC, 2009). Piaget, a psychologist who did extensive research on child cognitive development, identified developmental stages. Children go through the same stages but at different rates, and no one skips stages (Piaget, 1965). Piaget noticed people pass through the stages gradually and that one stage forms the foundation to move to the next stage (Flavell, 1963).

The preoperational stage is characterized by a lack of logic and rational thought (Flavell, 1963). Children at this stage are not flexible in their thinking. Piagetian tasks have been developed to determine which stages children are in. One *conservation of number* task is to present a set of counters to a student and have the student determine the quantity of the group. Then the counters are rearranged without putting any on or taking any off. The child is asked, "Now how many are there?" If the child is in the preoperational stage, the child will not know (Ramos-Christian, Schleser, & Varn, 2008). The child must count them again because the child does not realize just moving the counters around would not change the quantity (Richardson, 1999). Teachers of children at this stage need to use lots of questioning to encourage students to think about quantities (Ojose, 2008).

In the concrete operations stage, children use materials to make sense of abstract math ideas. Children examine their reasoning through making connections between math

ideas and concrete things they can move around. Physical representations are needed to make math ideas meaningful (Flavell, 1963; Ojose, 2008).

Questioning Previous Beliefs

In the late 1960s and early 1970s researchers examined critiques regarding Piaget's *conservation of number* task. In their review of research, Mix, Huttonlecher, and Levine (2002) explained that the difficulty in the task is not attributed to lack of understanding of number. The reasons given are the verbal skills of *more*, *less* and *same* are too complex for young children and the questioning misleads the child. Mix et al. reviewed literature to describe children as able to show more competence if given the task without using words. Also, changing the format of the task by de-emphasizing the importance of moving the items resulted in children responding more appropriately on the task. Researchers have examined the number abilities of preschool children more recently and found the children to be more capable than previously thought under the influence of Piaget (Baroody, 1992; Baroody & Ginsburg, 1986; Fuson, 1988; Miller, 1992; Rittle-Johnson & Siegler, 1998).

Number Development in Children

Preschoolers can approximate when attempting to match quantities of sets of more than three. They cannot determine more or less with quantities that are close such as ten and eleven (Carey, 2004; Feigenson, Dehaene & Spelke, 2004; Spelke & Kinzler, 2007). Children's early learning of numbers is highly contextualized. Children need objects to count and within natural situations (Mix, 2008). Growth in children's numerical knowledge between the ages of two and six is greatly enhanced by the use of

cultural tools such as labels for quantities, written symbols, and learned solution methods such as counting (Klibanoff et al., 2006). It takes about a year for children to learn how the counting system represents numbers (Wynn, 1992). It is important for children to learn the language that goes with the abstractness of numbers (Sarnecka & Carey, 2008; Wynn, 1992). This means that four things, no matter what size, shape, or color, if grouped in sets of four, are labeled orally or written as four things. Understanding this point, students have access to numerical relations. Children understand that adding one more to a group of four means counting one more in the counting list, and the extra item results in a new quantity of the group (Sarnecka & Carey, 2008).

Influences on Mathematical Development

Income, gender, cultural background, second language learning, and parent attitude toward math learning are factors in a child's math achievement (NRC, 2009). The income level of families is a predictor of math achievement (Clements & Sarama, 2007; Knitzer & Lefkowitz, 2006; McLoyd, 1990). Mathematical skills of young children from low-income families lag behind those of their middle-income peers (Klein & Starkey, 2008). As a child with low socioeconomic status increases in age, so does the gap in math achievement (Clements & Sarama, 2007).

There is conflicting research about the effect that gender plays on math achievement (NRC, 2009). Jordan et al. (2006) found kindergarten boys had a small advantage in number sense, nonverbal calculation, and estimation. There have been more findings showing no differences in math performance with regards to gender (Aunola,

Leskinen, Lerkkanen, & Nurmi, 2004; Clements & Sarama, 2008; Lachance & Mazzocco, 2006; Sarama, Clements, Starkey, Klein, & Wakeley, 2008).

The trend in mathematics achievement for several decades has been that Hispanic and African American students' scores trail behind European American students' (National Center for Education Statistics, 2009). However, the Nation's Report Card (2008) showed that 9-year-old African American and Hispanic American students made greater gains in math than European American 9-year-olds. European American students made a 25 point gain since 1973, where African American students made a 34 point gain and Hispanic Americans made 32. A gap remains between African American and Hispanic American and European American students by about 23 points (Magnuson & Waldfogel, 2008).

Little research has focused on English language learners and mathematical performance (NRC, 2009). For other subject areas, researchers showed children who have English as a second language do not perform as well as their native English-speaking peers (McKeon, 2005). The California Department of Education (2009) reported overall ELLs scored 43% proficient or advanced in math, which fell short of the AYP target of 45%

Barbarin et al. (2008) investigated the attitudes of preschool parents who belong to a variety of ethnic and socioeconomic groups. Twenty percent of the parents surveyed spoke another language besides English in the home. Answers to open-ended questions about school readiness revealed literacy and language were mentioned at least 50% of the

time where math was mentioned only 3.5%. Parents do not view math learning at the preschool stage as significant because of its perceived simplicity (NRC, 2009).

Role of Language in Math Development

Language is important to mathematical development. Klibanoff et al. (2006) discovered a significant relationship between preschool children's mathematical knowledge and the amount of the teacher's mathematical talk. People in cultures whose language does not include an elaborate counting system are deficient in skills to represent number exactly (Gordon, 2004; Pica, Lemer, Izard, & Dehaene, 2004). Languages vary in the ways they represent mathematical concepts and thus influence how children learn mathematics. Children who speak a language that makes a distinction between one noun and more than one noun (for example using *s* on the end of *cats* to indicate more than one) learn the meaning of small cardinal numbers sooner than children whose languages do not make the distinction between singular and plural nouns (Sarnecka, Kamenskaya, Yamana, Ogura, & Yudovina, 2007). Experience with numbers and quantities in everyday life and in direct instruction are a great influence on number sense acquisition (Geary, 1995; Levine et al., 1992). The number sense children bring with them when they enter the kindergarten doors can predict math achievement in first grade and beyond (Duncan et al., 2007; Fuchs et al., 2007; Jordan et al., 2007; Locuniak & Jordan, 2008; Mazzocco & Thompson, 2005).

Teaching-Learning Paths

There is considerable variability in the timing of children's acquisition of skills in number. The stages or phases of number skills children maneuver through are the same

(NRC, 2009). The NRC's early childhood committee developed math goals in four steps and attached age ranges with the steps, acknowledging some children would be advanced and some would be behind. Step 1 defines math learning goals for ages two and three, Step 2 defines math goals for age 4 or prekindergarten, Step 3 defines math goals for kindergarten, and Step 4 defines math goals for first grade. These goals are desired and achievable at each age if children are given opportunities to learn and practice the number skills (NRC, 2009).

Four aspects of knowing number sense, which are culturally transmitted, are identified and described at each step, and they are (a) cardinality, (b) number word list, (c) 1-1 counting correspondence, and (d) written number symbols. The committee categorized children into four steps describing children's abilities in each of these aspects. Those steps are (a) children ages two to three, (b) children ages four or five but still in prekindergarten, (c) kindergarten, and (d) Grade 1 (NRC, 2009). Experts in the field of early childhood education have agreed on learning paths that are foundations for later math achievements, and those learning paths are achievable for all children if they are given the opportunity to be taught and practice those skills in numbers (NRC, 2009).

The NRC (2009) identified learning paths children pass through in number sense and geometry. They also recommended more research in the area of supporting ELLs in early childhood mathematics. Language is the means by which math concepts develop (NRC, 2009). In California, the language of instruction is English, and ELLs have an extra challenge of learning math content and language at the same time (CDE, 2006). Teachers have a challenge to know how to support ELLs, especially in kindergarten,

where the trajectory of math learning is launched (Duncan et al. 2007; Jordan et al., 2007; Jordan et al., 2009; Lucuniak & Jordan, 2008; Mazzocco & Thompson, 2005).

Students who are learning English and new math concepts at the same time create a special circumstance for instruction. Young children's mathematical learning has received much needed attention in the past decade. Historically, attention to young children's learning has been focused on social growth and language or literacy learning (Kowalski, Pretti-Frontczak, & Johnson, 2001; Lee, 2006). In 2000 the National Council of Teachers of Mathematics (NCTM, 2000) produced a document which included standards for school mathematics in prekindergarten for the first time. A report from the NRC (2001), *Adding it Up*, acknowledged the importance of the mathematical knowledge children bring to school. In 2005, the California state superintendent of public instruction announced a Preschool for All initiative along with assembly bills to provide for preschool learning standards (CDE, 2005).

Important learning outcomes in young children's mathematics have received more attention in the report *Early Childhood Assessment: Why, What and How* (NRC, 2008). However, the report *Mathematics Learning in Early Childhood: Paths toward Excellence and Equity* (NRC, 2009) went one step further than the previous reports. It provided an in-depth literature review and detailed teaching-learning paths to guide curriculum development and teacher professional development for children. This latest report highlighted a need to better support English learners.

Factors Influencing Math Learning

Infants from all over the world have the same starting points in number awareness (Klibanoff et al., 2006), but due to other influences in preschool years, children enter kindergarten in different stages of number knowledge (Brannon, 2002; Brannon, Abbot, & Lutz, 2004; Cantlon & Brannon, 2006; Dehaene, 1997; Dehaene-Lambertz & Cohen, 1998). Cognitive developmental psychologists are discovering that infants know more about number than previously thought. Universally, infants can make distinctions between quantities (Brannon, 2002; Brannon et al., 2004). Preschoolers build on this knowledge but still need to use objects to think about number (Mix, 2008). Adding labels and symbols to what children know about number significantly improves number sense learning. Knowledge grows as a preschooler gains experience with quantifying objects and language; however, not all children enter kindergarten with the same mathematical knowledge. Influences on mathematical development before a child enters kindergarten are as follows: socioeconomic status, possibly gender, ethnicity, English learners, attitudes of parents towards math learning, and native language conventions (NRC, 2009).

The early childhood committee commissioned by NRC (2009) to study how children develop mathematical knowledge identified young children's learning trajectories in mathematics and labeled them as teaching-learning paths. These goals are "foundational and achievable for all children in the designated age range for that step" (NRC, 2009, p.5-1). These teaching-learning paths help educators to create reasonable

standards, develop appropriate curriculum and instruction, and form informative assessments.

Language is the tool which fosters growth of mathematical concepts in children (Diaz, 2008). When teachers provide children opportunities to use language to communicate their mathematical reasoning, student math understanding increases (Warren, 2003). California kindergarten teachers are expected to know and understand the foundational and achievable mathematical goals for their kindergarten students (CDE, 2006). California kindergarten teachers are also expected to provide ELLs access to those mathematical goals (CDE, 2006).

Mathematics Learning in Early Childhood: Paths toward Excellence and Equity (NRC, 2009) recommended research to identify best methods of increasing mathematical learning of English language learners, especially in early childhood. Also included in the recommendations was a call for examining the role of teachers and teacher preparation. Number sense is the foundation of all mathematics, and language is the medium through which concepts in number are developed (Diaz, 2008). Without language for counting and numbers, humans do not develop complex number sense (Diaz, 2008).

Recommendations for Research

The reports from The Center for the Future of Teaching and Learning (CFTL) by Gándara et al. (2005) and the early childhood committee from the NRC (2009) both recommended further investigation of ELL instruction in the area of mathematics. The NRC recommended examining the role of teachers and professional development in early childhood math instruction and ELL instruction. The CFTL recommended a focused

investigation at the local school level because of the diversity of needs each school or district may have. The gap of mathematical performance between California's ELLs and English proficient students, the recommendations of the NRC and the CFTL, and research that showed how end of kindergarten math achievement predicts later math achievement (Duncan et al., 2007; Jordan et al., 2007; Jordan et al., 2009, Lucuniak & Jordan, 2008; Mazzocco & Thompson, 2005) all provided the rationale for this qualitative research study.

ELLs represent 25% of California's school children. Providing access to mathematical curriculum for ELL children presents extra challenges for teachers. My aim for this qualitative research study was to provide (a) an in-depth description of the most difficult challenges teachers face in kindergarten with ELLs and(b) teachers' views of their preparation, and (c) knowledge in meeting the needs of their ELL students. Teachers are directly involved in educating students. Asking teachers to describe their experiences and knowledge will provide insight for ways to help them improve instruction.

Analysis

Including a literature review about young children's mathematical knowledge provides a rationale and a lens of focus in this qualitative research study. Mathematical development in young children is underemphasized by parents and preschool teachers (Kowalski, Pretti-Frontczak, & Johnson, 2001; Lee, 2006), partly due to previous knowledge based on Piaget's (1965) theory that claimed young children were developmentally incapable of developing math concepts previous to entering school. Recent research has found young children are capable of developing more sophisticated

math concepts than previously understood when given experiences and supportive language (Baroody, 1992; Baroody & Ginsburg, 1986; Fuson, 1988; Miller, 1992; Rittle-Johnson & Siegler, 1998). Language development has been given more weight in the development of young children's math concept development (Klibanoff et al, 2006). This knowledge helped set the stage for the NRC (2009) to form a committee for mapping out young children's mathematical learning paths. What is now known from these recent researchers about young children's mathematical knowledge guided my questions in participant interviews and aided in analyzing qualitative data.

The next section is a description of the methodology for this qualitative case study. I detail procedures and criteria for choosing participants and gaining access to them. I also express ethical protection of the participants and data collection particulars. I include discussion of how I tracked, recorded, and analyzed data in this study. I explain procedures to ensure credibility and validity.

Section 3: Research Method

Introduction to Methodology

The qualitative research design of this research study is a case study method. The type of case study method chosen was instrumental case study which I will explain later in this section. For this case study, I used interviews to gather information from kindergarten teachers regarding their perceptions about barriers ELLs face in accessing math curriculum. I explain the criteria for participant selection, procedures for selecting participants, ethical protection of participants, and the role of the researcher later in the section. Last, I provide information regarding interview data collection procedures and analysis.

Qualitative Research Paradigm

I designed this qualitative research as an instrumental case study. Instrumental case study is "a particular case is examined mainly to provide insight into an issue or to redraw a generalization" (Stake, 2005, p. 445). Case study design often uses interviews with open-ended questions and questions the researcher develops in response to the participants' answers (Hatch, 2002). In this qualitative case study I collected interview data from open-ended questions posed to kindergarten teachers. Interview studies seek to give voice to participants and encourage participants to explain their perspectives (Hatch, 2002). For this qualitative case study I encouraged kindergarten teachers to explain their perspectives on the barriers ELLs face in accessing the kindergarten mathematics curriculum. I also encouraged the kindergarten teachers to explain their views on how best to meet those challenges.

I employed a social constructivist paradigm for this qualitative case study. Constructivists claim the truth is dependent upon the participants' perspective (Crabtree & Miller, 1999). In a study where a researcher utilizes a social constructivist paradigm, the researcher co-constructs understanding of an issue with the participants (Hatch, 2002). The philosophical underpinnings of a constructivist paradigm was a good match for the goal of constructing an understanding of kindergarten teachers' perspectives of barriers ELLs face in math. I asked open-ended questions of participants and also had an interactive conversation during the interview, based on kindergarten teacher responses. I will describe the research analysis protocol I used later in the section.

Research Design

In this section, I explain the methodologies I considered for this research study and provide a description and some defining aspects of instrumental case studies. Interviews were the means of data collection; therefore, I explain the rationale for choosing interviews through an instrumental case study as a suitable approach to answer the research question.

I considered several methodologies for this research study; however, the case study methodology design promised to be more effective in offering the exploration and understanding related to the research question. Quantitative studies could have provided similar results to existing research since most of the studies found for the literature review were quantitative surveys. Within qualitative inquiry methods, I considered narrative research, phenomenology research, ethnographic research, grounded theory, and case study methods. Narrative studies focus on the life of an individual, and ethnographic

studies describe how members of a culture work together (Creswell, 2007). Neither of these types of studies lends themselves to the focus of this qualitative research study. I considered a phenomenological research method because the focus is to describe the essence of individuals' experiences; however, in phenomenology research there is no explanation or analysis (Creswell, 2007).

I desired not only to describe kindergarten teachers' perceptions of the factors related to barriers to ELLs learning math, but I also want to participate in explaining and analyzing the data. Both grounded theory and case studies provide in-depth understanding, descriptions, and analysis. Grounded theory design dictates developing a theory which is grounded in the data (Creswell, 2007; Hatch,2002; Rubin & Rubin, 2005), and case study design is focused on understanding and explaining an issue or phenomenon as it relates to the research question (Creswell, 2007; Rubin & Rubin, 2005). The design and focus of case studies aligned best with the purpose of this qualitative inquiry into kindergarten teachers' perceptions of the barriers ELLs face in accessing the math curriculum. I collected data for this qualitative case study through multiple interviews.

I chose a case study design for this study because of the desire to move beyond identifying the challenges, experiences, and professional development needs of teachers with ELLs. Creswell (2007) defined a case study as "the study of an issue explored through one or more cases within a bounded system" (p. 73). The issue explored in this qualitative case study is barriers kindergarten ELLs face in math. The bounded system, or setting or context (Creswell, 2007), in this qualitative case study is public school

kindergarten with an enrollment of 30% or more ELLs. The sources of data in this case study were multiple in-depth interviews, which is an acceptable form of data collection in case studies (Creswell, 2005, 2007; Hatch, 2002; Rubin & Rubin, 2005; Stake, 2005). I selected several sites to conduct kindergarten teacher interviews.

Much of the recent research on teachers' challenges, experiences, and needs in teaching ELLs (Aragon, 2009; Batt, 2008; Gándara et al., 2005; Hernandez et al., 2008) identified challenges and professional development needs to provide ELLs access to the curriculum. The research reviewed (Aragon, 2009; Batt, 2008; Gándara et al., 2005; Hernandez et al., 2008) did not, however, provide detailed explanations or theories about teachers' perceptions of providing instruction to ELLs. For example, teachers reported that lack of parent support was a challenge in addressing the needs of ELLs in the classroom (Gándara et al., 2005); however, it is not specifically known what teachers meant by parent support when choosing it on a survey. Deeper inquiry into what kind of support teachers want from parents provides better understanding of the issue of parent support. It is not clear if language development, homework, concept development, better home-school communication, or something else are what teachers desire when they report parent support as a challenge.

The purpose of interviews in an instrumental case study is to find out what and why something is happening (Rubin & Rubin, 2005). In this case study, my goal was to understand through teachers' perspectives what barriers ELLs face in kindergarten math achievement and why the barriers are there. Other purposes in instrumental case studies are to consider what something means to the participants, what the participants believe,

and to elaborate on a broader meaning (Rubin & Rubin, 2005). My study aligns with this aspect of instrumental case study design because I pursued understanding kindergarten teachers' beliefs and attitudes about the struggles their ELLs are having during math instruction. I sought to address what factors increased or decreased ELLs' math success through the perception of the teachers. My hope was to discover causes and explanations and to make generalizations of barriers ELLs face in accessing kindergarten math curriculum.

Research Questions

The research question is: What are kindergarten teachers' perceptions of the factors related to barriers ELLs face in accessing the math curriculum? The following subquestions are related to the main research question:

1. What are the factors related to ELL students' successes and struggles in kindergarten mathematics curriculum and instruction?
2. In what aspects do kindergarten teachers perceive they are prepared in meeting their ELL students' struggles in mathematics?
3. What additional resources, support, or professional development do kindergarten teachers perceive they need in order meet the challenges of providing ELLs access to mathematics curriculum?

As each interview unfolded, I asked clarifying questions of the participants. I asked for more detailed explanations when one of the categories identified in previous researchers' studies was mentioned by the participant (Aragon, 2009; Batt, 2008; Bunch et al., 2009; Fuller, 2004; Gándara et al., 2005; Hernandez et al., 2008). These categories

include parent support, types of professional development valued, English language development materials desired, and classroom management of meeting the range of language needs. I met my goal in understanding participants' views about factors relating to barriers for ELLs in learning math. I asked participants to give detailed explanations about these categories and other categories when they appeared in the interviews.

Participant Selection

Purposeful selection was used to choose participants for this study. Purposeful selection means, "the inquirer selects individuals and sites for study because they can purposefully inform an understanding of the research problem and central phenomenon in the study" (Creswell, 2007, p. 125). I chose the participants in this qualitative case study if they could provide information about obstacles kindergarten ELLs encounter with the math curriculum. Kindergarten teachers with at least 2 years of experience and at least 30% of their student enrollment identified as ELLs were considered to have an understanding of the phenomena as it relates to the research question.

Creswell (2007) asserted no more than four or five cases are needed in a single case study because that number should provide more than adequate data to identify themes. Creswell also advised to "employ maximum variation" (p. 126) when choosing participants in order to gain a full perspective of the phenomenon. Hatch (2002) noted the number of participants in a qualitative case study depends upon the purpose, the type of study, and "the questions the study is trying to answer" (p. 49). Hatch explained the researcher must balance between depth and breadth of a study. The fewer participants a researcher uses means the more in-depth questioning and involvement with each

participant. In this study, I chose and interviewed participants until the data were saturated and no new ideas or themes became known. Eight participants participated in this instrumental case study.

Procedures for Gaining Access

I have professional relationships with district administration and kindergarten teachers at the school district where I work and reside. I communicated with district administration at the school district through email for cooperation in this research study. Once I obtained the letter of cooperation, I accessed the district website to acquire email contact information of kindergarten teachers for participation in this study.

The research study was conducted within a school district in a suburban city within a large agriculture based valley. For this qualitative research study I gathered interview data from several school sites located within this district. In this instrumental case study, kindergarten teachers at four school sites were represented.

Ethical Protection

The Walden University IRB board reviewed and approved this qualitative research study, approval number 03-27-12-0129266, before I made any contact with or request of participants. After receiving IRB approval, I sent a letter via email to prospective participants describing the purpose and content of this research study. The email conveyed information regarding the purpose, goals, privacy protection, commitment to prospective participants, and an invitation to participate. When the prospective participants agreed to participate in the study, they indicated in a response email that I had permission to contact them to arrange meeting with them.

I made contact personally through email and phone calls to arrange meetings with the participants. I communicated to the prospective participants that participation in this qualitative case study was voluntary. Often, teachers perceive researchers as their

superiors or they may feel "subtly coerced into participating" (Hatch, 2002, p. 67). I expressed a clear message to the participants that they are volunteers and could opt out of the research study at any time.

I conveyed the purpose of this study, described in section 1, to the participants. I made clear that the purpose of the interview was not to evaluate the teacher. Also, I plainly communicated that I would not report anything to administration unless the participant desired it and granted written permission. I told the teacher-participants they had the right to withdraw from the study at any time. I fully informed the teachers ahead of time that I would record the interview session and asked them to provide written authorization.

I respected the participants' busy and dedicated time as professionals by being punctual, organized, and committed to prearranged time limits. I conducted interviews outside of school business hours to protect the integrity of the participants' workday. I asked participants to reveal personal opinions and experiences about instructing ELLs in their classrooms. For many teachers, revealing their instructional habits and opinions can make them feel very vulnerable (Hatch, 2002). I reassured participants verbally and in writing that their privacy was protected. I changed or eliminated the names of the participants, schools, and district in the study in order to protect the anonymity of the participants.

Reciprocity in this qualitative study was very important to me. Hatch (2002) stated, "Reciprocity is an ethical issue in any research effort, but it is especially important when participants invest themselves in close relationships with the researchers and trust

them with sensitive information" (p. 66). Rewards for the participants included gift cards to a local coffee shop.

Role of the Researcher

I collected data through individual interviews, analyzed data, and wrote the summary of the findings in this qualitative research study. I directly arranged and conducted the interviews with the participants. I coded and analyzed data. Once the data was analyzed and generalizations were made, I conducted member checking sessions with some participants. The purpose of these member checking sessions was to ensure quality of the generalizations drawn from the data and gain additional input from the teachers. I established relationships with most of the participants since this was a first introduction between some of the participants and me. After initial contact was made, a meeting was arranged. An explanation of the goals, purposes, and commitments were reviewed. Thick, rich descriptions and explanations were desired for this qualitative case study. It was important for me to develop a good relationship with participants and confirm their input to this qualitative case study was valued.

I brought biases related to the study due to my experiences as a former kindergarten teacher, math curriculum coach, and 25 years of experiences with ELLs in education settings. I chose the research question, What are kindergarten teachers' perceptions of the factors related to barriers ELLs face in accessing the math curriculum because of strong opinions about how early mathematics curriculum is most effective. In addition, I have a strong belief teachers are rarely provided a voice in the creation of education policy. It has been my experience that most of the English language

development (ELD) training is mainly focused in the area of language arts and not mathematics. At least once a year for the past ten years, the school district where I am employed has provided ELD training but not once has the focus been ELD training in math. Some of the training has included strategies that are general ELD strategies and can be applied to math. The ELD training I have experienced has been onetime teacher training workshops with no follow up coaching. It is my opinion that follow-up coaching is essential to retaining and refining skills and knowledge acquired in the workshops.

In my experiences with state-adopted math textbooks, I have found ELL instruction components inadequate. To gain state-adopted status, a publisher must provide a universal access portion to their program (CDE, 2011a). English language development must be part of the universal access piece (CDE, 2011). I have experiences with training teacher in using the state-adopted mathematical base program which included the ELD universal access pieces. I found the universal access for ELLs incomplete in the state-adopted math text books. The supplemental lessons did not address the range of language needs for ELLs.

The California Mathematics Framework (CDE, 2001) calls for intervention groups to have extra instruction during the school day. This is in addition to whole group lessons. Managing the time to meet with small groups is a challenge, especially in kindergarten. Budget cuts threaten paraprofessional support in the classroom (California Federation of Teachers, 2011). It is my experience that kindergarten children are often off task if not directly supervised by an adult. This makes it challenging for the teacher to attend to a small intervention group. It is my experience that if the teacher is able to have

English proficient students independent for a time while meeting with small groups, the teacher will use that time for literacy support and not math. I have heard teachers say there is not time for both. Kindergarten has a four hour per day maximum instructional time in California (CDE, 2011b). This limits the time kindergarten teachers can meet students in small intervention groups.

My role as the researcher was to create the questions and conduct the interviews. The interviews contained open-ended questions and follow-up questions to clarify understanding. The researcher role included interpreting and analyzing the data as well. Consider my background and attitudes when reading the analysis of the data, conclusions, and recommendations.

Data Collection Procedures

After initial contact and information sharing with participants was made, a location for interviews was set for each participant. The participant chose a place where he or she felt comfortable. The only requirement for the meeting place was that it was quiet enough so the digital recording device can record the interview clearly. It was important to me that the participant felt at ease in order to be candid with responses to questions. Interviewing in a comfortable place is vital to the success of the interview (Hatch, 2002).

Hatch (2002) offers tips for successful interviews. Hatch (2002) suggests to begin with polite conversation, then signal when the interview is about to begin. Hatch mentions having a plan and purpose in mind for the interview will help keep the interview productive and on track. To assist in having an organized plan, open-ended

interview questions were given ahead of time to the participants. Giving participants the questions a before the interview gave them time to think deeply about their responses so the participants felt prepared and at ease in the interview. Most of the participants took advantage of having the questions ahead of time and wrote notes to aide during the interview. My aim was to actively listen during the interview and let the participant do most of the talking in this qualitative case study. Any additional questions asked by me during the interview were for the purpose of deeper understanding of a participant's response to an open-ended question. I am aware that it is important to make the interview feel like a natural conversation and not a cross examination.

Each participant interacted with me during an individual interview. The interviews were recorded on a digital recording device. The recorded interviews were transferred to a computer. The interviews were transcribed into written form as soon as all interviews were complete. The written transcripts were examined in order to look for emerging patterns and themes. My interpretations and generalizations were presented to the participants during member checking sessions. The participants were asked to provide comments and suggestions in order to verify interpretations and generalizations.

Data Analysis

After the conclusion of all interviews, the transcripts were read. Words and phrases related to the questions were highlighted then sorted into the predetermined categories and displayed in a table. The highlighted words and phrases were searched within each category for emerging patterns and themes. Themes were formed in each category and the data was manipulated again to place the words and data under the

category themes. Excerpts from the interviews were used to support the generalizations.

For this qualitative case study I followed the procedures of analysis for a case study as described by Creswell (2007), influenced by typological analysis as described by Hatch (2002). In typological analysis the data categories or typographies are predetermined (Hatch, 2002). In this instrumental case study the data was divided into predetermined typographies using common sense, which is an acceptable form of analysis (Hatch, 2002). The first step in analysis was to read the interview transcripts "to begin with a sense of what is there" (Hatch, 2002, p. 162). In this qualitative case study I read each interview without making any notes or highlighting any remarks and then reread the transcripts to desegregate the data elements into categories. Hatch (2002) refers to this step in typological analysis as "an early step is to read through the data set and divide it into elements (i.e., disaggregate it from the whole) based on predetermined categories (Hatch, 2002, p. 152). Hatch wrote the typologies for the study should be obvious if typological analysis is appropriate for a study. The selection of typologies was obvious to me because of my years of experience and background described in section 1 and earlier in this section. The apparent typologies surrounding ELL educators were professional development needs, needs of ELLs, base math curriculum, and ELL support materials. I read the interview transcripts many times. After the first reading, new insights, questions, perceptions emerged and was noted until saturation of categories was achieved.

In case study analysis, one category is to be identified as the "central phenomenon" (Creswell, 2007, p. 160). In this qualitative case study I referred to the

questions of the study to determine the typologies. As the data became saturated, one typology became prominent as the central phenomenon. The statements in the interviews have been highlighted with color by category. The purpose of color coding is so statements can easily be seen when searching the interview transcripts again after forming the central phenomenon of the study. Finally, after categorizing and analysis was completed, a composite of the experiences of the participants was written as guided by the descriptions of case study analysis (Creswell, 2007) and typological research analysis (Hatch, 2002).

Quality

I disclosed personal experiences and perceptions about ELLs and kindergarten math curriculum previously in this section. This is an attempt to reveal my notions and partialities about the topic. Take into account the my attitudes regarding ELLs math instruction in kindergarten when reading the generalizations about on participants' perceptions. Creswell (2007) states that clarifying the researcher's position from the beginning helps the reader understand the analysis from the researcher's position. I also took meticulous care to attain genuine responses from the participants. The procedures I took to attain genuine responses are described in section four.

The second way to assure quality and reliability of the study is to conduct a member checking session. Member checking involves taking the "data, analysis, interpretations, and conclusions back to the participants so they can judge the accuracy and credibility of the account" (Creswell, 2007, p. 208). This method of quality assurance was reported by Creswell to be the most credible. After the interviews were read, reread,

frames of analysis were made and coded, I conducted member checking sessions with some participants. My analysis and interpretations were written and distributed for the participants to read. The participants were given these prior to meeting in a member checking session. I provided my analysis and interpretations to participants before having them participate in a member checking session. This allowed the participants time to reflect and formulate clarifications. The participants were asked to clarify and comment on my analysis, interpretations, and generalizations. I took notes in a log during the member checking sessions. Changes were made to the generalizations according to the responses of the participants.

Section 4: Research Study and Analysis

Introduction

This section begins with an explanation of data collection and the systems for keeping track of the data. Next is a description of how I analyzed the data using qualitative analysis procedures from the resources "Qualitative Interviewing: The Art of Hearing Data" (Rubin & Rubin, 2005) and "Doing Qualitative Research in Education Settings" (Hatch, 2002). Then following the procedures of the study, I discuss the findings from the interviews and analysis. This section ends with how the quality of evidence was achieved.

Data Collection Procedures

The Walden University IRB required a letter of cooperation from the community research partner, a school district, before approval of this research study. I inquired at the school district whom I needed contact to obtain a letter of cooperation. The assistant superintendent is the person who makes decisions regarding the district's involvement with research studies. I emailed the assistant superintendent with a brief written explanation of the study and asked for a letter of cooperation. I attached a sample letter of cooperation and a PowerPoint presentation of the study proposal to the email. I received a letter of cooperation within 2 weeks of the request.

I obtained potential participants' names and email addresses through the district's website. It was important to find school sites with enrollments of 30% or more of ELLs to conform to the criteria for participation. Every school in this large southwestern state is required by state law to publish a school accountability report card (CDE, 2012). One of

the components of the accountability report card is to state the percent of total enrollment of ELLs in the school. I viewed each of the 24 elementary schools' accountability report cards and made a list of schools with 30% or more ELLs.

There are seven schools in the district with a 30% or higher enrollment of ELLs. On the district website, each school maintains a staff directory identifying teachers by grade-level and providing contact information. Being able to screen teachers by grade-level was efficient because only participants who teach kindergarten were intended for this study. The search on the district's website found there were 21 kindergarten teachers with 30% or more ELLs.

Twenty-one kindergarten teachers were emailed consent forms to invite them to participate in this study. Nine teachers responded yes to participation in the study, six responded no to participation in the study, and six teachers did not respond at all. One of the willing participants was ineligible because the participant criteria of having at least 2 years of experience teaching kindergarten was not met. The number of participants desired for this case study was dependent upon how many participants it took to saturate the data. That number was determined after several interviews and upon the determination that no new patterns or themes had emerged. I found the data was saturated after four interviews, however, I continued to interview all eight respondents because of their desire to participate and due to the fact that I gained deeper insight and richer details to the patterns and themes. Eligible participants received a copy of the interview guide (see Appendix A) for reviewing before the interview. The purpose of giving the questions

before the interview was to allow participants time to develop their answers and to relieve possible anxiety about what questions I was to ask.

A time and place to meet were arranged for the interviews by email and phone. Five participants chose to meet in the classroom immediately after official school hours ended. One participant chose to meet in my classroom and another participant invited me to her home to conduct the interview. One participant chose to meet at a local coffee shop. The times and places to meet were at the consideration and convenience of the participants.

It was communicated to participants that their time was valuable and all efforts would be made to be conscientious of the allotted time schedule. Initial greetings and pleasantries were brief because all participants were eager to start the interview immediately. The participants prepared themselves to answer the questions in-depth by writing notes on the interview guide provided for them. A $5 coffee shop giftcard was given to each participant as a token of thanks before beginning of interview. I reminded each participant the interview would be recorded on a digital recording device. They were also reminded anything said to identify them or their workplace would be deleted from the transcripts and everything they said was confidential.

I verbally checked with the participant for readiness to begin before turning on the digital recording device. When the participant confirmed readiness, I turned on the digital recording device. I began each interview by stating my name and identified the participant as interview and a number, for example, this is interview number three. Before asking any questions, I said the title of the study and the research question. I asked

each question on the interview guide allowing time for the participant's responses. At times, I would paraphrase or ask questions to clarify meaning. During the interview, I purposefully withheld comments in order to minimize bias. I asked questions and paraphrased to clarify understanding during the interview. After the third interview, certain concepts and patterns began to emerge in the data. I was careful not to vary from the interview guide. I was especially diligent not to instigate conversation about particular topics. If the participant did bring up topics that were emerging in the data, I was conscientious to ask questions for clearer understanding. Elapsed time for the interviews was between 10 and 20 minutes.

Systems for Keeping Track of Data

The digital recording device was connected to a personal computer in order to download the interview in an audio file. Each interview was saved as an audio file and titled. For example, the first interview was titled," Interview 1". No participants used names of individuals, schools, or towns during the interview so no deletions were necessary. A professional online transcription service was hired to transcribe the audio files to written transcripts. Transcripts were printed when all interviews had been transcribed.

"Qualitative Interviewing: The Art of Hearing Data" (Rubin & Rubin, 2005) and "Doing Qualitative Research in Education Settings" (Hatch, 2002) were used as guides in the analysis process. Recognition is the first stage of analysis (Rubin & Rubin, 2005) where concepts and themes are discovered. The interview transcripts were examined for words, phrases. and comments to place in the predetermined typologies. First, all

transcripts were read once without making any marks or notes in order for ideas, patterns, and concepts from participant's comments to become recognized. Next, all transcripts were read again and this time participants' remarks were highlighted when recognized as part of a pattern or concept associated with one of the typologies. "A concept is a word or term that represents an idea important to your research problem" (Rubin & Rubin, 2005; p. 207). The typologies were formed based on the research questions. Participants' answers relating to the research question, How prepared and supported to kindergarten teachers feel in effectively supporting English language learners in the math curriculum? developed into these broad categories: (a) professional development training, (b) base math program materials, (c) ELL support materials, and (d) teacher's suggestions. To highlight themes related to each concept, the transcripts were reviewed a third time. Similar remarks in response to questions from the interview guide were recognized, highlighted, and themes were created.

The next step in analyzing the data was to identify and mark the themes. Hatch (2002) describes the next step as "coding entries according to patterns identified and keeping a record of what entries go with which elements of your patterns" (p. 153). Rubin & Rubin suggest creating a brief label to designate each category then marking the category in the interview transcript each time the participant refers to that subject. After manipulating the words, phrases, and comments into predetermined categories, I reread the words and phrases within each category to find patterns and themes. I created a brief label for each theme within each category. I manipulated the words, phrases, and comments within the themes into a table with labels. I read the interviews again. Each

time a remark referred to a theme, I wrote the quote under the theme label. I identified the origin of the quote with the corresponding interview number (see Appendix B). Each theme had several quotes from the interviews after all interview data had been manipulated.

Discrepant Cases

One participant had slightly different experiences and perceptions about ELLs and math instruction in kindergarten from most of the other data collected. This participant was asked questions to clarify the perceptions. I asked questions of the participants until the position was clearly understood.

Findings

Since typological analysis was used in this instrumental case study, phrases and words from the interviews with the participants were placed in predetermined categories. The typologies teachers discussed in interviews were (a) what ELLs need in math instruction, (b) effective professional development support, and (c) effectiveness of base program materials. The interview questions were constructed to elicited responses around the predetermined categories regarding kindergarten teachers' perceived barriers for ELLs in accessing the math curriculum. Kindergarten teachers were asked questions about (a) what instruction strategies ELLs need in order to access the math curriculum, (b) what kind of professional development training have teacher received regarding ELLs in math, and (c) the effectiveness of the base math program and (d) ELL support materials.

Kindergarten teachers in this study share common beliefs about best practices to support ELLs in mathematics which are described in the following paragraph. Professional development training in Kagan Engagement Structures (Kagan) and Direct Interactive Instruction (DII) offered by the district was found to be more beneficial in helping teachers support ELLs in math than state mandated base program training.

Teachers were united in stating the base mathematics program does not offer enough practice to support ELLs in becoming proficient. In order for ELLs to become proficient in math, teachers must gather and choose supplement materials from other sources. The ELL support components in the base math program are not utilized often by kindergarten teachers. The participants expressed the ELLs often enter kindergarten without prerequisite skills to access the math curriculum.

Support ELLs Need

Teachers in this study hold beliefs that ELL kindergarteners need manipulatives, visuals, repetition, and native language support to aide them in meeting grade-level expectations in mathematics. “We do lots of modeling” was a common statement among kindergarten teachers in this study. Teacher’s said ELL kindergarteners need to physically move objects and their bodies while repeating the vocabulary of the lesson in order to gain meaning of the vocabulary and fluency in using the math language. Math concepts such as counting, sequencing numerals, attaching numerals to quantities, identifying more and less, adding, subtracting, and writing equations are acted out by students so the understanding intended for that lesson is comprehended. Teachers said ELL students need opportunities to manipulate objects to practice the math concepts taught in lessons. “Students need lots of visuals” and “Visual things are very important” were some remarks from participants. Visual support such as posters and lots of modeling help ELLs attain math concepts. Lots of repetition was emphasized by the participants as an important part of daily math lessons. The comments teachers made were “Students need lots of repetition” and “A lot of repetition is what we do in class”. Half of the

participants used the primary language of their students to communicate math concepts to the students. “Sometimes they don’t know how to respond so they tell me the sentence in Spanish and then I have them repeat it in English” said one kindergarten teacher. “I’ll do a sample in Spanish and then I’ll do it in English” said another. Two quotes form participants summed up the sentiments of all participants: “They need to be able to see it, hear it, and do it themselves.” “Provide lots of visuals, do lots of modeling, stay consistent with the language you use.”

Another vast opinion of the teacher participants was the view most ELL students do not enter kindergarten adequately prepared to learn mathematics. When asked what suggestions does the teacher have for teachers who provide math instruction to ELLs, all participants made suggestions that the ELL students do not have the prerequisite skills to begin kindergarten math instruction. Teacher’s supported their remarks with, “A lot of students did not go to preschool,” and “In many cases parents don’t talk to their kids. I’ve had kids who didn’t know their own native language.” Teachers said they attempt to counter-balance student’s unreadiness by providing background information and skills along with the kindergarten curriculum. “English-language learners need a lot of background and frontloading before teaching the lesson,” declared a participant. Another participant stated, “You have to frontload a lot. A lot of time is spent on formation of the number, what it looks like, how to make it, and what the quantity is.” Teachers also advised a teacher should not assume your students come in knowing prerequisite skills and to accept students as they come. A few participants suggested teachers try to relate to the student’s culture and lifestyle to new knowledge and vocabulary. And the best way

for ELL students to learn, suggested the teachers, is to get them moving, get them talking, and get them interacting with each other.

Professional Development

Kindergarten teachers in this study described the most helpful professional development training to support ELL learners has been Kagan and DII. Teachers' said, "I really enjoy implementing Kagan because students learn how to work together" and "Kagan structures do help a lot in supporting students' access to curriculum. What doesn't work is me standing up there and lecturing them." About DII, a participant said, "Having them hear me say what they're going to learn and have them repeat it to me. That part is working." Another participant stated, "I think the direct interactive instruction lessons really give the students a visual." "I feel going over the steps in DII, the I do, we do, you do has made a big difference." said one participant about Direct Interactive Instruction. One participant summed up her feelings about Kagan and DII by saying, "I think it has been a valuable thing for them so it makes me buy into that a little more because I do think it helps."

Half of the participants mentioned implementing aspects of Language Forms and Functions training and participation in Professional Learning Communities (PLC) was also valued. Language Forms and Functions is an instructional method where the teacher frames a sentence using academic language. Students are expected to use the sentence frame in context during the lesson. A teacher commented, "They need more sentence frames" and another participant said, "Yes, I use sentence frames but they do not lend themselves to every lesson." Some kindergarten teachers in this study meet together in a PLC each week to review math assessment results. "We bring our chapter tests, and we talk about all of them. Sometimes we decide we need another week of instruction." In

these PLC meetings teachers also discuss lessons and decide which ones meet the needs of their students best. Another use of PLC time a teacher said“ We make a list of who is not proficient yet and we make a plan on how we are gonna help those kids.”

Participation in the stated-mandated five-day base math program training helped in learning the mathematics base program components but did not adequately address targeting ELLs. “I went to the five-day training and I found out there were a lot of things that do support students in some areas, but it’s also lacking in some areas.” explained one participant. “The only training I received in the math program was to go to the district library and go through and introduction of the materials.” said another participant.

Kagan engagement structures. Kagan engagement structures are methods of instruction where students interact with the curriculum content and each other frequently. “Partner share helps if the low level English are paired with a higher level English speaker.” claimed a participant.Teachers said Kagan cooperative structures engage their students “and so they are responsible for keeping each other accountable. So, if they are not talking, the students will tell me ‘My partner is not talking to me’.” Participants claimed to have seen a lot of language growth in their ELLs due to implementing Kagan structures. “Kagan helps reinforce the meaning of the academic language and students get more comfortable with their peers in speaking English.” said a kindergarten teacher.

Direct interactive instruction. Participants have positive things to say about DII which is professional development training offered by Action Learning Systems. DII is professional development in systematic instructional design and delivery. Teachers said ELL students use academic language during the lesson when stating the objective.

Participants agreed that to have the ELLs repeat the standard did not have meaning for them, however; it was helpful to ELLs to practice academic language when repeating the objective of the lesson because there is a tangible action to attach to the academic vocabulary. To emphasize these points participants said, "The really good results are that the students really do know exactly what they are learning for that particular lesson," and "DII is a good structure to help the kids see what you are asking of them and so they feel like they are being successful." When talking about the use of language in a DII lesson, a teacher said, "For a kindergartener to repeat the standards, that, to me, seems too removed from meaning. They can state what the objectives are and know what their job is, and it is helpful." "It is super direct instruction and that is where they get the academic language," stressed a participant.

Attitudes about other professional development training. Participants' remarks about other training provided by the school district was positive but did not seem to have the impact on instruction and learning as Kagan or DII. The district is required by the state to provide professional development training in how to use state-adopted programs each time a new adoption occurs. The overall sentiment about these trainings was that while it is useful to learn the components of a program, the ELL components of the program are lightly examined. "Every time you go to a base-program inservice, they'll touch on what you can do for second language learners and it's always an afterthought," described a kindergarten teacher. Training focused on English language forms and functions was provided for the district's elementary teachers through local university professors. Some of the teachers in this study used an element of this training, sentence

frames, in their math lessons. The use of sentence frames was combined with the use of Kagan structures. Students are provided a question and response using academic vocabulary. Students take turns interacting with their partner asking and responding with the given sentence frame and academic vocabulary. Teachers' reasons for using sentence frames were. "Students need a lot of vocabulary to build their understanding," and "Language is very much a part of mathematics."

One type of helpful professional development, peer collaboration, was mentioned by several participants as helpful. Teachers expressed working together with grade-level peers before teaching a math chapter or unit to discuss use of vocabulary and lesson design was useful. Collaborating about results of chapter tests and unit tests proved helpful to participants. Teachers focus on students who are not achieving and then provide ideas on how to support those students. " We collaborate with peer teachers about math test data and create a plan to help those kids," explained one teacher. Using the school system's computer public drive to share curriculum maps, lessons, charts, and other materials was an vital way for grade-level partners to support each other in math instruction. Peer collaboration is not a requirement at all school sites but teachers who do collaborate found the process invaluable.

State-adopted Math Program

Some materials in the base math program and assessments were viewed as helpful in supporting ELLs towards grade-level standards. Participants expressed the flip chart and the big book was helpful because they gave visual support for math concepts and vocabulary. The student math book and the reteach support pages were viewed as

presenting the math concepts well for ELLs by most participants. Teachers valued the chapter assessments for informing instruction as evidenced by this quote, "Chapter tests are really helpful as formative assessments." Another participant commented about the chapter tests, "It gives you a chance to see if they are getting it." Some groups of teachers use the chapter and unit assessments to guide them in what vocabulary to focus on during lessons leading up to the assessments. "It lets you know what kind of vocabulary is gonna be on the test. We practice that vocabulary so they can understand the questions on the tests."

Areas of criticisms of the base math program include the amount of practice for a given math concept, lesson pacing, and confusing wording, and format. Teachers overwhelmingly agreed the state-adopted base mathematics program does not offer enough practice for ELLs to proficiently grasp math concepts. Teachers also mentioned the wording and the math problem format are often confusing to students.

More practice pages needed. The collective voice of kindergarten teachers said students need more practice. The base program provides about two worksheets to practice a concept according to participants. "You get maybe two pages on something and then it is off to the next," exclaimed a teacher. Teachers implementing DII lesson design use the following systematic lesson delivery method: teacher modeling (I do), shared work (We do), guided support (You do with support) and independent (You do alone). One teacher explained, "The base program gives only about two or three sheets. Each sheet has four problems. If I do, then we do, then you do, then they only get one problem to do alone. That doesn't give me enough information that they can do it on their

own so I have them do the other side. So, what do I have to use for tomorrow?" Teachers solve this problem by supplementing the math program with other things. Teachers pull in materials from previous math programs, commercially made items that teacher's purchase, or teacher-created worksheets and lessons.

Pacing is too fast. It is a mutual feeling among the participants that the base math program's lesson pacing is too fast. "Students need a lot of time to process," explained a teacher. "Our base program goes very quickly through the math concept so you really have to do a lot of white board work, one to one, and small group work. It's really lacking." stated another participant. Teacher's attempt to solve the fast pacing problem by supplementing students with extra work. "The pacing is too quick. I find that I have to supplement with materials other than the base program" voiced a teacher. One kindergarten teacher explained it like this, "On one page they were asking the children to add and the next page to subtract. So, teachers are making their own copies and supplementing." Teachers also attempt to solve the pacing problem in grade-level collaboration meetings. One participant explained that her grade-level group had years of experience with the program and working together. They know students are going to need more time on some concepts than allotted by the program. The teachers plan the chapter or unit together, building in more instructional time for those concepts and skimping on easier concepts.

Confusing language. The other objections about the base math program are that the words and the format of some lessons and assessments are confusing. One teacher explained, "Before I teach, I go over the assessment and I see the wording they use

because some of the words are not in the daily work." During an interview, a participant demonstrated how the pictures in an assessment lent themselves to misinterpretations. The format of the assessment is sometimes different from daily work. Teachers claimed this can be confusing to students who rely on visual cues due to language deficiencies. Teachers liked using the flip chart because of the visual support for ELLs. There is a student workbook that matches the format of the flip chart but it is not included in the given base program. Participants said the student handbook that is provided with the base program has a different format from the flipchart. Participants communicated it takes extra instructional time to clear up confusions due to the format differences.

ELL support materials. The participants had mixed reactions and usage of the base math program's ELL support pieces. Comments ranged from, "The Universal Access page is a good one" to " I have used Universal Access piece a couple of times" to "I've not really focused on the Universal Access part of it." When asked about the English Language Resources book, teacher's feedback was also a mixture of positive, negative, and apathetic. Teacher's said positive things like, "I like how the lesson flows a lot better and how it has reinforcements," and "the ELD book goes really well with developing vocabulary" The negative comments were "I have been frustrated with the ELD book because it's hard to use" and "I have used it some but I haven't found it helpful this year." One teacher gave reasons why the ELD pieces have not been overall successful in her classroom when she said, "I have used it a little bit, but not so much. With 29-30 kids it becomes tough to pull small groups. With DII and Kagan there's no time to sit down in small groups."

Discrepant Case

One participant expressed some different perceptions about the role language plays in math concept development. Seven of the eight participants relayed language and vocabulary development was an important part of student's mathematical understanding and skills. The discrepant participant stated, "They don't really have to express themselves verbally, language wise, on number sense." The teacher expressed math was visually supported and students use manipulatives to solve problems, therefore; students understood math concepts and could perform math skills without having to use language.

Evidence of Quality

Each participant was asked each question on the interview guide to ensure consistency in participant's responses. To check for understanding, I would paraphrase or ask questions to clarify meaning. During the interview, I purposefully withheld comments in order to minimize bias. I asked questions and paraphrased only to clarify understanding. After the third interview, certain concepts and patterns began to emerge in the data. I was careful not to vary from the interview guide so I would not encourage the topics to emerge. I was especially diligent not to instigate conversation about particular topics. If the participant did bring up topics that were emerging in the data, I was conscientious to ask questions for deeper understanding.

I presented my findings, analysis, and interpretations to two participants for the purpose of checking for accuracy. Each member checking session was conducted separately. Both participants stated they agreed with the analysis and interpretations of the data. In particular they again emphasized the vocabulary in the base program "jumps

around" and there needs to be "less vocabulary" so as not to confuse students. Participant members stressed it was important for the teacher to be purposeful in selecting the vocabulary to use for each lesson and to be sure the assessments used align with the vocabulary taught in the lessons. One participant member pointed out the importance of focusing on the standard of the lesson by stressing, "It's also important to keep the standard in mind at all time to discern which language leads them to meeting the objective in the best way." The need for more repetition and practice was reemphasized during the member checking sessions with both participants. One participant member stated the base program was not a "lost cause" because there were many good components to the program and in fact liked the program very much. The member pointed out the need for the teacher to be choosy in the lessons and vocabulary. The consensus in the member checking sessions was that the analysis and interpretations of the data were "definitely on the right track." The next section will give an overview of the purpose of the study, review research questions, and summarize the findings.

Section 5: Discussion and Recommendations

Introduction

This section begins with an overview of the study and a summary of the findings. Next is an interpretation of the participants' comments in relation to the research question, What are kindergarten teachers' perceptions of the barriers ELLs face in accessing the math curriculum? I discuss the implications for positive social change as well as recommendations for action based on the findings and interpretation of the data. This section concludes with a reflection of my experiences in the research process, changes in thinking as a result of this study, and concluding statements.

Overview

The purpose of this study was to gain a deeper understanding of kindergarten teachers' perceptions of the barriers ELLs face in accessing the math curriculum. Twenty-five percent of the California K-12 school population are ELLs (CDE, 2009). This population group has historically underperformed on state achievement tests compared with their English proficient counterparts (CDE, 2009). A review of research literature found early foundations affect a student's academic path (Duncan et al. 2007; Jordan et al., 2007; Jordan et al., 2009; Lucuniak & Jordan, 2008). Also discovered in a review of research literature was the important role language plays in developing math concepts (Diaz, 2008; Mix, 2008; Sarnecka, Kamonskaya, Yamano, Ogura, & Yadivina, 2007). I found some studies which investigated teachers' views on the needs of ELLs. Few studies investigated ELLs' needs in accessing the math curriculum. These few studies were limited to answer choice surveys and some short answer surveys. One study

involved focus groups. No research studies investigated ELLs' access to kindergarten math curriculum, and none asked the teachers to provide in-depth insight into what obstacles might be preventing ELLs from achieving math proficiency. Teachers are the agents who deliver instruction and work with students daily, and it is the teachers who have the most information regarding the needs and unmet needs of ELLs (Gándara et al., 2005). This study aimed to gain deep insights and understandings from kindergarten teachers about the barriers ELLs face in accessing the math curriculum.

Summary of Findings

Kindergarten teachers expressed ELLs need to manipulate objects, to have strong visual support, have repeated opportunities to use English math language, and it is helpful if students have native language support in order to grasp meaning of concepts. Instructional strategies learned in Kagan Engagement Structure training and Direct Interactive Instruction training have been implemented and found helpful in supporting ELLs access to the math curriculum. Participants have blended the use of sentence frames from English language forms and functions training with Kagan and DII instructional strategies. The base math program training was helpful to know the components of the program but did little to help teachers support ELLs in math. Participants who regularly collaborated with grade-level colleagues described participation in the meetings helpful in supporting ELLs access the math curriculum.

Participants expressed positive and negative aspects of the base math program in supporting ELLs in math. The flip chart, big book, and student workbook were viewed as positive aspects of the base math program because of the visual support they provided for

ELLs. Assessments were valued because they guided teachers on the vocabulary students needed to learn. The assessments also provided formative information to guide instruction and were used as a basis for discussing instructional approaches for ELLs. The base math program provides about two practice sheets for students per concept learned. Teachers feel students need more practice to know the concepts to mastery. All participants claimed to supplement the base program with other materials. The pacing of the lessons goes too quickly for ELLs to absorb the concepts and the academic language so teachers supplement the program to give students more experiences. Other critiques of the base math program were the format and language of assessments do not always align with student daily work pages. A participant succinctly stated "We get one or two pages to cover a topic so I don't feel supported in the math program."

ELLs entering kindergarten without the prerequisite skills to access the math curriculum was a concern voiced by the participants. One teacher warned, "A teacher should hit all the prerequisite skills that they need in the beginning of the year." Not only do many ELLs need language and vocabulary support but they also need background information. Teachers explained some ELLs do not have any experiences with numbers or counting in any language when entering kindergarten. Teachers spend class time providing background knowledge before being able to teach kindergarten math curriculum.

In summary of the findings relating to the research question, How prepared and supported do kindergarten teachers feel in effectively supporting English language learners in the math curriculum?, teachers feel prepared and supported with training

received from Kagan, DII, English forms and functions, and grade level collaboration. The training provides lesson design and instructional strategies to engage ELLs with using academic math language in English and collaboration provides support for teachers to solve problems in meeting the needs of ELLs. While teachers like some features of the base math program, teachers do not feel supported with materials or the training provided by the base math program in meeting the needs ELLs. The participants feel the base math program does not provide ample opportunities to practice math concepts for ELLs. Also, participants feel the assessments do not consistently match vocabulary or format of daily work which confuses students. The pacing of lessons was perceived as moving too quick for ELLs to understand the concepts to proficiency. Teachers supplement the base math program with materials from other programs, purchased commercial materials, or teacher created materials. The participants conveyed some of the barriers ELLs face in accessing the math curriculum as lacking English vocabulary but also lacking experiences with numbers in their native language upon entering kindergarten. Teachers said they had to introduce the prerequisite skills and provide time for students to practice those before introducing grade-level content in the math curriculum.

Interpretation of the Findings

The theoretical framework this qualitative case study is founded on is social development theory (Vygotsky, 1978). The premise of social development theory is in order to internalize concepts which lead to higher level thinking, humans must interact and use speech. Participants were asked, what are the factors related to ELLs success in math? The participants appeared to be in agreement about four core essentials ELLs need

in order to be successful in math. According to the participants, ELLs gain better understanding of math ideas when they are able to manipulate and move objects. Second, the math concepts become comprehensible to ELLs when presented with visual representations. Third, ELLs need to have many opportunities to repeat math language and math skills to retain math concepts and skills. Last, some participants added ELLs benefit from some translation in their native language. Participants' comments can be easily aligned with social development theory. In essence the teachers said when ELLs use language while interacting with objects, visuals, each other, and the teacher, then ELLs are able to learn. Kindergarten teachers feel prepared and supported in providing ELLs access to the math curriculum when professional development training and base math program materials align with the four core essentials ELLs need in order to be successful in math.

Teachers viewed Kagan as providing lesson structures where ELLs can receive some of the essentials for success in accessing the math which are instrumental in helping ELLs develop meaning and correct use of academic language. A math lesson presented to students using a Kagan engagement structure provides opportunities to move objects and repeat associated vocabulary with peers. Peers help and guide each other providing many chances to practice. These structures provide students opportunities to use speech and interaction to internalize concepts which follows Vygotsky's (1978) theory. Kagan Engagement Structure training is viewed by the participants as a helpful support provided by the school district to meet the needs of ELLs in math.

DII training received by the participants was considered helpful in aiding teachers to provide ELLs access to the math curriculum. DII trained teachers in lesson design strategies which promoted monitoring students for understanding and students' repetition academic language. The DII lesson designs provide ELLs opportunities to interact with the teacher, content, and their peers using academic language which is alignment with Vygotsky's (1978) social development theory that holds social interaction affects to cognitive processes. These strategies supported the essential core elements identified by participants in support needed to meet ELLs need in math.

Other training perceived useful by participants was English language forms and functions. This training promoted identifying key academic words in a lesson and having ELLS use sentence frames with academic language in partner work and choral responses. Practice using the academic language appropriately solidifies understanding which follows social development theory because the theory holds that social interaction precedes cognitive development. ELLs practice academic language with sentence frames in meaningful ways. Teachers perceived this training as a helpful guide for enhancing lessons. Being trained in English forms and functions helped teachers to support ELLs in accessing the curriculum through practice and repetition of academic language.

When asked in what aspects to the participants perceive they are prepared to meet the needs of ELLs in math, the participants declared they felt supported in training received from Kagan, DII, and English language forms and functions. Teachers identified four core elements they perceive ELLs need to access the curriculum. Teachers felt the trainings provided by the district did help guide their lesson design to include essential

elements. The lesson designs include manipulation and movement of objects, repetition of academic language and skills, and visual stimuli to attach meaning to the vocabulary. Teachers felt supported by the district through training received in meeting the math needs of ELLs.

When asked about the struggles ELLs face in accessing the math curriculum, participants pointed to the lack of enough practice pages in the base math program as being a barrier for ELLs. Due to the fact that ELLs are learning a second language and new math content concurrently, they need more practice than is provided in the base math program to internalize the language and math concepts. Social development theory holds that humans use speech and interaction to internalize concepts, thus, ELLs need more time to interact with the language and the materials because they are learning the language along with the concepts.

The central phenomenon I discovered in this qualitative case study is the lessons in the base program create barriers for ELLs to access the curriculum. Participants report the base math program page arrangement and language in daily work and in assessments are visually different, use different language, and ask students to do different tasks. Participants agreed that all of these differences cause confusion, especially for ELLs. ELLs need visual support in a consistent format and language. Since ELLs are learning a new language, the visual support and vocabulary should remain constant in daily work and assessments to solidify understanding. Teachers reported that they did not feel supported in helping ELLs gain access to the math curriculum with using the base math program.

It seems that teachers feel confident that their students are engaged in their mathematical thinking with a partner or when asked to individually respond in a whole group. Teachers see growth in the use of English academic vocabulary as ELLs of all levels. Through interactions with teachers and peers teachers can observe the students' conceptual math development. Teachers are teaching to the standards using the base math program and supplementing a lot with purchased or made materials. The teachers gave the impression the tasks on the assessments are confusing and do not match tasks students did in daily work, however; they want to use assessment to inform their instruction.

To supplement the base math program so ELLs can have meaningful practice uses extra teacher time and money. Teachers spend time and resources to supplement the base math program. Teachers create games, worksheets, or other activities so ELLs have more practice. Sometimes commercially made products are purchased with school budget money or out of pocket by the teacher. Materials from previously used programs are copied. Designing, finding, purchasing, and making supplement materials uses teacher time. Teachers are interested in the success of their students so they put in the extra time and money gladly for the good of their students. However, what is really the best use of a teacher's time? .

Implications for Social Change

Students are motivated to spend more time on tasks and engaging with academic materials even when small gains in success are perceived (Weber, 2008). Students seek out opportunities to work on academics when they feel pleasure and encouragement from being successful (Weber, 2008). When students feel frustrated and anxious due to

repeated perceived failure they will avoid those tasks and engaging with materials (Weber, 2008). The implication is ELLs will feel more successful and confident in when provided enough practice pages where the tasks are consistent. ELLs will also feel successful when the assessments have familiar tasks and vocabulary as their daily work. When ELLs feel successful in math then they feel encouraged which will motivate them to seek out more opportunities to practice math skills.

Math achievement is a filter for career aspirations (Shapka, Momene, & Keating, 2007). The students who performed poorly on math achievement tests aspired towards careers with lower prestige (Shapka, Momene, & Keating, 2007). Mathematics achievement was found to be a pathway to science, technology, engineering, and math (STEM) professions (Miller & Kimmel, 2012). The implication is that low math achievement limits ELLs opportunities for career choice later in life. A major national concern is the inadequate number of young adult Americans choosing careers in STEM professions (Miller & Kimmel, 2012). The implication is that by supporting kindergarten teachers with appropriate math curriculum with adequate practice and proper design, the gap of math achievement will narrow between EO and ELL students. The implication for positive social change is that ELLs will have more opportunity to choose a STEM profession or higher prestige careers.

Gándara, Rumberger, Maxwell-Jolly, and Callahan (2003) identified seven areas where ELLs appear to receive inferior educational experience than their English-speaking peers. One of the areas identified was inadequate access to instructional materials and curriculum. Oaks and Sanders (2002) argue the “research evidence demonstrates a clear

link between appropriate materials and curriculum and student academic outcome" (Gándara, Rumberger, Maxwell-Jolly, & Callahan, 2003). The implication for positive social change is when kindergarten math curriculum is tailored to the linguistic and developmental needs of ELLs, the student will follow a learning trajectory closer to that of EOs.

Papay, Murnane, and Willett (2010) studied the causal effects of low-income urban high school students who barely failed the math portion of the required high school exam taken in tenth grade. Papay, et al, (2010) found those students are four percent more likely to drop out of school the following year and have an eight percent lower graduation rate. Just barely failing the English Language portion of the test does not have the same impact on these students. On the 2010-11 California High School Exit Exam (CAHSEE) 56 percent of ELL tenth graders passed the math portion compared to 83 percent of all students taking the tenth grade CAHSEE. The actual number of tenth grade ELLs who did not pass the CAHSEE in 2010-11 school year is 29,803 students. Relating these numbers to the Papay, et a., (2010) study puts those 29,803 ELLs at risk of dropping out or not graduating high school. The implication for positive social change is improving ELL students math scores improves their chances of graduating high school.

Recommendations for Action

Recommendation 1

The findings of this study be disseminated to school district administration through written and personal communication. A coordinated district level kindergarten mathematics committee should be commissioned to improve the mathematics instruction

for ELLs. Kindergarten teachers of ELLs support and network with each other at specific school sites, however; A support network for communication among kindergarten teachers of ELLs between school sites does not exist. It is recommended that an ELL kindergarten network be established to address ELLs needs in mathematics, share materials, and answer questions. A number of specific recommendations also relate to the recommendation of establishing an ELL teacher kindergarten network.

Recommendation 2

The findings of this study be disseminated to district kindergarten teachers through written and personal communication. A major issue expressed by participants was dissatisfaction that the base program was not consistent with tasks, vocabulary, and visual input between daily work and assessments. A mission for this network committee is to review, revise, and align assessments to reflect coordination with tasks and language practiced in daily work. Formative assessment is an important component of what teachers need to know to effectively guide children to meet grade level standards.

Recommendation 3

Participants in this qualitative case study voiced frustration in using the lessons in the base math program because there was not adequate opportunities to practice the math concepts on math pages. The base math program provides a series of support materials for each lesson. A mission for this committee is to exhaust all resources in the base math program to best match the tasks in the daily work in the student workbook.

Recommendation 4

Teachers in this qualitative case study explained sharing ideas and resources with colleagues through their school's public computer drive was valuable in helping teachers support ELLs access to the math curriculum. It is recommended that a link be provided on the school district's website for kindergarten teachers of ELLs for the purpose of sharing knowledge and resources helpful in supporting ELLs. It is recommended that once the ELL kindergarten network completes the above recommendations, then the aligned math assessments and best matched base math program resources for each lesson be made available through the district website.

Recommendation 5

Participants who participated in regular peer collaboration described that process as being an integral part of effective math instruction. Teachers worked together on lesson design, lesson preparation, and assessment analysis. Opportunities for kindergarten teachers to collaborate about the needs of ELLs in mathematics in regards to lesson pacing and vocabulary is recommended.

Recommendation 6

The findings of this study be disseminated to the publisher of the state-adopted math program written and personal communication. It is recommended that the state-adopted base program develop or revise assessments and daily work in the student workbook. One goal for the revisions is to align tasks and language on assessments and daily work. Another goal for the revisions is to develop more meaningful practice pages to support each lesson.

Recommendation 7

One participant in this qualitative case study strongly recommended using resources that were in the students' environment. In particular, the participant was referring to acknowledging students use of technology in their daily lives and transferring that use to math development. Increasing curricular resources, software, and other media that can support ELLs in accessing the math curriculum is recommended.

Recommendations for Further Study

Evaluation of Curricula

In the course of my review elementary school math curriculum, it became clear that there is limited research on state-adopted math curricula rigorously evaluated for effectiveness. High-quality curriculum research is needed to track the effectiveness of curricula during implementation, using the theories and instructional models that were originally used to guide development of the curriculum. The range in students' backgrounds and the spectrum of learning environments influence the implementation and effectiveness of curriculum and thus must be considered in research. To achieve these goals, I recommend curriculum research and development systematically use a baseline evaluation of curriculum and then confirm evaluation of curriculum using rigorous designs of quantitative and qualitative methodologies. This type of research will help ensure that states, school districts, and any entity providing math instruction to ELLs can make informed, evidenced-based choices among curricula.

Student Preparation for Kindergarten

As described in the literature review for this research study, parents and preschool programs do not emphasize number sense as much as literacy knowledge is emphasized. The participants in this qualitative case study profoundly expressed that ELL student come to school unable to count or know numeral names in their native language. According to the participants, ELLs must be taught the prerequisite number sense skills before accessing the math curriculum. I recommend more qualitative research to examine and describe ELL parents' understanding about supporting their child's math learning. More research is recommended to understand what impedes parents' support in their active promotion of their child's math learning.

English-Learners

As described earlier in the literature review, research on ELLs and early childhood math learning was difficult to find. Continued research to help identify the best methods of enhancing mathematical learning of young children who are ELLs in recommended.

Teacher Input about ELL resources in Base Math Program

In this research study few teachers said they valued and used the ELL resources provided by the base math program. I recommend for researchers to conduct qualitative studies to investigate impediments for teachers to actively use the ELL resources of the base math program. More qualitative studies asking teachers to provide perceptions and opinions about ELL lessons in the base math curriculum is recommended.

Reflections

When considering a topic that would impact positive social change in my community, I asked some local school district administrators for guidance in what were the areas of concern in our district. Their advice pointed to concerns surrounding ELLs and underperforming achievement scores. My experience as a kindergarten and first grade teacher provided me with knowledge on the importance of the first years school and their impact on a child's later school success. I learned the nuances of early childhood math development from my experiences with being a participant in the STEPSS project and later a lead teacher and coach. Through those experiences I came to believe in how critically essential it is to build a child's number understanding foundation from the very beginning of their school experience. I also came to know and understand that if those foundations are not laid properly students use coping mechanisms such as relying on rote memorization instead of really understanding and knowing number composition and number relationships. As a coach I observed students in higher grades struggling with math operations when in earlier grades they had been able to do the

operations at grade level. These students had memorized math facts and procedures but with only superficial understanding of the number system.

Synthesizing the district's need to advance ELLs achievement and my knowledge and understanding about early childhood math development, the topic of this research study developed as ELLs in kindergarten with regard to math development. I took advantage of an opportunity to speak with language acquisition research pioneer, Dr. Stephen Krashen, when he spoke at a local reading association seminar. We discussed kindergarten ELLs issues in learning math then he asked me what the teachers thought. When I replied that I did not know, his comeback was, "Now, *that* would be a good study!" and thus the direction and topic of this research study was established.

The review of literature on early childhood mathematics development confirmed and enhanced my knowledge about children's learning paths. The project report, Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity (NRC, 2009), was instrumental in fostering my passion to deepen my knowledge and promote understanding in the education community. I was fortunate to be able to attend a national math conference where some of the researchers who worked on the project report were presenting their findings. In meeting with two of the researchers, Dr. Douglas Clements and Dr. Karen Fuson, both emphasized the need for more research to support ELLs and research on curriculum effectiveness evaluation.

A revelation in my review of literature was the lack of qualitative research based on teachers' opinions and perceptions in teaching ELLs. Teachers' input on what is happening in the classroom with ELLs is an invaluable untapped resource. I discovered

the education research community needs more descriptive responses from teachers in order to develop policies and curriculum. Teachers I interviewed were happy to be a part of a research study. All of the teacher participants were passionate about their students and were eager to help unveil the barriers their ELLs face when accessing the math curriculum. Teachers' desire is to meet the need of each of their students. The students are a name, face, personality, and relationship to the teachers, not a statistic number on an accountability report. The teachers in this research study took time out of their very busy day to describe what prevents their ELLs from reaching grade level goals in the hopes that their voice will be heard and solutions will be developed.

In reviewing my predictions about participants' responses about training, I thought teachers would emphasize training received during their preservice education as feeling supported in meeting the needs of ELLs. In regards to training offered by the school district, I expected about half of the teachers to praise Kagan engagement structures and DII training in helping meet the needs of ELLs and the other half either not using it or not mentioning the training. I was pleasantly surprised to discover all but one teacher highly valued using Kagan engagement structures and DII training. I did correctly predict that teachers would mention repeating the standard would not mean much to the kindergarten ELLs but repeating the lesson objective had value and meaning for those students.

My background and experience as a math coach and former base program math trainer for another program contributed to forming my bias in how I view math programs. My focus lies in critiquing the program for balance of conceptual development, problem

solving, and skills and covering key standards in depth. Each participant pointed out thatthere were not enough pages to adequately practice the math concepts and skills for each lesson. My first reaction was to be concerned that teachers' had the misconception that doing more worksheets would improve ELLs math learning. Also, participants explained the work pages would have students working on a concept one way on the front and another way on the back. I was again concerned because to really know a number children must be flexible with that number. Being flexible with a number means objects of that quantity can be arranged in a variety of ways. Flexibility with number means a quantity can be a number of claps, a number of blocks, a number of children, or dots on a page. I was concerned that teachers wanted students to learn one or two structures to knowing a number and students would not develop flexibility. However; my initial concerns were unfounded as the interviews unfolded. Teachers described various ways their students practiced using numbers without work pages such as using whiteboards, using objects, acting out with students, and student to student interactions. It appeared students were getting a variety of practice with numbers beyond work pages. When I reviewed and analyzed the base math program lessons, I gained deeper insight into why participants feel ELLs need more practice pages. It is not the content in the lesson that is confusing but it is the directions that are confusing. I came to understand the lessons gave too many directions using many nouns and verbs and it is for this reason the program becomes a barrier for ELLs to access the curriculum. The participants helped me grow to view the state-adopted math program through the perception lens of an ELL.

Concluding Statements

Twenty-five percent of the students in grades preK-12 in California are identified as ELLs. Students who speak English proficiently consistently outperform ELLs on state achievement tests. The U.S. Supreme Court (1954) argued in the landmark case Brown vs. The Board of Education, "Where a State has undertaken to provide an opportunity for an education in its public schools, such an opportunity is a right which must be made available to all on equal terms." (U.S Supreme Court, 1954, p. 493). The participants in this research study communicated a barrier ELLs face in accessing the math curriculum is the design of state-adopted base math program. The design flaws in the state-adopted math program, as described previously in this section, inhibit equal access to the mathematics curriculum for ELLs. Every effort must be made to ensure the opportunity for an education is on equal terms for ELLs.

Recommendations to begin a shift in equal access for ELLs are to commission a district kindergarten teacher committee for the purpose of aligning daily work and assessment academic vocabulary and tasks, organizing base program resources so all lesson practice pages are easily accessed, and make available the aligned assessments, daily work, and support resources on the district website so all kindergarten teachers can retrieve them. Recommendations also include for the base math program to revise lessons and assessments in the math program so language, vocabulary, and visual support are simplified while providing ELLs rigorous engagement with the grade level math standards.

Students who are proficient in mathematics are more likely to stay in high school and graduate. Students who perform well on math achievement tests aim for careers with prestige and math is a pathway for much needed STEM careers. All learners, including ELLs, deserve an equal choice in their career path. Equal choice is manifested from equal opportunity.

References

Aragon, L. A. (2009). *The impact of an English language learner professional development program on teacher perception of preparedness and practice* (Doctoral dissertation). Available from ProQuest Digital Dissertations database. (UMI 3406384)

Aunola, K., Leskinen, E., Lerkkanen, M., & Nurmi, J. (2004). Developmental dynamics of math performance from preschool to grade 2. *Journal of Educational Psychology, 96*, 699–713. doi:10.1037/0022-0663.96.4.699

Barbarin, O. A., Early, D., Clifford, R., Bryant, D., Frome, P., Burchinal, M., & Pianta, R. (2008). Parental conceptions of school readiness: Relation to ethnicity, socioeconomic status, and children's skills. *Early Education & Development, 19*(5), 671-701. doi:10.1080/10409280802375257

Baroody, A. J. (1992). The development of preschoolers' counting skills and principles. In J. Bideaud, C. Meljac, and J. P. Fischer (Eds.), *Pathways to Number* (pp. 99-126). Hillsdale, NJ: Erlbaum.

Baroody, A. J., & Ginsburg, H. P. (1986). The relationship between initial meaning and mechanical knowledge of arithmetic. In J. Hiebert (Ed.), *Conceptual and procedural knowledge: The case of mathematics*. Hillsdale, NJ: Erlbaum.

Batt, E. G. (2008). Teachers' perceptions of ELL education: Potential solutions to overcome the greatest challenges. *Multicultural Education, 15*(3), 39-43. Retrieved from http://www.eric.ed.gov/PDFS/EJ793903.pdf

Brannon, E. M. (2002). The development of ordinal numerical knowledge in infancy. *Cognition*, *83*, 223-240. doi:10.1016/S0010-0277(02)00005-7

Brannon, E. M., Abbott, S., & Lutz, D. (2004). Number bias for the discrimination of large visual sets in infancy, *Cognition*, *93*, B59-B68. doi:10.1016/j.cognition.2004.01.004

Bresser, R., Melanese, K., & Sphar, C. (2009). *Supporting English language learners in math class: Grades K-2*. Sausalito, CA: Math Solutions Publications.

Bunch, G. C, Aguirre, J. M, & Tellez, K. (2009). Beyond the scores: Using candidate responses on high stakes performance assessment to inform teacher preparation for English learners. *Issues in Teacher Education, 18(*1*),* 103-128. Retrieved from http://www.eric.ed.gov/PDFS/EJ851544.pdf

California Department of Education. (2002). *English-language development standards for California schools: Kindergarten through grade twelve*. Sacramento, CA: Author.

California Department of Education (2005). *Information memoranda*. Retrieved from http://www.cde.ca.gov/be/pn/im/documents/infocibcddoct05item01.doc

California Department of Education. (2006). *Mathematics framework for California public schools: Kindergarten through grade twelve*. Sacramento, CA: Author.

California Department of Education. (2009a). *Number and percent of English learners (ELs), fluent English-proficient (FEP), and students redesignated as FEP 2009-10*. Retrieved from

http://dq.cde.ca.gov/dataquest/LC/LCOtherDistrict.aspx?dType=52&co=All%20Counties&TheYear=2009-10&sortby=c

California Department of Education (2009b). *2009 STAR test results*. Retrieved from http://star.cde.ca.gov/star2009/SearchPanel.asp?lstTestYear=2009&lstTestType=C&lstCounty=&lstDistrict=&lstSchool=&lstGroup=4&lstSubGroup=160

California Department of Education (2010a). *2010 STAR Test Results State of California English Learner - California Standards Test Scores*. Retrieved from http://star.cde.ca.gov/star2010/ViewReport.asp?ps=true&lstTestYear=2010&lstTestType=C&lstCounty=54&lstDistrict=&lstSchool=&lstGroup=4&lstSubGroup=160Bottom

California Department of Education (2009). *2008-09 Accountability Progress Reporting.* Retrieved from http://ayp.cde.ca.gov/reports/AcntRpt2009/2009APRStAYPReport.aspx

California Department of Education. (2010). *California English language development test (CELDT).* Retrieved from http://www.cde.ca.gov/ta/tg/el/

California Department of Education (2010). *DataQuest.* Retrieved from http://dq.cde.ca.gov/dataquest/

California Department of Education. (2010). *California High School Exit Exam*. Retrieved from http://cahsee.cde.ca.gov/ExitProg1.asp?cLevel=State&cYear=2007-08&cChoice=ExitProg1&cAdmin=C&tDate=000000&TestType=M&cGrade=10&Pageno=1

California Department of Education (2011a). Instructional Materials: Information and resources for instructional materials. Retrieved from http://www.cde.ca.gov/ci/ma/im/

California Department of Education. (2011b). Kindergarten in California. Retrieved from http://www.cde.ca.gov/ci/gs/em/kinderinfo.asp?

California Department of Education. (2012). School Accountability Report Card. Retrieved from http://www.cde.ca.gov/ta/ac/sa/

California Department of Education. (2012b). Dropouts by Ethnic Designation by Grade. Retrieved from http://dq.cde.ca.gov/dataquest/DropoutReporting/DrpGradeEth.aspx?cDistrictName=State&CDSCode=0000000000000000&Level=State&TheReport=GradeEth&ProgramName=All&cYear=2010-11&cAggSum=StTotGrade&cGender=B

California Department of Education (2012c). California High School Exam Results. Retrieved from http://cahsee.cde.ca.gov/ExitProg1.asp?cLevel=State&cYear=2010-11&cChoice=ExitProg1&cAdmin=C&tDate=000000&TestType=E&cGrade=10&Pageno=1

California Federation of Teachers. (2011). Faculty stand with classified against threats of layoffs. *Classified Insider, 1(2)*. Retrieved from http://www.cft.org/index.php/publications/706-californial-teacher-test.html#Faculty stand with classified against threat of layoffs

Cantlon, J. F. & Brannon, E.M. (2006). Shared system for ordering small and large numbers in monkeys and humans. *Psychological Science*, *17*, 401-406.

Carey, S. (2004). Bootstrapping and the origins of concepts. *Daedalus*, *133(*1*),* 59-68. doi:10.1162/001152604772746701

Carpenter, T. P., Fennema, E., Franke, M. L., Empson, S. B., & Levi, L. W. (1999). *Children's mathematics: Cognitively guided instruction*. Portsmouth, NH: Heinemann.

Clements, D. H., & Sarama, J. (2007). Early childhood mathematics learning. In J. F. K. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 461-555). New York: Information Age.

Clements, D. H., & Sarama, J. (2008). Experimental evaluation of the effects of a research-based preschool mathematics curriculum. *American Educational Research Journal*, *45*, 443-494.

Commission on Teacher Credentialing. (2010). Teaching performance assessment. Retrieved from http://www.ctc.ca.gov/educator-prep/TPA-files/TPEs-Full-Version.pdf

Commission on Teacher Credentialing. (2011). *Teaching performance assessment.* Retrieved from http://www.ctc.ca.gov/educator-prep/TPA.html

Crabtree, B. & Miller, W. (1999). *Doing qualitative research, 2nd edition.* London: SAGE publications..

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approach, 2nd edition*. Thousand Oaks, CA: SAGE Publications.

Creswell, J. W. (2007). *Qualitative inquiry & research design: Choosing among five approaches, 2nd edition*. Thousand Oaks: SAGE Publications.

Dehaene, S. (1997). *The number sense: How the mind creates mathematics*. New York, NY: Oxford University Press.

Dehaene, S., Dehaene-Lambertz, G., & Cohen, L. (1998). Abstract representations of numbers in the animal and human brain. *Trends in Neurosciences*, *21*, 355-361

Diaz, R. M. (2008). *The role of language in early childhood mathematics*. (Doctoral dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3319002)

Driscoll, M. P. (1994). *Psychology of learning for instruction*. Needham, MA: Allyn & Bacon, Duncan, G.J., Dowsett, C.J., Classens, A., Magnuson, K., Huston, A.C., Klebanov, P., Pagani, L., Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*(*6*), 1428-1446.

Education Week. (2004). *Adequate yearly progress*. Retrieved from http://www.edweek.org/ew/issues/adequate-yearly-progress/

Education Week. (2004). *No child left behind*. Retrieved from http://www.edweek.org/ew/issues/no-child-left-behind/

Fang, Z. (1996). A review of the research on teacher beliefs and practices. *Educational Research, 38(*1*), 47-65.*

Farran, D. C., Lipsey, M., Watson, B., & Hurley, S. (2007). *Balance of content emphasis and child content engagement in an early reading first program*. Paper presented at the American Educational Research Association.

Feigenson, L., Dehaene, S., & Spelke, E. (2004) Core systems of number. *Trends in Cognitive Sciences, 8*, 307-314.

Flavell, J. H. (1963). *The developmental psychology of Jean Piaget.* The university series in psychology. Princeton, NJ: D Van Nostrand.

Frede, E., Jung, K, Barnett, W. S., Lamy, C. E., & Figueras, A. (2007). *The Abbott preschool program longitudinal effects study (APPLES)*. Rutgers, NJ: National Institute for Early Education Research.

Fuchs, L. S., Fuchs, D., Compton, D. L., Bryant, J. D., Hamlett, C. L., & Seethaler, P. M. (2007) Mathematics screening and progress monitoring at first grade: Implications for responsiveness to intervention. *Exceptional Children, 73(3),* 311-330.

Fuller, K. (2004). *Teacher perceptions of the preparation for effective teaching of English learners*. (Doctoral dissertation) Available from ProQuest Dissertations and Theses database (UMI No 3164273). Retrieved from ProQuest.

Fuson, K. C. (1988). *Children's counting and concept of number*. New York, NY: Springer Verlag.

Gándara, P, Maxwell-Jolly, J, & Driscoll, A. (2005). *Listening to teachers of English language learners: A survey of California teachers: Challenges, experiences, and professional development needs.* Santa Cruz, CA: The Center for the Future of Teaching and Learning.

Gándara, P., Rumberger, R., Maxwell-Jolly, J. & Callahan, R., (2003, October 7).

English Learners in California Schools: Unequal resources, unequal outcomes. *Education Policy Analysis Archives, 11*(36). Retrieved from http://epaa.asu.edu/epaa/v11n36/

Geary, D. C. (1995). Reflections of evolution and culture in children's cognition: Implications for mathematical development and instruction. *American Psychologist, 50(*1*),* 24

Gordon, P. (2004). Numerical cognition without words: Evidence from Amazonia. *Science, 306,* 496–499.

Hatch, J. A. (2002). *Doing qualitative research in education settings*. Albany, NY: State University of New York Press.

Hernandez, A., Herter, R., & Wanat, S. (2008). Perceived challenges in working with English learners: Meeting the professional development needs of teacher candidates and classroom teachers. *The International Journal of Learning, 15,*107-114.

Huinker, A. (2006). *Mathematics assessment sampler, prekindergarten-grade2.* Reston, VA: National Council of Teachers of Mathematics, Inc,

Jordan, N. C., Kaplan, D., Nabors Oláh, L. & Locuniak, M.N. (2006). Number sense growth in kindergarten: A longitudinal investigation of children at risk for mathematics difficulties. *Child Development, 77*, 153-175.

Jordan, N. C., Kaplan, D., Locuniak, M. N., & Ramineni, C. (2007). Predicting first-grade math achievement from developmental number sense trajectories. *Learning Disabilities Research and Practice, 22*(1), 36-46.

Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. (2009). Early math matters: Kindergarten number competence and later mathematics outcomes. *Developmental Psychology*, *45(*3*),* 850-867.

Kagan, D. M. (1992). Implications of research on teacher belief. *Educational Psychologist, 27(*1*), 65-90.*

Klein, A., & Starkey, P. (2004). Fostering preschool children's mathematical knowledge: Findings from the Berkeley Math Readiness Project. In. D.H. Clements, J. Sarama, and A-M. DiBiase (Eds.), *Engaging young children in mathematics: Findings of the 2000 national conference on standards for preschool and kindergarten mathematics education*, p. 343-359. Mahway, NJ Erlbaum.

Klibanoff, R. S., Levine, S. C., Huttenlocher, J., Vasilyeva, M., & Hedges, L. V. (2006). Preschool children's mathematical knowledge: The effect of teacher "Math Talk" *Developmental Psychology, 42(*1*),* 59-69.

Knitzer, K., & Lefkowitz, J. (2006). *Helping the most vulnerable infants, toddlers, and their families*. Retrieved from http://www.nccp.org/publications/pdf/text_669.pdf

Kowalski, K., Pretti-Frontczak, K., & Johnson, L. (2001). Preschool teachers' beliefs concerning the importance of various developmental skills and abilities. *Journal of Research in Childhood Education, 16*, 5-14.

Lachance, J. A., & Mazzocco, M. M. M. (2006). A longitudinal analysis of sex differences in math and spatial skills in primary school age children. *Learning and Individual Differences, 16*, 195-216.

Lee, J. S. (2006). Preschool teachers' shared beliefs about appropriate pedagogy for 4-year-olds. *Early Childhood Journal, 33*(6), 433-441.

Levine, S. C., Jordan, N. C., & Huttenlocher, J. (1992). Development of calculation abilities in young children. *Journal of Experimental Child Psychology, 53*, 72-103.

Locuniak, M. N., & Jordan, N. C. (2008). Using kindergarten number sense to predict calculation fluency in second grade. *Journal of Learning Disabilities, 41(*5*), 451-459.*

Magnuson, K. & Waldfogel, J. (2008). *Steady gains and stalled progress: Inequality and the black and white test score gap*. New York, NY: Russell Sage Foundation.

Mazzocco, M. M. M., & Thompson, R.E. (2005). Kindergarten predictors of math learning disability. *Learning Disabilities Research and Practice, 20(*3*),* 142-155.

McKeon, D. (2005). *Research talking points: English language learners*. Retrieved from http://www.nea.org/home/13598.htm

McLoyd, V. C. (1990). The impact of economic hardship on black families and children: Psychological distress, parenting, and socio-emotional development. *Child Development*, *61*, 311-346.

Miller, K. F. (1992). What a number is: Mathematical foundations and developing number concepts. In J.I.D. Campbell (Ed.), *The nature and origins of mathematical skills* (pp. 3-38). New York: Elsevier.

Mix, K. S. (2008). Surface similarity and label knowledge impact early numerical comparisons. *British Journal of Developmental Psychology*, *26*, 13-32.

Mix, K. S., Huttenlocher, J, & Levine, S.C. (2002). *Quantitative development in infancy and early childhood*. New York, NY: Oxford University Press.

National Center for Educational Statistics, U.S. Department of Education, (2009). *National assessment of educational progress*. Retrieved from http://nces.ed.gov/nationsreportcard/mathematics/

National Council of Teachers of English. (2008). *English Language Learners: A policy research brief*. Retrieved from https://secure.ncte.org/store/english-language-learners

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

National Research Council. (2001). *Adding it up: Helping children learn mathematics*. J. Kilpatrick, J. Swafford, & B. Findell. (Eds.) Mathematics Learning Study Committee, Center for Education, Division of Behavioral and Social Sciences and Education. Washington D.C.: National Academy Press.

National Research Council. (2009). *Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity.* Committee on Early Childhood Mathematics, Christopher T. Cross, Taniesha A. Woods, & Heidi Schweingruber, Editors. Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Oakes, J., & Saunders, M. (2002). Access to textbooks, instructional materials, equipment, and technology: Inadequacy and inequality in California's public

schools, found in the Williams Watch Series (wws-rr001-1002). Los Angeles, CA: UCLA/IDEA.

Office of English Language Acquisition, Language Enhancement, and Academic Achievement for Limited English Proficient Students. *Biennial Report to Congress on the Implementation of the Title III State Formula Grant Program, School Years 2004–06.* Washington, DC; 2008.

Ojose, B. (2008). Applying Piaget's theory of cognitive development to mathematics instruction. *The Mathematics Educator, 18,(*1*),* 26-30.

Papay. J., Murnane, R. & Willett, J. (2010). The consequences of high school exit exam for low-performing urban students: Evidence from Massechusetts. *Educational Evaluation on Policy Analysis, 32 (*1*)*, 5-23.

Performance Assessment for California Teachers. (2011). *What is PACT?* Retrieved from http://www.pacttpa.org/_main/hub.php?pageName=Home

Piaget, J. (1941/1965). *The child's conception of number*. New York, NY: Norton.

Pica, P., Lemer, C., Izard, V., & Dehaene, S. (2004, October 15). Exact and approximate arithmetic in an Amazonian indigene group. *Science, 306,* 499–503.

Ramos-Christian, V., Schleser, R., & Varn, V. E. (2008). Math fluency: Accuracy versus speed in preoperational and concrete operational first and second grade children. *Early Childhood Education Journal, 35,* 543-549.

Richardson, K. (1999). *Assessing math concepts: Book 1, counting objects*. Dale Seymour: New Jersey.

Rittle-Johnson, B., & Siegler, R. S. (1998). The relation between conceptual and procedural knowledge in learning mathematics: A review. In C. Donlan (Ed.), *The development of mathematical skills* (p.75-110). East Sussex, England: Psychology Press.

Rubin, H. J. & Rubin, I. S., (2005). Qualitative interviewing: The art of hearing data. 2nd ed. Sage Publications. Thousand Oaks, California.

Sarama, J., Clements, D. H., Starkey, P., Klein, A., & Wakeley, A. (2008). Scaling up the implementation of a pre-kindergarten mathematics curriculum: Teaching for understanding with trajectories and technologies. *Journal of Research on Educational Effectiveness,1*, 89-119.

Sarnecka, B. W. & Carey, S. (2008). How counting represents numbers: What children must learn and when they learn it. *Cognition, 108*, 662-674.

Sarnecka, B. W., Kamenskaya, V. G., Yamana, Y., Ogura, T., & Yudovina, Y. B. (2007). From grammatical number to exact numbers: early meanings of "one", "two", and "three" in English, Russian, and Japanese. *Cognitive Psychology, 55, (2),* 136-168.

Shapka, J. D., Domene, J. F. & Keating,D. P. (2006). Trajectories of career aspirations through adolescence and young adulthood: Early math achievement as a critical filter. *Educational Research and Evaluation: An International Journal on Theory and Practice 12, (4),* 347-358.

Shutz, R. (2007). *Stephen Krashen's theory of second language acquisition*. Retrieved from http://www.sk.com.br/sk-krash.html

Stake, R. E. (2005). Qualitative case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), The Sage handbook of qualitative research (3d ed., pp. 443-466). Thousand Oaks, CA: Sage.pelke, E.S., & Kinzler, K.D. (2007). Core knowledge. *Developmental Science, 10*, 89-96.

Stipek, D. J., Givven, K. B., Salmon, J. M., $ MacGyvers, V. L. (2001). Teachers' beliefs and practices related to mathematics instruction. *Teaching and Teacher Education, 17, 213-226.*

The Nation's Report Card, National Assessment for Educational Progress. (2009). *Greater gains in mathematics for black and Hispanic students than for whites since 1973*. Retrieved from http://nationsreportcard.gov/ltt_2008/ltt0005.asp

United States Census Bureau. (2007a). *Percentage of the population who spoke a language other than English at home by state: 2007.* Retrieved from http://www.census.gov/hhes/socdemo/language/data/acs/ACS-12.pdf

United States Census Bureau. (2007b). *Percentage of the population who spoke a language other than English at home who spoke less than "very well" by state: 2007*. Retrieved from http://www.census.gov/hhes/socdemo/language/data/acs/ACS-12.pdf

United States Census Bureau. (2009). *State and county quickfacts*. Retrieved from http://quickfacts.census.gov/qfd/states/06000.html

United States Department of Education. 2006. *Letter from Assistant School Secretary to Chief State School Officers*. Retrieved from http://www2.ed.gov/policy/elsec/guid/stateletters/index.html

United States Department of Education. (2007). *Digest of Education Statistics.* Retrieved from http://nces.ed.gov/programs/digest/d10/tables/dt10_041.asp

United State Department of Education (2010). *Consolidated State Performance Report*. Retrieved from http://www2.ed.gov/admins/lead/account/consolidated/index.html

United State Department of Education (2011a). *Elementary and second education no child left behind education policies*. Retrieved from http://www2.ed.gov/policy/elsec/guid/states/index.html

United State Department of Education (2011b). *Stronger accountability no child left behind legislation and policies*. Retrieved from http://www2.ed.gov/policy/elsec/guid/states/index.html

United States Supreme Court. (1954). Brown vs the board of education of Topeka. Retrieved from http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=us&vol=347&invol=483

Van De Walle, J. A., Karp, K. S., & Bay-Williams, J.M. (2010). *Elementary and middle school mathematics: Teaching developmentally (7th Ed.).* Needham Heights, MA: Allyn & Bacon.

Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes.* Cambridge, MA: Harvard University Press.

Walsha, M. & Anthony, G. (2008). The role of pedagogy in classroom discourse: A review of recent research into mathematics. *Review of Educational Research,* 78(3), 516-551.

Weber, K. (2008). The role of affect in learning Real Analysis: a case study. *Research in Mathematics Education, 10,(*1*),* 71-85.

Wertsch, J. V. Sohmer, R. (1995). Vygotsky on learning and development. *Human Development. (*38*)*, 332-37.

Wynn, K. (1992). Children's acquisition of the number words and the counting system. *Cognitive Psychology, 24*, 220-251.

Appendix A: Interview Guide

Qualitative research question:

How prepared and supported do kindergarten teachers feel in effectively supporting English language learners in the math curriculum?

Interview questions:

1. What is your understanding of the kind of support English language learners need in order to meet end of the year grade level expectations in mathematics?
    a. Describe any training you have received regarding teaching students whose first language is not English.
    b. What aspects of the training have you put into practice and what results have you noticed in student achievement?
2. When thinking about materials such as lesson guides, rubrics, student materials or any kind of materials you have used to support English language learners in the classroom, what aspects of those materials were most helpful in developing English language fluency and academic language?
    a. Explain why those aspects were helpful in developing English language fluency.
    b. What parts of materials did you find least helpful?
3. What have you found helpful or unhelpful about the support the state adopted mathematics curriculum has provided for English language learners?
    a. Can you give examples of lesson adaptations you have tried?
    b. What was the result?

4. What suggestions do you have for teachers who instruct mathematics to kindergarten children whose second language is English?

Appendix B: Table of Themes

What support do ELLs need to meet grade level expectations in math?
Manipulatives
[Students need] manipulatives opportunities for practice (1) hands –on things (2) white boards (2) (3) manipulatives (2) put numbers in order physically (3) act it out (1) (3) [ELLs] need a lot of hands-on materials(4) We do a lot of equations on the whiteboards (6) They write the answer on the whiteboard(7) [I support them with lots of manipulatives (7) moving their bodies (2) so we're moving it, we're writing the number – we are tracing or copying the number writing (3) TPR (6) They need to be able to see it, hear it, and do it themselves (6) Hand gestures (7) We will add or subtract using models or objects(8)
Visuals
[Students need] lots of visuals(7) [Students need] a lot of modeling (1) Moving my body (2) lots of modeling (2) I do a lot of realia (3) so we're moving it, we're writing the number –we are tracing or copying the number writing (3) I find I have to break everything into tiny steps and I have to do a lot of modeling (4) visual things are very important(5) They need to be able to see it, hear it, and do it themselves (6) Its very visual (8) showing them (8) We will add or subtract using models or objects(8) model everything and have visuals (8) Provide lots of visuals, do lots of modeling, stay consistent with the language you use. (1)
Repetition
Students need lots of repetition (1) They really need repetition (6) I use repeating(7) A lot of repetition is what we do in class (7) Repeating the objective of the lesson is great because they hear themselves and they hear others (8)
Native language support
Uses Spanish as a support when students do not understand what the teacher is asking them to do or to understand. (1) some have not Spanish as far a mathematical terms – I do a lot of Spanish (3) I have the Spanish language so I repeat it in Spanish (6) This is the way they understand what it is, and I'll do and example in Spanish then I'll do it in English(6) I am fortunate because I speak the language. I am Spanish speaking (7) Sometimes they don't know how to respond so they tell me the sentence in Spanish and then I have them repeat it in English (7)
Describe any training you have received regarding teaching students whose first language is not English. What aspects of the training have you put into practice and what are the results?
Kagan Engagement Structures
Kagan structures to teach math (1) "Kagan structures do help a lot in supporting students to access the curriculum" (1) "And what doesn't work is me standing up there and lecturing them." (1) not a lot of telling (2) They do need Kagan (2) The kids are a little shy in the beginning (2) they want to talk to each other (2) partner share and rallying has help if the low level English are paired with the higher level English speaker(3) And the other part that is working is student engagement. I noticed

that the students like that engagement part. And they like sharing with their partners what they've learned.(4) What is not working is you have a group of students that really have no idea what to do and I have to stop the lesson and review what we do [in the structure].(4) They need [language] models.(5) I tweaked how I have students working with partners to correlate to the Kagan model. (5) I make a poster of the structure and the cheer with pictures so the students know the name of the structure and what it looks like. (6) I use hand up, pair up, share. I use inside/outside circle and I use round robin (6) getting them involved in it [keeps them engaged] (6) Kagan has really made my students responsible for their actions, they are responsible to their partner (6) Pulling sticks (6) lots of engagement (7) I pair students together with students who are a different language level so they get language support (7) Cooperative learning really helps the kids (7) They don't realize they are learning because they are having fun(7) They have to learn to work together (7) They are responsible for keeping each other accountable (7) If they are not talking the students will tell me "My partner is not talking to me." (7) They [ELL] need time in order to get their thoughts across. English learners have difficulty responding on demand and more teachers need to wait for them to give their response and not rush them. We have so much to teach and limited time (8) A lot of my students don't want to participate or wont' do the work but when they have a peer that's helping them that has been very helpful(8) I've seen a lot of growth in learning names of items and objects because of Kagan (8)
Direct Interactive Instruction
DII gives them a visual (2) good structure to help the kids see what you're asking of them and so they feel like they're being successful. (2) Focus wall (2) I have to do a lot of modeling Watch me do it and then now you do it with me and then you do it with your partner (4) the students have to be very involved with the lesson(4) The good results are that the students do really know exactly what they're learning for that particular lesson (4) With DII things don't go as well as they should but that comes with practice and a lot of modeling (4) I go over the steps the I do, We do, You do with help, and You do (6) it's super direct instruction. That's where they get the academic language [by repeating the objective](7) To have kindergarten students repeat the standard does not have meaning for them (7) For a kindergartener to just repeat the standards, that, to me, seems too [removed from meaning] (8) They can state what the objectives are and know what their job is and it is helpful(8)
Forms and Functions
Sentence frames (1) repeating (2) lot of labeling (2) lot of vocabulary to build their understanding (2) They need more sentence frames (2) academic language (2) language is very much a part of mathematics (3) We run into a lot of vocabulary things that the students have never been exposed to such as the symbol for addition. (4) We run into a lot of vocabularies that students need in order to meet the standard of adding two groups together (4)
Professional Learning Community
Assess each Section (1) then assess each unit (1) Section tests are really helpful as a formative assessment. (2)"It gives you a chance to see –Are they getting it? and lets you know what kind of vocabulary is gonna be on the test so they can understand the

questions. I like that part about the curriculum." "We (at the same grade level) take unit tests at the same time." The Section tests and the unit tests are helpful (4) The reteach and enrichment lessons are helpful(4) We collaborate on the results of our unit tests(6) Collaborate with peer teachers (2) about math test data and create a plan how to help those kids. (2) We use the public drive to share materials (6) We collaborate about how many days to teach a concept (6)
Base program
We are expected to go to training every time the district adopts a new program. I took the [HM math] training for a whole week. I found out there was a lot of things in this program that do support [EL] students in some areas but it also is lacking in other areas. (4) Every time you go to [a district] inservice they'll touch on what you can do for second language learners and it's always after the fact.(5) The part of the training that was helpful with ELLs was getting to see the manipulatives (8) As far as training specifically math for EL learners, not so much (8)
What aspects of the base program are helpful in supporting ELLs in math?
materials
Some of the things I find very helpful are the big flip chart(4) It has been very helpful in introducing a concept or vocabularies (4)The other thing I find helpful is the student practice book(4) We do not have the student workbook but that one goes right along with the flipchart(4) The student practice book and the flip chart teach the same concept but in a different format(4) The reteach is helpful in small group(7) The big book is very helpful because its' visual (8) the math book have been helpful but we have to supplement a lot (8) (4) The reteach and enrichment lessons are helpful(4)
assessments
Assess each Section (1) then assess each unit (1) Section tests are really helpful as a formative assessment. (2)"It gives you a chance to see –Are they getting it? and lets you know what kind of vocabulary is gonna be on the test so they can understand the questions. I like that part about the curriculum." "We (at the same grade level) take unit tests at the same time." The Section tests and the unit tests are helpful
What aspects of the base program are least helpful in supporting ELLs in math?
Not enough practice
Students need more practice (1) We plan so in some units we know students are going to need more time [on concepts] than allotted. So we plan to give them more time and then less time on others like position words and shapes (2)"[In the base program] there's like one or two worksheets, and then that's it. That's all the practice that they're receiving." Our HM goes very quickly through the math concept so you really have to do a lot of whiteboard, one to one, small group, it's really lacking, Maybe two pages on something and then off to the next.(3) We need to pull in extra materials – Frank Schafer and previous math curriculums and Kathy Richardson(3) Houghton-Mifflin does not provide enough practice with concepts (3) I wish there was a lot more supplementals that we had to pull. I think they really need a lot more than what they have.(3) I have to use supplemental materials, teacher-created materials to support them (4) I've used a lot of teacher-created materials to differentiate(4) I supplement to give them extra practice (4)

The [HM] program does not provide extra practice (4) The program doesn't provide that(4) The pacing is too quick. I find that I have to supplement with materials other than the base program (4) I like to create things for my students that fit them(5) The base program moves too quickly and it covers too much material. (5) [The base program] only gives you one page maybe two to cover a topic or subject. (5)And then it's up to you to come up with other supplemental materials (5) Some of the activities in HM really don't get the students engaged (6) Sometimes I have to make up a lesson so that I feel it is going to connect to them.(6) Sometimes I'll create a lesson or use one from a previous program (6) HM give only about two or three sheets and each sheet have about four problems. If I do, then We do, You do, then they only get one problem to do alone. That doesn't give me enough information that they can do it on their own so I have them do the other side. So – what do I have for tomorrow?(6) We need more worksheets. We only get two or three and that's not enough.(6) The student handbook that's given to us has one concept on one side and another concept on the other side. It is very confusing for any student (7) So I have to take the initiative and decide if I am going to teach this concept for one day or one week (7) One day learning is not sufficient for any learner let alone ELD learners (7).We have to supplement with other outsource materials that we have in the classroom (7) They need a lot of time to process(8) We have to supplement a lot (8) on one page they will be asking the children to add and the next page to subtract so teachers are making their own copies and supplementing (8) teachers purchase them on their own (8) We get one or two pages to cover a topic so I don't feel supported in the math portion (8) Standards Plus (1) provide more practice (1) "This is the first year we're doing it, and I am finding out that it is successful." I would rather have more practice pages (8)
Confusing
wording
Assessment is confusing. Some questions lend themselves to misinterpretations or unclear of what they are supposed to do. (1) Before I teach I go over the assessment and I see the wording they use because some of the words are not in the daily work (6) I collaborate with my grade level and discuss what wording we will use on the assessment and we discuss the format of the assessment as well.(6)
format
The format of the assessment is different than daily work.(1) not having the student workbook is not helpful. The student workbook is the same format as the flipchart (4)The student handbook that's given to us has one concept on one side and another concept on the other side. It is very confusing for any student (7) There is an item that comes with the practice book called Circle Time Math that is just not helpful at all. I tried it and it's just a waste of time(8)
What have you found helpful or unhelpful about the base program's ELL support materials?
State adaptations for ELL – I like how the lesson flows a lot better and how it has enforcements. I feel like there's more to it. I like how it tells you here's your warm-up with your prior knowledge and there's a vocabulary word right there. It shows you where

they practice together with you and then they do it independently. (2) They universal access page is a good one. (2). I have been frustrated with the ELD book because it's hard to use. (2) I've used it (ELL adaptations) some. I haven't found it helpful this year (3) I have used the universal access lessons a couple of times(4) I don't use it [the English learner support book or the Universal Access piece (5) The ELD book goes really well with developing vocabulary (7) Uses Section resources for extra practice (1) I use the UA, the reteach and enrichment to differentiate instruction (4) I've not really focused on the universal access part of it (7) I have used it a little bit but not so much. With 29-30 kids it becomes tough to pull small groups. With DII and Kagan there's not time to sit down in small groups (8)

Curriculum Vita

Martha Franklin, Ed.D.

Summary

Passionate educator with 25 years hands on classroom experience, which includes 8 years leading teachers through content focused curriculum coaching, seeks to contribute to the community of professional educators through teacher leadership. My primary goal in recently earning a doctorate in education is to pass the torch of my knowledge, skills, and experience to prospective and new teachers. My secondary goal is to support student achievement through research, design, and development of effective early elementary curriculum.

Core Qualifications

Knowledge	**Skills**
• Early childhood reading development • Early childhood math concept development • Curriculum design	• Designing engaging interactive lessons • Leading professional reflective conversations • Leading professional development workshops for teachers

Education

2013	**Walden University**	Minneapolis, MN
	Doctor of Education, Teacher Leadership	
1999	**California State University**	Fresno, CA
	Master of Arts in Education, Reading Emphasis	
1987	**California State University**	Fresno, CA
	Bachelor of Arts, Liberal Studies	

Certifications

2000	California Reading Specialist Credential
1994	Language Development Specialist Certificate
1987	Multiple Subjects Teaching Credential

Achievements

- Facilitated professional learning communities in tailoring language arts curriculum and lesson design to target English learners.
- Demonstrated lessons and provided follow up coaching for individual teachers in implementing English language development lessons.
- Facilitated professional learning communities to identify key academic vocabulary for development of a school academic vocabulary handbook.
- Modeled and coached teachers in implementing vocabulary development lessons.
- Trained groups of teachers in math lesson design, development, and implementation.
- Coached individual teachers in math lesson design, development, and implementation.
- Facilitated professional learning communities in backwards mapping language arts and mathematics curriculum.

Work History

Visalia Unified School District, Visalia, CA

Elementary teacher, July, 2009 - current

Visalia Unified School District, Visalia, CA

Curriculum coach, August, 2002 – July, 2009

Visalia Unified School District, Visalia, CA

Elementary teacher, July, 1995 – August, 2002

Orange Center School District, Fresno, CA

Elementary teacher, August, 1990 – July, 1995

Terra Bella Union School District, Visalia, CA

Elementary teacher, August, 1987 – July, 1990

Adjunct Work History

Tulare County Office of Education, Visalia, CA

Trainer 2005 - 2007

Led five day training for teachers in analyzing and planning elementary mathematics instruction using district adopted state program.

HEART, Visalia, CA – an after school program,

Reading intervention coordinator 2007 - 2009

Responsible for organizing, training tutors and monitoring after school reading intervention 2004 - 2005

Academic Coach 2005 - 2008

Led training and support in academic materials for HEART program leaders.

Fresno County Office of Education

Trainer 2005

Led five day training for teachers in analyzing and planning elementary mathematics instruction using district adopted state program.

Los Angeles Unified and University of California (LUCI) Math

Trainer 2002

Provided five day training for teachers in analyzing and planning elementary mathematics instruction using district adopted state program.

Math Perspectives

Independent Consultant 2002

Led math curriculum workshops for San Diego City Schools

Visalia Unified School District

Master Teacher 2000

Mentor and direct student teachers

BTSA Support Provider 1998 - 2000

Mentor beginning teachers

Mathematics Lead Teacher 1999 - 2002

Led a demonstration classroom which modeled effective math instruction and curriculum implementation.

Orange Center School District

Mentor teacher 1993 - 1995

Oversaw implementation of science curriculum.

Professional Growth and Training

Direct Interactive Instruction, 2012
Action Learning Systems
Visalia Unified School District

Engagement Structures, 2009 - 2011
Kagan Professional Development
Visalia Unified School District

Leading Professional Conversations, 2005
By Marilyn Tabor
Tulare County Office of Education

AB466/SB472 Trainer of Trainers for Mathematics, 2005
Sacramento County Office of Education

Investigations in Number, 2003 - 2004
Gail Lowe-Parrino
Visalia Unified School District

AIMS training, 2003
Fresno Pacific University

Cognitive Coaching Institute, 2000
William Baker
Tulare County Office of Education

Teaching and Assessing Math for Understanding
Math Perspectives, Kathy Richardson
Visalia Unified School District

Math Matters, 1997
Tulare County Office of Education

Early Literacy training, 1995 - 1996
Visalia Unified School District

Affiliations

National Council of Teachers of Mathematics
National Council of Supervisors of Mathematic
Association for Supervision of Curriculum Development
California Mathematics Council