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Early science learning among low-income Latino preschool children: The role of parent and teacher values, beliefs, and practices

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Author
Choi, Bailey Miyeon

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Early science learning among low-income Latino preschool children: The role of parent and teacher values, beliefs, and practices

A dissertation submitted in partial satisfaction of the Requirements for the degree Doctor of Education in Teaching and Learning by Bailey Choi

Committee in charge:

Alison Wishard Guerra, Chair
Amanda Datnow
Barbara Sawrey

2016
The Dissertation of Bailey Choi is approved, and is acceptable in quality and form for publication on microfilm and electronically:

Chair

University of California, San Diego
2016
DEDICATION

To my parents,
who gave their everything to give me opportunity.

You have taught me that anything is possible
with persistence and hard work and that
education is the greatest pursuit.
Science is more than a school subject, or the periodic table, or the properties of waves. It is an approach to the world, a critical way to understand and explore and engage with the world, and then have the capacity to change that world

President Barack Obama
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VITA

Education

2016   Doctor of Education, Teaching and Learning  
       University of California San Diego

2009   Master of Education  
       University of California San Diego

2009   Multiple Subjects Teaching Credential  
       University of California San Diego

2008   Bachelor of Arts, History  
       University of California San Diego

Professional Experience

2009- Present    Teacher  
                 Carlsbad Country Day School

2014- Present    Graduate Research Assistant  
                 University of California, San Diego

2013- 2015       Teaching Assistant  
                 University of California, San Diego

Related Experience:

2011- Present    Guest Speaker, UCSD Education Studies, EDS 115,128,  
                 131

2015    Presenter, Diving Deep: Transforming Educational Practice  
         for All Students through CCSS/NGSS Conference

2014    Presenter, Implementing Innovative Strategies in the Era of  
         CCSS/NGSS Conference

2014    Presenter, Early Childhood STEM Institute
ABSTRACT OF THE DISSERTATION

Early science learning among low-income Latino preschool children: The role of parent and teacher values, beliefs, and practices

by

Bailey Choi

Doctor of Education in Teaching and Learning

University of California, San Diego, 2016

Alison Wishard Guerra, Chair

Science Technology Engineering and Math (STEM) education has become a top priority, particularly for low-income Latino students, who are vastly underrepresented in STEM fields, largely due to various inequities in the PK-20 pipeline (Villareal, Cabrera, & Friedrich, 2012). Implementing effective science instruction in preschool has been identified as a way to increase low-income Latino students' participation in STEM (U.S. Department of Education, 2014). However, science in preschool classrooms is often nonexistent or not of high-quality (Nayfield et al, 2011; Tu, 2006). This lack of high-quality science in
preschool is especially problematic for low-income Latino children, who already face challenges persisting in the STEM pipeline throughout their years of schooling. Research that centers around improving children’s early science learning focus mostly on children’s science experiences within the classroom, but there is little research that consider children’s culturally-based early science experiences within the home.

This study investigated low-income Latino children’s early science experiences at home and at school. Using mixed-methods and an ecocultural (Bronfenbrenner, 1979; Weisner, 2002)/ cultural communities (Rogoff 2003) perspective, this study examined and compared the early science learning beliefs/values and practices of low-income Latino parents of preschool children and their children’s preschool teachers. Both parents and teachers ranked science as one of the least important school readiness domains that children should learn about in preschool. Teachers also rated science the domain they felt least comfortable teaching. Teachers reported science as being difficult to teach due to various barriers (i.e. fixed mindset of their science teaching capabilities, issues with preschool program structure, and a belief that science is inappropriate for preschool children). Science was both a reported and documented area of weakness, as there were very few science-related activities/interactions and several “missed opportunities” for science-related talk, play, and exploration that were observed. This study provided a more detailed picture of two cultural communities (home and school) that impact children’s early science learning. An increased awareness of parents and teachers’
beliefs/values and practices, can aid in the improvement and development of
effective, culturally adaptive, science curriculum and instruction that is informed
by the beliefs/values and practices of children’s parents and teachers.
Chapter 1: Introduction

New theoretical ideas and empirical research have shown that young children are not only developmentally prepared to learn about science, but they also behave in ways that are strikingly similar to scientists (French, 2004). Both young children and scientists investigate their worlds by using data to make and test predictions. They also learn from the results of their investigations and make causal representations or scientific theories (Gopnik, 2012). As children make sense of their surroundings in their earliest years, they naturally participate in activities that help develop their scientific thinking skills. Although young children commonly think and act like scientists, formal attention to science learning is typically relegated to the domain of K-20 education. However, the increasing attention on Science Technology Engineering and Mathematics (STEM) and STEM education is helping to build awareness of the importance of science in preschool.

Increasing Attention on STEM Education

In the past decade, STEM education has become a national topic of critical importance. Advancements in STEM fields are considered an important component of national prosperity and well being, and STEM skills are becoming increasingly necessary to compete in the global economy (US Department of Education, 2014). The STEM Education Coalition (2012) has highlighted the need for students’ development of STEM skills and has made STEM education a
top priority, particularly for students of color, who are vastly underrepresented in STEM.

**Latino students and STEM.** As it stands today, people of color are highly underrepresented in STEM fields. This lack of representation is even more prevalent among Latinos, who are currently the nation’s largest minority group, but make up less than two percent of the entire STEM workforce (US Department of Education, 2014). There are various leaks in the Latino PK-20 STEM pipeline that have been well documented, such as low levels of achievement in math and science (National Center for Education Statistics, 2012), and a low number of students who major in STEM fields and complete STEM related degrees (Villareal, Cabrera, & Friedrich, 2012). These leaks are strongly related to the inequities of students’ PK-20 experiences, which include “inequities in schooling practices, resources, academic achievement and the culture of schooling” (Johnson, 2010, p.170).

The underrepresentation of Latinos in STEM has been greatly attributed to these leaks in the Latino STEM pipeline. However, relatively recently, a lack of effective STEM education in preschool has also been thought to contribute to the underrepresentation of Latinos in STEM. In fact, the Department of Education (2014) explained that the key to expanding Latino participation in STEM “starts with exposing Latino students to STEM-focused education and careers at earlier ages,” advocating that STEM education “begin in preschool” (p.2).

**Early STEM experiences.** Although several initiatives (Department of Education, 2014; STEM Education Coalition, 2014), policy statements (National
Science Teacher’s Association, 2014), and early learning standards (California Department of Education, 2013) support the implementation of STEM education in preschool, science is not a priority in many preschool classes. In fact, preschool students and teachers spend little time engaged in science (Early et al., 2010) and when they do, it is often not effective or of high-quality (Tu, 2006). This lack of high-quality science in preschool is problematic for preschool age children in general and low-income Latino children specifically, who already face various challenges staying in the STEM pipeline throughout their years of schooling.

**Purpose of This Study**

Research that centers around improving young children’s early science learning focus mostly on children’s science experiences within the preschool classroom, but there is little research that consider children’s culturally-based early science experiences within the home. In order to improve the early science learning of low-income Latino children, and to provide an effective entry point to the STEM pipeline, there is a need for more investigation of low-income Latino children’s early science learning experiences. Examining these children’s science experiences at home and at school, two contexts that have a great impact on a child’s development of science knowledge, can contribute to a more holistic understanding. More specifically, studying the beliefs/values and practices endorsed and enacted by parents and teachers, at home and at school, can
provide a more detailed picture of how low-income Latino children develop science knowledge and how it can be improved upon.

It is particularly important to learn more about low-income Latino parents’ early science learning values/beliefs, as there is very little research on science learning among families with preschool age children in general, and low-income minority families with preschool age children more specifically. Investigating parents’ values/beliefs around early science learning can provide additional insight into children’s development of early science learning, as parent values and beliefs have been found to impact parental practices that shape children’s development (Rogoff, 2003).

Research with low-income Latino families often reflects a deficit perspective and highlights achievement gaps (Fuller & Garcia Coll, 2010). Throughout history researchers have compared people of color to European American people using a deficit model (Rogoff, 2003). A deficit model holds that European American skills and upbringing are considered “normal” and any variations are considered deficits. A deficit perspective has been utilized in research in various domains of low-income Latino children’s learning/development. Specifically in terms of science, the cultural resources that Latino students bring to the classroom are often ignored and students who veer from what is considered “normal” are thought of as having deficits (Lee & Luykx, 2006). Therefore, there is a great need for learning more about the cultural resources and strengths of students of diverse backgrounds, especially in science.
This study will combat the deficit perspective of low-income Latino preschool children by taking a strengths-based approach in which the unique values/beliefs, which ultimately impact home practices, are uncovered and seen as strengths, rather than deficits. There is little known about the within-group variation in family education, income, beliefs and values, childrearing styles and the economic and social investments that families make for their children (Cabrera, 2013). Studying these within-group variations among minority families, like families’ values/beliefs, can help show the ways in which these values/beliefs promote positive development, focusing on families’ strengths. Therefore, this study will focus on exploring low-income Latino parents’ early science values/beliefs.

A strengths-based approach to teaching and learning also acknowledges that there are multiple pathways to successful development and promotes what families are already doing within their cultural contexts (Cabrera 2013). This study will provide a better understanding of Latino families’ early science learning values/beliefs, which ultimately impact the ways in which parents are already supporting their children’s science early learning at home.

Combined with information on the early science learning beliefs/values of teachers of low-income Latino children, this study will compare the beliefs and practices of both parents and teachers to identify overlaps in terms of things like content, approaches, language use, etc. These areas of overlap will indicate areas that effective early science curriculum and instruction can build or
capitalize upon, while identified areas of disconnect will indicate areas in which home expertise can be better integrated.

This study will also promote the practice of looking closely at the lives of Latino children for preschool teachers and other preschool personnel who interact with Latino children and their families. Asking parents about their values/beliefs of early science learning, which inform their science-related home practices can provide teachers with important data that they can use to inform their instruction and build on what families already do at home.

Culturally adaptive protocols (i.e. Mexican American Socialization Scale) that provide preschool teachers and personnel with a more in depth look at the lives of diverse families can help them better serve these families (Bridges et al. 2012). Similarly, this study promotes the practice of looking closely at parent belief systems of low-income Latino preschool children as a way to understand children’s science learning and facilitate positive relationships with families.

In summary, the goals of this study center around: learning about and comparing the early science learning values/beliefs and practices of low-income Latino parents of preschool children and teachers of low-income preschool children in hopes of gaining a more comprehensive view of low-income Latino children’s early science learning. A more comprehensive view may contribute to the development of early science curriculum and instruction that are informed by the values/beliefs of low-income Latino families and improve the early science experiences of low-income Latino preschool age children.
Improving the early science experiences of preschool age children in general, and low-income Latino children specifically can have positive implications that extend beyond science learning. High-quality science is an important part of high-quality preschool programs (Brenneman, Boyd, & Frede, 2009) and high-quality preschool programs have a positive impact on children's school readiness outcomes. This positive impact on both children's cognitive and social readiness outcomes is particularly great for low-income minority children (Shonkoff & Phillips, 2000). Therefore, improving preschool age children's early science experiences may positively impact children's overall early learning experiences and help support their school readiness in a variety of domains including science.

Theoretical Framework

The vast majority of research on early science learning focuses on classroom based curriculum and learning (Gelman & Brenneman, 2004; French 2004). There is very little research on early science learning experiences in the home. What little research that does exist has been conducted with White middle-income families or focused on families participating in school-based science learning curriculum at home (Korpan, Bisanz, Bisanz, Boehme, & Lynch, 1997; Mantzicopoulous, Patrick & Samarapungavan, 2011). Little to no research has investigated the authentic science-related interactions that occur within the homes of culturally and socioeconomically diverse families. Theories of
development as a cultural practice will inform this investigation of early science
learning among low-income Latino families.

The study is broadly based in Ecocultural Theory (Bronfenbrenner 1979,
2006; Weisner 1998, 2002) and more specifically in Rogoff’s (2003) Cultural
Communities framework. In unison, both theories provide a useful conceptual
framework for (a) understanding importance of examining relations among
multiple settings that children and families are involved (b) understanding how
the home and school function as cultural communities in which young children
and their families participate in and (c) understanding how participating in these
cultural communities impact Latino preschool children’s development of early
science learning.

Ecocultural theory. Bronfenbrenner’s (2006) ecological perspective
emphasizes that development occurs within an ecological system of more
proximal and distal environments, or “ecological niches.” The child’s most
proximal environments, and those having the most immediate impact on the child
include settings like the home and school. Moving outward to more distal
ecologies are things like the parent workplace, district policies (ie. STEM
programs), social norms, etc. There are four ecological systems (microsystem,
mesosystem, exosystem and macrosystems) that are sequentially nested within
larger contexts to identify the multiple layers of influence on a child’s individual
development. Students’ early science learning will be investigated in both the
home and the school environments. Practices endorsed in each microsystem
context are assumed to be influenced by practices and policies in the more distal ecologies of the mesosystem, exosystem, and macrosystem.

Bronfenbrenner’s bioecological perspective is particularly useful when examining the relations among multiple settings in which children and families are directly or indirectly involved in their daily lives. This study focuses on examining the proximal processes or interactions within settings that low-income Latino children and their families involve in their daily lives: the school and the home. A child’s development is most directly influenced by his/her immediate experiences that occur within the microsystem, which include settings like the school and the home (Bronfenbrenner & Morris, 2006). For young children, the preschool, the school is likely to be the second most frequent environment in which they spend time. This study will focus on the interactions that occur within both of these contexts.

Building off of Bronfenbrenner’s bioecological theory, Weisner (2002) argued that development occurs through “cultural pathways” that are made up of everyday routines, which consist of a variety of cultural activities (i.e. bedtime, homework, watching TV). When looking at daily routines as cultural practices, Weisner’s framework emphasizes five important components: (1) the task itself (2) the goals or outcomes the task promote (3) the motives that bring participants to the task (4) the people who participate in the task and (5) the scripts and schemas that guide the task (Weisner, 1998). According to Weisner (1998), at the core of ecocultural theory is the idea that the daily routines and activities children routinely participate in have the most important influence on shaping a
child’s cultural developmental pathway. This study will examine the cultural practices that are a part of the daily routines of the home and the school, looking closely at the five important components of these practices.

**Cultural communities framework.** Rogoff’s (2003) cultural communities framework also emphasizes the role of daily routines. Rogoff (2003) argues that children develop through everyday routines that are determined by the cultural communities in which they participate. She defines a cultural community as a group of people who have common goals, beliefs, history, values, and practices (Rogoff, 2003). Practices can be thought of as “ways of doing things” that are rooted in people’s beliefs, expectations, goals, and traditions (Rogoff, 2003).

Although cultural communities are influenced by race, ethnicity and home language, they go beyond simple ethnic or racial labels. Often times ethnicity is conflated with culture, which assumes that people of the same ethnicity are homogenous, however, there are many variations in the cultural practices of people who have the same country of origin or current residence (López, Correra-Chávez, Rogoff, and Gutiérrez, 2010). There are multiple cultural communities within people of the same ethnic group, as cultural communities are defined by shared practices.

When shared practices are used to define cultural communities, patterns of regularities or variations in the daily routines within traditionally defined groups become more visible (Rogoff, 2003). Therefore, this framework is valuable when looking for patterns within groups of people that are often thought of as homogeneous. In this study, low-income Latino families will not be treated as a
homogeneous group. Within-group variations will be examined by looking closely at patterns of cultural practices that define cultural communities within this larger group.

Children can and do participate in multiple cultural communities, which may overlap and conflict with each other at times (Rogoff, 2003). For example, children may participate in two or more cultural communities, including his/her family/home and classroom/school and these communities are defined by a set of shared practices. In this study, the preschool classroom, defined by the shared practices that make up the daily routines of the classroom and the home of each low-income Latino family, defined by the shared practices that make up the daily routines of the home, will be considered as two distinct cultural communities.

Intent participation. Each cultural community has its own repertoire of practice, or ways of engaging in cultural activities (Gutierrez & Rogoff, 2003). As children participate in their communities they develop their repertoires of cultural practice (Coppens, Silva, Ruvalcaba, Alcala, Lopez, Rogoff, 2014). There are several different cultural repertoires for learning activities, which vary among cultural communities. Many repertoires of practice involve intent participation, or learning by observing and pitching in (LOPI) to family and community endeavors.

There are several specific features of intent participation or LOPI in regards to these motives, goals, social organization and means of learning. With intent participation learning activities, often the motive of the parent is to accomplish a specific task and to guide the learner’s contributions. The learner’s motive is to contribute or belong as a valued member of their family/community
Instead of attempting to complete tasks that are out of context, young children’s integration in family and community activities allows them to become increasingly involved through their intent participation (Rogoff, Paradis, Arauz, Correa-Chavez, Angelillo, 2003). The goal of the learning activity is to transform participation to contribute and belong in the family/community (Coppen et al, 2014). The social organization of home/community endeavors involves collaborative engagement between the learner and the family/community members facilitating the activity. Finally, learning occurs by means of activities that include keen observation and contribution to family/community events.

The intent participation model varies greatly from the assembly line/factory model that is often associated with formal schooling. While the intent participation model involves a collaborative, horizontal participation structure, the assembly line/factory model emphasizes that learning occurs hierarchically, as a product of transmission from the teacher to the learner (Rogoff et al, 2003). With intent participation, children and parents engage together in a common endeavor and parents play a guiding role, facilitating learners’ involvement. In contrast with the assembly line/factory approach, learning is based on transmission of information from experts outside the context of purposeful, productive activity.

The intent participation model is particularly useful when investigating the early science teaching and learning practices in the homes of low-income minority children, whose learning experiences more closely identify with that of the intent participation model than assembly line/factory model. There are
several communities in which the patterns described by intent participation or LOPI is prevalent (Coppen et al.). For example, learning through observation and contribution is common in a number of non-western communities (i.e. indigenous-heritage communities, rural Latino communities). The intent participation model can help describe the teaching and learning practices that families participate in at home that often differ from the traditional model.

**Children’s development of early science learning**

The theoretical framework that guides this study emphasizes development as a cultural process, driven by the values/beliefs and practices of the cultural communities in which children participate. More specifically, it helps situate the development of children’s science knowledge as a cultural process. Children develop their science knowledge by participating in the cultural communities within the home and the school. These communities are often seen as separate systems that influence the child’s early science learning. Figure 1 shows that in the home community, parents values/beliefs of early learning, and their values/beliefs about early science learning impact their practices around early science learning, which ultimately impact children’s development of early science learning outcomes. Figure 1 also shows that in the school community, teachers’ values/beliefs of early learning, and early science learning impact their practices around early science learning in the classroom, which ultimately impact children’s development of early science learning outcomes. This figure illustrates
children’s development of early science learning through participation in cultural communities of the home and school.

**Figure 1.** Children’s development of early science learning.

Additionally, Figure 1 also depicts bidirectional influence between the home and school systems. Children’s early science learning outcomes are mutually supported by the values/beliefs about early learning, values/beliefs about early science learning, and the practices around early science learning in the home and school. Although this model posits the intersection home and school early science learning practices, this study focuses on early science learning practices at school along with the values/beliefs around early learning and early science learning at school and at home. This study seeks to identify where instances of overlap between elements of these two systems, specifically focusing on values/beliefs about early learning. Building on these areas of overlap, and utilizing the expertise of both communities will enrich children’s
learning experiences in both the home and the school, and improve development of early science learning.

Research Questions

There are several research questions that are directly informed by the theoretical framework and the goals of the study. These research questions are as follows:

1. What early learning values/beliefs do low-income Latino parents of preschool children endorse?
   a. How does science fit into their early learning values/beliefs?

2. What early learning values/beliefs do teachers of low-income Latino preschool children endorse?
   a. How does science fit into their early learning values/beliefs?

3. In what ways do these values/beliefs shape the way teachers of low-income Latino preschool children approach activities that support children’s science learning at school?

4. How do low-income Latino parents of preschool children’s values/beliefs around early science learning compare to the values/beliefs and practices of teachers of low-income Latino preschool children?

These questions were explored through a mixed methods study that sought to examine and compare the values/beliefs and practices of low-income Latino parents and their children’s preschool teachers.
Chapter 2: Literature Review

The research questions explored in this study build upon the existing literature around three interconnected domains: high quality early education and school readiness, development as a cultural process, and early childhood science.

This chapter begins with a discussion of preschool program quality and its impact on school readiness, particularly for low-income Latino children. It will also include an overview of school readiness and the varying values/beliefs of early learning that center on school readiness held by early childhood teachers and parents. Next, an examination of the literature on development as a cultural process will be provided. Finally, this chapter will conclude with a review of research in early childhood science, which will include research that has been conducted in preschool classrooms, and what little research has been conducted in home settings. Taken together, these domains of research inform the current study, which investigates the early science learning values/beliefs and practices of low-income Latino parents and their children’s teachers.

High Quality Early Education and School Readiness

Quality in early education. Although the achievement gap in science has become a relatively recent topic of increasing concern, various achievement gaps have persistently plagued the U.S education system. The U.S. has struggled to address several achievement gaps: international gaps when compared to other countries, and internal gaps by race and income (Crawford,
Cobb, Clifford and Ritchie, 2014). Educational reform has attempted to address these gaps using various strategies. Increasing the quality of preschool education is a strategy that has shown great promise in raising student achievement. Children’s early learning experiences are crucial for their long-term success and high quality preschool programs have been proven to support children’s development of cognitive and social-emotional skills, especially for children who are “at risk” (Shonkoff & Phillips, 2000).

Quality is reliant on structural dimensions (i.e. qualifications of teachers, staff-child ratios, physical environment of the room) and process dimensions (i.e. teacher warmth, positive teacher-child interactions) (Howes, 2010). Process quality can be further broken down into social-emotional quality and instructional quality (Holland, Crawford, Ritchie & Early, 2014).

Common measures of quality in early childhood environments include assessments of structural and process quality. Although structural quality is a necessary component of overall quality, structural quality alone is not a sufficient component of overall quality. Often times, structural dimensions contribute to quality in indirect ways as they influence process dimensions. For example, small ratios (a structural dimension) can lead to more positive and warm teacher-student interactions (a process dimension). Measures of quality, including The Classroom Assessment Scoring System (CLASS) (Pianta, La Paro, & Hamre, 2008) and the Early Childhood Environmental Rating Scale (ECERS) (Harms, Clifford, & Cryer, 1998) have demonstrated improvements in structural quality
and emotional support in preschool. However, there is stagnation in instructional quality (Holland et al., 2014).

In addition, in order for programs to be considered high quality, they should also reflect developmentally appropriate practice (Ackerman & Barnett, 2005). Developmentally appropriate practice (DAP) is an approach to teaching that requires teachers to combine their knowledge of child development and learning, their knowledge of individual children, and their knowledge of what is culturally relevant to children and their families (Bredekamp & Copple, 2009). Essentially, when triangulated structural dimensions, process dimensions and DAP work together to determine program quality.

It is becoming commonly accepted that children who attend a high-quality preschool are more likely to succeed in kindergarten than those who do not. As previously mentioned, quality plays an important role in supporting school readiness and it is a strong predictor of children’s future social and academic success. The Cost, Quality, and Child Outcomes (CQO) in Child Care Centers Study, a study of center-based community child care and children’s longitudinal outcomes, examined the long-term effects of child care quality on children’s language, cognitive and social skills (Peisner-Feinberg et al., 2001). Child care quality positively influenced children’s receptive language, math, cognitive and attention, problem behaviors, and sociability skills throughout kindergarten and, in some cases, throughout second grade. The impact of preschool program quality on children’s cognitive and social skills provides evidence that the quality of children’s preschool experiences is an important predictor of school readiness.
High quality preschool experiences have the greatest impact on minority and low-income children, who are more likely to enter kindergarten behind their middle-class White and Asian peers and demonstrate lower achievement in reading and math (Crawford et al, 2014; Espinosa, 2002). In fact, according to Ackerman and Barnett (2005), “increasing access to high-quality early childhood education is the most effective strategy in supporting school readiness in minority children” (p.12).

In a study examining the impact of the HighScope Perry Preschool, a high-quality preschool program, on low-income minority children, researchers found long-term benefits for children including higher academic achievement in various school readiness domains, lower dropout rates, lower crime rates and higher rates of employment (Schweinhart et al., 2005). Relatedly, Currie and Thomas (1996) compared the long-term effects of preschool on low-income African American and Latino children. They found that both African American and Latino children showed initial gains in achievement in school readiness domains, compared to children who did not attend preschool. While these initial gains tended to eventually “wash out” for African American children, this was not the case for Latino children. Latino children benefited cognitively over time from their preschool experiences. According to Gándara (2006), more recent studies that examined the effects of Head Start programs by racial and ethnic background found that cognitive gains that support school readiness have been “substantial and persistent” for Latino children (p.226). While high-quality preschool has been
found to be particularly beneficial for all low-income, minority children, this especially seems to be the case with low-income Latino children.

**School readiness in early childhood.** It is generally accepted that preschool quality positively impacts children’s school readiness skills. It is also generally accepted that a child’s future success is dependent on being ready for school, or being ready learn and participate in kindergarten (Ackerman & Barnett, 2005). However it is more difficult to define “what being ready for school” or “school readiness” is. Readiness has often been defined as “a child's skills, behaviors, or attributes in relation to the expectations of individual classrooms or schools” (Ackerman & Barnett, 2005). It has also been defined in relation to specific school readiness domains. For example, in the Office of Head Start’s policy statement on school readiness, Head Start agencies set “school readiness goals” that are defined as “the expectations of children’s status and progress across domains” (U.S. Department of Health and Human Services, Administration on Children, Youth and Families, Head Start Bureau, 2011). These domains include: language and literacy development, cognition and general knowledge, approaches to learning, physical health and well-being and motor development, and social-emotional development.

Parents and teachers often have differing expectations for what children should know and be able to do to be ready for kindergarten as a part of their early learning values/beliefs. Although both parents and teachers ultimately want their children to be ready for school, their early learning values/beliefs around school readiness can look very different.
**Teachers and school readiness.** Early learning values/beliefs that center on school readiness do not only vary among parents and teachers. There is also within group variation among early childhood teachers, more specifically, between kindergarten and preschool teachers.

*Kindergarten teachers.* Overall, kindergarten teachers’ perceptions about readiness vary, but generally they rate non-academic skills as being important indicators of school readiness. For example, Heaviside and Farris (1993) examined kindergarten teachers’ views on school readiness and found that over 75 percent of participants believed the top readiness skills were: to be physically healthy, well rested and well nourished, to be able to communicate thoughts and needs in words, and to be curious and enthusiastic when approaching new activities. More than half of teachers also indicated that not being disruptive, being sensitive to other children’s feelings, and taking turns and sharing were important components of school readiness. Less than 10 percent believed that being able to count to 20 or knowing the alphabet were important in terms of readiness.

Similarly, in a more recent study by Lin, Lawrence and Gorell (2003), using data from the Early Childhood Longitudinal Study- Kindergarten Cohort (ECLS-K), the authors also found that the kindergarten teachers sampled were less likely to endorse academic skills in their descriptions of school readiness. Academic tasks like using a pencil, knowing the names of colors, recognizing letters, or counting to 20 or more were less likely to be rated as important. Instead, over 75 percent of teachers mentioned being able to follow directions,
communicating needs and thoughts, and not being disruptive as more important readiness skills.

*Preschool teachers.* While most Kindergarten teachers were less likely to cite academic skills as crucial for school readiness, there was more variation within preschool teachers. In a study by Hains, Fowler, Schwartz, Kottwitz, and Rosenkoetter (1989), the authors examined the readiness expectations of preschool teachers. They found that preschool teachers had higher academic readiness expectations for their children, as at least 80 percent of preschool teachers listed more academic skills as “very important” for kindergarten success. However, Hatcher, Nuner, and Paulsel (2012), found that preschool teachers associated readiness with social-emotional maturity and the ability to interact successfully with peers. The findings of both Hains et al. (1989) and Hatcher et al., (2008) highlighted this variability in preschool teachers’ perceptions.

Although it seems that preschool teachers value either academic/cognitive skills or social skills when it comes to school readiness, many preschool teachers’ perceptions of readiness include both skills. For example, Lara-Cinisomo, Fuligni, Ritchie, Howes, and Karoly (2008) examined preschool teachers’ perceptions about school readiness by program type (public center-based programs, private center-based programs, and family child care centers). They found that across program types, teachers mentioned that in order to be ready for school, a child must be socially/emotionally ready (i.e. impulse control, ability to get along with others, being accountable, sharing with others),
physically ready (i.e. healthy, fit, motivated, confident), and cognitively ready (numbers, letters, colors, shapes). Taken together, the findings of Hains et al. (1989), Hatcher et al. (2012), and Lara- Cinisomo et al. (2008) demonstrate that the readiness views of preschool teachers are varied, but generally include a combination of social and cognitive skills.

**Preschool parents and school readiness.** Preschool parents’ perceptions of school readiness appear to differ from teachers’ opinions. For the most part, parents tend to value academic/cognitive skills more than both kindergarten and preschool teachers. For example, in a study by West, Germimo-Hausken, and Collins (1995), the authors found that less than 10 percent of kindergarten teachers felt counting to 20 or more and knowing the letters of the alphabet were important parts of school readiness, while 58 percent of parents felt that counting to 20 or more and knowing the letters of alphabet were necessary components of school readiness. Similarly Grace and Brandt (2006) found that parents valued children’s readiness skills in general knowledge domains (i.e. language, cognitive, motor development) more than teachers did.

However it is important to mention that there are variations within parents’ perceptions of school readiness. In fact, parent perceptions appear to vary according to socioeconomic status and ethnicity. Piotkowski, Botsko, and Matthews (2000) studied parents and teachers’ beliefs on school readiness in a school district that served predominantly low-income minority children. The authors assessed parents and teachers’ beliefs regarding the importance of 12 school readiness “resources” using the Community Attitudes on Readiness for
Entering School Survey (CARES). CARES measured beliefs about readiness domains that included: health; basic self-care; socio-emotional maturity and self-regulation; interaction with peers; interest and engagement in the world; motor skills; cognitive knowledge; communication; and adjustment to the classroom setting, that is, complying with teacher directions and classroom routines. They found that the low-income minority parents who participated in this study believed that cognitive knowledge was most important. Between 76 and 82 percent of parents felt it was “absolutely necessary” that children entering kindergarten know their letters and colors and be able to count to 10 or 15. These findings highlight the idea that low-income minority parents are more likely to perceive academic skills as the primary component of school readiness.

In addition to income, parent perceptions also appear to vary according to ethnicity. In a study by Barbarin, Early, Clifford, Bryan, Frome, Burchinal, and Pianta (2008), the authors examined the school readiness beliefs of parents whose children attended a public pre-kindergarten program and found that differences in parents’ perceptions of school readiness skills were related specifically to ethnicity. Across ethnic and income groups, most parents cited academic skill development as essential to school readiness. Most parents conceived readiness largely in terms of children’s ability to name objects, letters, or numbers. However, there were notable ethnic differences in regards to the role of social development in school readiness. White and Latino parents were much more likely than African American parents to cite social-emotional domains as critical for school readiness.
**Latino preschool parents and school readiness.** Teachers and parents’ perceptions of school readiness differ particularly in terms of what skills they think are important for success in kindergarten and beyond. This difference in perceptions has been highlighted in low-income Latino families. In fact, there is a perceived mismatch between low-income Latino parents and school expectations (Farver, Xu, Eppe, & Lonigan, 2006; Goldenberg, Gallimore, Reese, and Garnier, 2001; Reese, Balzano, Gallimore & Goldenberg, 1995). According to Fuller and Garcia Coll (2010), the early learning values endorsed by many Latino parents, which emphasize a commitment to family obligation and respect for elders, are believed to put Latino children at a disadvantage in individualistic, and competitive U.S. schools. Latino parents’ early learning values and related practices are often considered deficits that lead to children’s low achievement. However, studies of Latino families have shown parents’ early learning values and practices as strengths that actually support children’s achievement (Farver et al, 2006; Goldenberg et al., 2001; Reese et al., 1995).

A key component of Latino parents’ early learning values is the concept of educación. Although it seems to be a direct translation of the “education,” the Spanish term educación has a much broader meaning. Educación includes a child’s formal academic learning, but it also encompasses nonacademic learning, such as knowing the difference between right and wrong, being respectful to adults, and behaving correctly, which parents view as the foundation in which learning is built upon (Goldenberg et al, 2001; Reese et al., 1995). Schooling and academic achievement are not seen as separate from moral development. In
fact, both are seen as part of a larger whole that leads to becoming a good person who is bien educado, or well brought up, and therefore on el buen camino, or the good path in life (Goldenberg 2001; Reese et al., 1995).

In a study by Reese et al. (1995), the authors examined Latino parents’ educación values, the ways their values shaped their parenting practices, and the impact of their values and practices on children’s early school achievement. They found that parents’ home practices reflected their beliefs around educación. For example, when asked what actions parents should take to help their children be successful in school, the most commonly reported action was to talk with their children about morality and proper behavior. Parents described various practices that centered on teaching right from wrong and discouraging negative behavior, which included techniques like using dramatic examples and restricting contact with bad influences. Less emphasis was reported on academic activities that might prepare a child for school. For example, when parents were asked to rank in order of importance a set of 12 statements regarding parent responsibilities before a child enters school, responsibilities like preparing a child for school by teaching the alphabet and numbers was ranked ninth and reading to a child was ranked tenth out of the 12 statements.

It is important to note that parents’ educación values were unrelated to children’s school achievement, as the endorsement of educación values was so common that there was no differential between high and low achieving children. This finding goes against the assumption that Latino families early learning values, centered on educación, work to the disadvantage of children’s
achievement. While the endorsement of educación values does not impact achievement, a relationship is observed when educación values were reflected in practices or activities. In fact, Reese et al. (1995) found that parents' endorsement of educación values lead to practices that actually supported children's school achievement. For example, they found that father involvement in a child's schooling tasks, a reflection of the family unity piece of educación, was related to children's academic achievement. This finding suggests that parents' educación-centered values shape childrearing practices that can be complementary to practices associated with formal education in the U.S.

Similar to the assumptions surrounding Latino parents' educación values and children's achievement, it has been assumed that Latino parents have low aspirations and expectations for their children and these aspirations and expectations directly contribute to children's low levels of academic achievement (Goldenberg et al. 2001). Goldenberg et al. (2001) examined Latino parents' educational aspirations and expectations for their children and their children's actual educational attainment. The data were obtained during the course of a longitudinal study (from kindergarten entry to sixth grade) of a random sample of Latino immigrant families and their mostly U.S. born children. They found that over the course of elementary school, parents consistently expressed high aspirations for their children. Approximately 90 percent of parents continued to say that they aspired their children to attend or complete university, except in second grade, when 84 percent of parents had this same aspiration. Parents' expectations were not as high as aspirations and they tended to change over the
years. Throughout the elementary grades, parents’ expectations become increasingly tied to how well children were doing in school. The findings challenge the idea that Latino parents have low aspirations and expectations for their children and these aspirations and expectations lead to their children’s poor academic performance.

**Development as a Cultural Process**

Despite decades of educational reform efforts to address various achievement gaps, they continue to persist for low-income minority children. These gaps begin as early as preschool. For example, according to data from the Early Childhood Longitudinal Study that collected data on 22,000 children who were entering kindergarten, Latino students are more likely to have lower levels of school readiness pre-mathematics skills as compared to White and Asian children (Gándara 2006). Persistent early learning gaps related to race/ethnicity, language, and income show that the current educational system is not effectively serving low-income minority students and demonstrate the need for examining development as a cultural process.

Measures of achievement are rooted in white-Middle class assumptions of what children should know and when, and they fail to consider children and families within other cultural contexts. Achievement comes in many different cultural contexts and it should be measured in culturally specific ways by examining development as a cultural process.
An important component of development as a cultural process lies in the understanding that a child’s development is supported and constructed by participation in the shared practices of the cultural community in which he/she is a part. Examining development as a cultural process requires an awareness that practices, or ways of doing things, are rooted within culture.

In a study by Howes (2010), she found that all of the child care centers that participated in the study had the same quality rating and the common goal of providing good care for children, but there was a great deal of variation in the practices of each child care center. Each child care center was considered its own cultural community, defined by shared practices of the center. She also found that practices have very different meanings in other programs, or cultural communities based on the cultural context of the community, further illustrating that the practices of cultural communities are culturally mediated. These culturally mediated practices that make up a community’s daily routines are what supports development.

Development as a cultural process in low-income Latino families. While there are many similarities among Latino families, it is important to note that Latinos are not a homogeneous group and there are various cultural communities within this larger ethnic group. Although many families’ early learning/school readiness beliefs center on educación, parents’ practices differ greatly among the various cultural communities within this group. There are considerable variations in parenting practices related to school readiness among
low-income Latino families, and these variations in practices can impact children’s school readiness outcomes.

In a study by Farver et al. (2006), the authors examined how aspects of low-income Latino family environments (i.e. parenting practices, maternal perceived stress levels) were associated with preschoolers’ receptive vocabulary and social functioning. The exploratory nature of this study highlighted the great deal of variability in Latino family practices. They found that parents’ involvement and encouragement of literacy-related activities and mothers’ perceived stress levels were associated with both receptive vocabulary skills and social functioning. This finding demonstrated that parental practices play an important role in supporting children’s readiness. In addition, it further challenged the myth that low-income Latino parents do not expose their children to literacy-related activities, nor provide children with learning experiences that contribute to academic achievement.

Zucker and Howes (2009) examined the socialization goals and practices of Mexican-Heritage mothers. They found that mothers of different cultural communities differed in practices in routines, but not with socialization goals. For example, mothers who participated in family clusters that “straddled” the U.S-Mexico border had socialization goals that were similar to that of other mothers who participated in different cultural communities (producing children who are bien educado, or brought up well) but varied in their practices around routines. These mothers were more likely to continue doing routines for their children through children’s preschool years. They also found that most Mexican-American
mothers’ goals to produce children who were *bien educado* were reflected in the respectful relationships between mothers and their children, along with teacher perceptions that children were socially ready for school, suggesting that these mothers successfully raised children who were ready for school. These findings provide another example of how the early learning goals of Latino families can support, not hinder, school readiness.

Increasingly in the literature, deficit models of Latino families are being replaced by strengths models, and new findings show that Latino children exhibit strengths in domains of development, especially in terms of social development (Cabrera, 2013). In fact, the majority of Latino children enter kindergarten with strong social skills and there is also evidence that Mexican American youth engage in relatively higher level of pro-social behaviors than White children (Cabrera, 2013). Measures like the Mexican-American Socialization (MAS) scale help highlight the socialization strengths of Latino children (Bridges et al., 2012). The MAS scale is used to assess the socialization of young Mexican-American children and its development was informed by culturally situated research with Mexican-American families. The scale was based on a year long ethnographic study in the homes of Mexican-American families and is consistent with socialization constructs that are prominent within Mexican-American homes like *bien educado*. The MAS scale can help teachers understand the valued social behaviors that Latino parents are likely to instill in their children, enabling teachers to be more emotionally supportive, and more likely to build more positive relationships with their Latino students and parents.
Culturally-situated research, like the approach used to inform the development of the MAS scale (Bridges et al., 2012) can help researchers focus on the strengths of Latino families. According to Cabrera (2013), examining cultural models are important as they “highlight cultural assets of particular groups” (p.9). Culturally situated research that has examined the values and beliefs of minority families have demonstrated that certain cultural values, may promote positive development. For example, culturally situated research in Latino families has helped shed light on how values and practices centered on educación, or more specifically bien educado, can promote positive social development and school readiness. In the same way, this study aims to examine the early learning values and practices endorsed and enacted by low-income Latino parents, specifically in terms of science, in hopes of better understanding what parents already do at home to support children’s science learning.

**Science in Preschool**

This study also aims to examine the early learning values and practices endorsed and enacted by teachers of low-income Latino children, specifically in terms of science, in hopes of better understanding what teachers already do at school support children’s science learning. Therefore, it is useful to have an understanding the current state of science teaching and learning in preschool.

Science as a curricular domain is a natural fit for young children, as they begin to investigate and explore the world around them from their earliest years (California Department of Education, 2013). However, science in preschool
classrooms is often either non-existent or not of high-quality. For example, Nayfield (2008) examined the use of science centers in preschool children in urban preschool classrooms and found that teachers and students rarely used designated science areas, commonly referred to as science centers. Similarly, Early et al. (2010) found that preschoolers engaged in science activities for only eight percent of the day.

When preschool teachers do include science as a part of the preschool day, often times they are not providing high-quality instruction or promoting effective activities. Tu (2006) found that when teachers did attempt to teach science, they used ineffective science teaching practices (i.e. not using developmentally appropriate science materials, didactic instruction). Additionally, 87 percent of activities that preschool teachers described as “science,” were actually unrelated to science. Taken together, these studies suggest that preschool students and teachers spend little time engaged in science and when they do engage in science, it is not of high quality.

Effective, high-quality science instruction is often defined as teaching science as inquiry through investigations in which children use developmentally appropriate materials to ask questions, make predictions, make observations, and answer questions (Trundle & Sackes, 2012). In a study bridging research and practice, this type of high-quality science instruction was found to enhance children’s interest in science, which was demonstrated by children’s integration of science concepts in their play (Choi, 2013). When children explored science concepts through play, the quality of play increased, as children used new
vocabulary, investigated cause and effect relationships, and engaged in rich
dialogue around scientific phenomena.

**Preschool teachers attitudes and beliefs about science.** The lack of
science instruction in preschool classrooms may be related to preschool
teachers' negative attitudes and beliefs about teaching science. In a study by Tu & Hsiao (2008), preschool teachers were interviewed and asked to rank their
preferences for teaching content areas. Teachers ranked science as the subject
they least preferred to teach, as only five percent of teachers ranked science as
their preferred content area.

Preschool teachers’ negative attitudes towards teaching science are
largely due to teachers’ negative experiences with learning science, which has
been found to contribute to their lack of self-efficacy with science instruction
(Greenfield et al., 2009). Greenfield et al. (2009) examined teachers’ attitudes
and beliefs about science instruction. They found that many teachers indicated
low self-efficacy with respect to teaching science. Self-efficacy with science
teaching can be thought of as a teacher’s belief in his or her ability to
successfully teach science. Many teachers indicated that they felt uncomfortable
using science related classroom materials, even though they had access to
them. Overall teachers felt uncomfortable with their knowledge of science and
their ability to teach science. Teachers also cited difficulty in finding the time to
provide children with learning experiences in all of the readiness domains,
including science. Teachers reported feeling considerable pressure to focus on
language and literacy skills, such as alphabet knowledge and phonological
awareness, which made finding the time to cover other readiness domains, like science, difficult.

Maier et al. (2012) also evaluated preschool teachers’ attitudes and beliefs about teaching science. In this study, the results indicated that teachers who reported positive attitudes and beliefs about the benefit of teaching science to young children were more likely to teach and develop science processing skills such as predicting, observing, comparing, and experimenting. In addition, teachers who said they felt more comfortable teaching science and perceived science instruction as beneficial for young children tended to teach science in their classrooms.

Generally, teachers’ attitudes and beliefs about teaching have a great effect on the frequency and quality of teaching practices in any domain (Wilkins, 2008). Preschool teachers’ attitudes and beliefs about science instruction are not any different. Preschool teachers’ attitudes and beliefs about science teaching seem to be strongly related to the frequency and quality of science instruction.

This lack of instructional time and quality instruction devoted to science may be reflected in an assessment of preschoolers’ school readiness domains, including science. Greenfield et al. (2009) examined how science learning compared with learning in the seven other Head Start school readiness domains. The results indicated that preschool children had significantly lower gains in readiness scores in science than that of other domains at the end of the preschool year. In two other domains, “language and literacy” and “social and emotional,” children had low scores in the beginning of the prekindergarten year,
but these scores were significantly higher than their scores for science at the end of the year. This study indicates that students may enter elementary school with less preparation and readiness in science. This study also suggests that teachers are supporting children’s development in readiness domains such a language and literacy and social and emotional development, but it appears that little is being done to support children’s development of science.

**High-quality approaches to science teaching in preschool.** Despite the lack of science instruction reported in most preschool classrooms, there are a handful of innovative approaches that have been developed and continue to develop, which aim to provide preschool age children with developmentally appropriate science curricula. Teachers have very few curricular models to inform their instruction, as there is a lack of “validated science curricula for young children” (Trundle & Sackes, 2012). In many preschool classrooms, science is often treated as “extra” to the curriculum rather than an integrated, integral part of the daily routine (Bosse, Jacobs & Anderson, 2009). However, innovative approaches to science teaching and learning are increasingly being developed (i.e. ScienceStart, Preschool Pathways to Science). Among these approaches, there are some key common features that generally contribute to the development of high-quality early learning environments and interactions, and specifically promote the development of science skills. These common features include: guided inquiry (Peterson & French, 2008), high quality teacher-student interactions (Hong & Diamond, 2012), effective use of science materials (Nayfield et al., 2011), curriculum and instruction that is integrated with other curricular
domains (Gelman et al., 2010) and relevant to students’ everyday lives (Trundle & Sackes, 2012).

**Early science learning in the homes of preschool children.** There is very little literature that focuses on science learning outside of preschool and even less on the home science experiences of preschool children. Therefore, examining the everyday science related practices that families do at home might add a missing piece to what we know about preschool science teaching and learning. Examining how science related routines vary by cultural community and how home science activities relate to scientific development are topics that have yet to be researched.

In recent years, researchers have begun to investigate young children’s opportunities to learn about science outside of school. The majority of research explores how children and their families learn about science in museums, science centers and other informal settings. There is less known about how families approach science and engage in science-related activities in the home. Learning about the nature and scope of science-related activities children and their families participate in could lead to important insights into how children learn scientific concepts and processes and could also be used to influence school-based instructional practices.

Korpan et al. (1997) developed structured interviews to shed light on middle class preschool and kindergarten children’s participation in home activities related to science, nature and technology. They found that the middle class kindergarten children in the study had exposure to a broad range of
science-related materials and participated in a variety of science-related activities that included community-based programs and activities that were a part of their everyday routines. For example, 83 percent of mothers reported that they read materials on science, nature, or technology to their children. In fact, they reported that they read books on science, nature, or technology about a third of the time. Results also revealed that in 86 percent of households, a member of the family helped the child conduct simple science experiments, such as color mixing or engaging in careful observation of things like flowers or caterpillars.

Another finding was related to the methodology of the study. The authors found that structured interviews can provide rich information about the kinds of science related experiences children have outside of school as a part of their daily routines. Asking parents about their children’s home science-related practices provides a good picture of how children approach science in this out of school context.

Hall and Schaverien (2001) also investigated families’ engagement with children’s science and technology learning at home in hopes of illuminating the types of science families do, but also its role in science learning. In this study, kindergarten and first grade children investigated flashlights as a part of an inquiry science unit in their classroom. Each day, kits containing the equipment used in school (batteries, bulbs, switches) were available for children to take home. Hall & Schaverien (2001) found that families engaged in scientific and technological inquiries in many different ways. Many of these families would collaboratively participate in inquiries with their children as a part of their
everyday activities. For example, one parent involved his son in inquiry when trying to figure out how a light could be dimmed in an outdoor shed. The authors also found that when families engaged in science and technology learning at home, children developed their scientific understanding. For example, initially a child named Oliver struggled to understand how a flashlight worked. However, Oliver’s scientific and technological inquiry deepened in response to shared activities with his family. It is important to note that the families involved in this study were also middle class and many of the inquiries that families did engage in were structured similar to the way science inquiry is taught in schools. Less research surrounds the authentic home experiences of low-income, minority children, such as low-income Latino children.

Mantzicopoulous, Patrick & Samarapungavan (2013) looked at how children’s participation in classroom and classroom-home components of the Scientific Literacy Project (SLP) affected science learning and motivation outcomes. The classroom-home component was an extension of the SLP’s classroom science-related literacy activities. The researchers found that children who participated in the SLP class-home component made higher gains over time in general science knowledge than the two other groups (students who participated in the SLP class component and the comparison group). This finding suggests that when home learning is in alignment with school learning, children’s development of conceptual knowledge increases. However it is important to note that the parents that participated in the SLP home component were given literacy packets that outlined how to read and discuss the non-fiction science books that
their children took home, requiring families to use classroom-based practices in
the home.

Overall, research on early science learning in the homes of families with
preschool age children focus on middle class children or how families participate
in classroom-based science practices at home. Little research has examined how
low-income minority families participate in science-related activities as a part of
their everyday routines. Additionally, little is known about these families’ practices
and values/beliefs around early science learning. Therefore, learning more about
low-income Latino families, their early science learning values/beliefs and
practices can contribute a missing element to the relatively understudied, but
growing knowledge base of early childhood science education.

Summary of Literature Review

There are several gaps in the literature that this study aims to address,
particularly in terms of low-income Latino children and their teachers’ early
science learning values and practices.

While there is a great deal of research surrounding preschool parents and
preschool teachers’ views of early learning/school readiness, (Barbarain et al,
2008; Farver et al, 2006; Goldenberg et al., 2001; Grace & Brandt, 2006; Hains
et al.,1989; Hatcher et al., 2012; Heaviside & Farris, 1993; Lara-Cinisomo et al.,
2008; Lin et al., 2003; Piotrkowski et al., 2000; Reese et al., 1995; West et al.,
1995), there is very little research surrounding parents’ and teachers’ views of
specific readiness domains, such as science. There is even less research that
examine low-income Latino parents’ and teachers of low-income Latino children’s early learning values around specific readiness domains like science.

Similarly, while there is a growing amount of research related to science practices in preschool classrooms (French, 2004; Gelman & Brenneman, 2004; Gelman et al., 2010; Hong & Diamond, 2012; Peterson & French, 2008; Nayfield et al., 2011) and some research related to science practices in home settings (Korpan et al., 1997; Hall & Schaverien, 2001; Mantzicopoulous et al., 2013), the research in homes focus on middle-class families and the implementation school-designed science interventions/activities. There is a gap in the literature when it comes to the authentic science-related activities that low-income minority families already do at home.

As previously mentioned, this study aims to address some of the gaps in the literature mentioned above by examining the early science learning values/beliefs of low-income Latino parents of preschool children and teachers of low-income Latino preschool children, how these values/beliefs shape the way parents and teachers approach activities that support children’s science learning at home and at school, and how they compare.
Chapter 3: Methodology

Research Design

This study employed a mixed methods design that examined the early science learning values/beliefs and practices of low-income Latino parents of preschool children and teachers of low-income Latino preschool children using a combination of quantitative and qualitative data collection methods (i.e. surveys, interviews, and observations) and analysis techniques. By using mixed methods, a more complete picture or deeper understanding of the phenomena being investigated, can emerge (Yoshikawa, Weisner, Kalil & Way, 2008), thus facilitating a more comprehensive view of parents’ and teachers’ values/beliefs and practices around early science learning.

This study was nested in a larger research project directed by Dr. Alison Wishard Guerra at the University of California, San Diego. This project examined early school readiness skills, specifically language and literacy development, among low-income Latino children. This study contributed to the larger project by examining the early science learning values/beliefs and practices endorsed and enacted among low-income Latino parents of preschool children and teachers of low-income Latino preschool children.

The study design included two phases. In Phase One, surveys were used to gather data on the early learning and early science learning values/beliefs among all enrolled families. In Phase Two, semi-structured interviews, surveys, and classroom observations were used to gather data on the early learning and
early science learning values/beliefs and practices endorsed and articulated by
teachers of low-income Latino children.

Context

This study was conducted at Las Olas Head Start, a Head Start center
located in San Diego County. Las Olas Head Start is a center-based Head Start
program that served families with preschool-age children from three to five years
old. At the time of data collection, Las Olas Head Start was in a state of
administrative transition. The center was under a new oversight agency, its fourth
agency in seven years. At the time of data collection, the oversight agency had
one year of management experience with center-based child care programs and
had instituted a number of changes in staffing and daily practices. Teacher
turnover was high, and teachers expressed concern about the frequent turnover
of administrative staff and supervisors, resulting in a disruption of mentoring and
supervisorial relationships.

All of the families who attended Las Olas Head Start were considered low-
income, based on federal poverty guidelines for Head Start qualification. Most
families who attended Las Olas Head Start were of Latino heritage (90%). Within
the enrolled families, 59 percent of parents were Mexican immigrants (born in
Mexico), 76 percent of parents reported that Spanish was their first language and
56 percent of parents reported that Spanish was currently the primary home
language. Relatedly, parents reported that 56 percent of children spoke Spanish
as their primary native language and an additional 19 percent of children were
described as having both Spanish and English as their primary native languages. In terms of parent education, 44 percent of parents had less than a high school diploma, 34 percent of parents had a high school degree or a GED, and 21 percent of parents had some college.

Among the Latino families at Las Olas Head Start, 65 percent of parents were Mexican immigrants and 8 percent were Central American immigrants. In terms of parent native language, 87 percent of parents reported Spanish as their native language. In terms of primary home language, 64 percent reported Spanish as the primary home language. Relatedly, 64 percent of parents reported that Spanish was their child’s native language and 19 percent reported that both Spanish and English were their child’s native languages. In terms of parent education, 58 percent of parents had less than a high school diploma, 27 percent of parents had a high school degree or a GED, and 15 percent of parents had some college.

There were three classrooms each with up to 20 children ages three to five years old at Las Olas Head Start. Each classroom had two or three lead teachers. Each classroom had at least one staff member who was a native Spanish speaker.

Participants

Las Olas Head Start was purposefully selected, due to its large enrollment of low-income Latino families, to provide information on low-income Latino families and their beliefs/values and practices of early science learning (Mertens,
This center was also chosen due to the existing relationships with the principal investigator of the larger study in which this study was nested.

To better investigate variations in early learning beliefs and practices within Latino families, study participants included all full time enrolled children whose parents self identified as Latino (n=52, 48% male) and their teachers at Las Olas Head Start.

**Phase one.** All parents of children who were enrolled in the Fall of 2015 (n=59) were invited to participate in this phase of the study (parent survey). Only the data from the Latino families are included in this analysis.

**Phase two.** All lead teachers of the three full-day preschool classrooms were invited to participate in the teacher interview, teacher survey, and classroom observation in Phase Two. All lead teachers were given a small monetary incentive to encourage participation.

**Recruitment Procedures**

**Phase one.** Lead research personnel (principal investigator, project coordinator, graduate student researcher) attended a monthly parent meeting in September 2015 to present the study to the parents at Las Olas Head Start and to answer any questions. Parents were given a consent form to take home and review. The following week, classroom teachers handed out consent forms and survey packets to families. Parents who wished to participate and allowed their child to participate in the study returned the signed consent form and the survey to their classroom teacher who collected completed consent and survey packets.
in a sealed envelope, which was given to research personnel each week. This was a procedure that had been followed in the larger Project over the past six years. Both families and teachers were familiar with the process of collecting such forms. All enrolled families (100%) provided consent to participate in the project.

**Phase two.** Lead research personnel (principal investigator, project coordinator, graduate student researcher) attended a weekly teacher meeting in October 2015 to give an overview of the study, describe the procedures of the interview, survey, and classroom observation, explain the risks and benefits of participation, emphasize confidentiality, and answer any questions from the teachers at Las Olas Head Start. Teachers were given a consent form to take home and review. The following week, research personnel handed out consent forms to teachers. Teachers who wished to participate in the study returned the signed consent forms and were given a clean copy for their records. All lead teachers (100%) provided consent to participate.

Lead teachers were contacted in person by research personnel. A brief overview of the study was given along with a short explanation of the procedures of the interview, survey, and classroom observation. Research personnel then scheduled an interview, projected to last approximately sixty minutes, at a time and place that was convenient for the participant. Lead teachers were given a small monetary incentive to encourage participation.

At the end of the teacher interview, teachers were given part two of the teacher survey, which was later collected by lead research personnel. This was a
procedure that had been followed in the larger project over the past six years. Teachers were familiar with this process.

Following the teacher interview, a classroom observation was scheduled on a date that was convenient for lead teachers. Consent/assent was obtained from all teachers prior to the teacher interview and classroom observation.

**Data Collection**

To provide information about different aspects of phenomena and aid in the triangulation of data to support external validity, multiple quantitative and qualitative data collection methods were utilized. This study included: parent and teacher surveys, parent and teacher interviews, and classroom observations.

Data collection methods are the means used to answering the research questions, therefore care was taken to ensure that the data collection methods were in alignment with the research questions of the study (Maxwell, 2013). Table 1 demonstrates how each data collection method (surveys, interviews, observations) aligned with the research questions in this study.
<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Surveys</th>
<th>Interviews</th>
<th>Observations</th>
</tr>
</thead>
</table>
| 1. What early science learning values/beliefs do low-income Latino parents of preschool children endorse?  
  • How does science fit in to their early learning beliefs/values? |         | X          |              |
| 2. What early science learning values/beliefs do teachers of low-income Latino preschool children endorse?  
  • How does science fit in to their early learning beliefs/values? | X       | X          |              |
| 3. In what ways do these values/beliefs shape the way teachers of low-income Latino preschool children approach activities that support children’s science learning at school? | X       | X          | X            |
| 4. How do low-income Latino parents of preschool children’s values/beliefs around early science learning compare to the values/beliefs and practices of teachers of low-income Latino preschool children? | X       | X          |              |
**Measures.** The measures in Phase One and Phase Two included surveys, interviews, and observations.

**Phase one.** The data collection method in Phase One of the study included the parent survey.

**Parent survey.** Because surveys are useful when collecting data from a large number of people, a survey was distributed to all of the enrolled parents at Las Olas Head Start (Mertens, 2010). The parent survey can be found in Appendix A.

The goal of the parent survey was to learn more about parents’ early learning values and where science fit into it. The survey protocol was adapted from a questionnaire developed by Sackes (2014). The protocol asked parents to prioritize eight academic content domains (Mathematics, Art, Social Studies, Science, Morals and Ethics, Pre-Reading, Pre-Writing, and Second Language) in descending order, by ranking the most important domain as first (1) and the least important as eighth (8). More specifically, parents were asked to respond to the following question/prompt, accompanied by a list of academic content domains: “What is important for your child to learn in preschool? Please rank each by noting a 1 for the most important and an 8 for the least important”

This survey was included as part of a larger survey administered by the larger study that this study is nested. The larger survey contained questions about parent background/demographic information and home literacy practices. The survey was translated in both English and Spanish.
**Phase Two.** The data collection measures included in Phase Two of the study included the teacher survey, teacher interview, and classroom observation.

**Teacher survey.** A teacher survey was distributed to all of all of the lead teachers at Las Olas Head Start (see Appendix B). The goal of the teacher survey was to learn more about teachers’ early learning values and where science fit into it.

The teacher survey contained questions about teachers’ background/demographic information, a modified version of the Modernity Scale (Schaefer & Edgerton, 1985), and a modified version of the Teacher Belief Survey (Burton et al., 1990). The Modernity Scale measured how progressive/traditional teachers beliefs were and the Teacher Belief Survey measured how developmentally appropriate/inappropriate teacher beliefs were.

Teachers were given statements that reflected either progressive or traditional beliefs about early learning and asked to rate to what extent they believed each statement on a scale that ranged from strongly disagree to strongly agree. For example, a statement that reflected a progressive belief was: “Children should be allowed to disagree with their parents.” A statement that reflected a traditional belief was: “The most important thing to teach children is absolute obedience to whoever is in authority.”

Teachers were also given statements that reflected either developmentally appropriate or developmentally inappropriate beliefs about early learning and asked to rate to what extent they believed each statement on a scale that ranged from strongly disagree to strongly agree. A statement that
reflected a developmentally appropriate belief was: “Children should be involved in establishing rules for the classroom.” A statement that reflected a developmentally inappropriate belief was: “Children should form letters correctly before they are allowed to create a story.”

This survey was included as part of a larger survey administered by the larger study that this study was nested. The larger survey contained additional questions about students considered Limited English Proficient (LEP).

**Teacher interview.** Teacher interviews were conducted with all lead teachers at Las Olas Head Start. The goal of the teacher interview was to learn more about teachers’ early learning values/beliefs and where science fit into it, and ways in which teachers approach activities that support children’s science learning at school. The interview lasted approximately one hour and consisted of two parts: the school readiness domain ranking activity, and interview questions.

**School readiness domain ranking activity.** The first part of the teacher interview was the school readiness domain ranking activity, adapted from a questionnaire by Sackes (2014), where teachers were asked to rank eight school readiness domains (Mathematics, Art, Social Studies, Science, Morals and Ethics, Pre-Reading, Pre-Writing, Second Language) in descending order, by ranking the most important domain as first (1) and the least important as eighth (8) (see Appendix C). Teachers were given the question/prompt: “What is important for students to learn in preschool? Please rank each by noting a 1 for the most important content area and an 8 for the least important content area.”
Teachers were also asked to rank their comfort level with teaching each school readiness domain (Mathematics, Art, Social Studies, Science, Morals and Ethics, Pre-Reading, Pre-Writing, Second Language) on a scale of one to five, where one was very comfortable, and five was not very comfortable.

*Semi-structured interview questions.* Following the school readiness domain ranking activity, teachers were asked questions that centered around: their past science learning experiences, beliefs about science teaching and learning, their perceptions of parents' beliefs of early learning, and classroom activities that supported science learning at school (see Appendix D). The teacher interviews were conducted in English. This semi-structured interview was included as a part of a larger interview conducted as a part of the larger study that this study was nested. The larger interview contained questions about teachers’ early literacy beliefs and classroom literacy practices.

*Classroom observation.* The goal of the classroom observation was to learn more about the science related practices that teachers engaged in at school and how teachers approached activities that supported children’s science learning in the classroom. Each of the three full-day classrooms were observed once. Classrooms were observed during the course of a typically scheduled day. Observations lasted approximately 4 hours, from children’s arrival to lunch. The Preschool Rating Instrument for Science and Math (PRISM) (Stevenson-Boyd, Brenneman, Frede, & Weber, 2008), a global rating instrument, was used to guide naturalistic observations of the classroom (see Appendix E).
Data Reduction and Analysis

This mixed methods study included both quantitative and qualitative data analysis techniques.

**Data reduction.** The description of the data reduction techniques has been separated into phases (Phase One and Phase Two).

**Phase one.** Phase One data included parent surveys. Parent survey data was collected and entered into a secure online data entry form and then exported into Excel and SPSS for analysis.

**Phase two.** Phase Two data included the teacher interview, teacher survey, and classroom observation.

**Teacher interview.** Teacher school readiness domain ranking data was collected and entered into a secure online data entry form and then exported into Excel and SPSS for analysis.

Teacher interview data was transcribed verbatim. Transcripts were entered into a mixed methods data analysis program (MAXQDA). The first pass through focused around applying a priori codes and open coding of “substantive categories” or emergent codes (Maxwell, 2013). Table 2 contains the a priori codes that were drafted based on the theoretical constructs that guided this study and a review of relevant literature. As each transcript was coded, a priori and emergent codes developed or changed. When codes were developed or changed, transcripts were recoded in a recursive process.
Table 2. A priori codes for teacher interview

<table>
<thead>
<tr>
<th>Topic</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic learning and preparation</strong></td>
<td>AL</td>
</tr>
<tr>
<td><strong>Educación values</strong></td>
<td>EN</td>
</tr>
<tr>
<td>- Knowing right from wrong</td>
<td>RW</td>
</tr>
<tr>
<td>- Respect</td>
<td>RSP</td>
</tr>
<tr>
<td>- Good manners</td>
<td>GM</td>
</tr>
<tr>
<td>- Family unity</td>
<td>FAM</td>
</tr>
<tr>
<td><strong>Strategies to support science learning</strong></td>
<td>SS</td>
</tr>
<tr>
<td>- Asking questions</td>
<td>AQ</td>
</tr>
<tr>
<td>- Observation</td>
<td>AA</td>
</tr>
<tr>
<td>- Predicting</td>
<td>PRE</td>
</tr>
<tr>
<td>- Investigation</td>
<td>INV</td>
</tr>
<tr>
<td>- Using science tools/materials</td>
<td>STM</td>
</tr>
<tr>
<td><strong>Recording/Documenting</strong></td>
<td>DCM</td>
</tr>
<tr>
<td><strong>Science Activities</strong></td>
<td>SA</td>
</tr>
<tr>
<td>- Gardening</td>
<td>GD</td>
</tr>
<tr>
<td>- Cooking</td>
<td>CK</td>
</tr>
<tr>
<td>- Reading science books</td>
<td>RE</td>
</tr>
<tr>
<td>- Watching science related TV/movies</td>
<td>TV</td>
</tr>
<tr>
<td>- Technology</td>
<td>TCH</td>
</tr>
<tr>
<td>- Experiments</td>
<td>FX</td>
</tr>
<tr>
<td>- Pet/Animal care</td>
<td>AML</td>
</tr>
<tr>
<td>- Sand/Water table</td>
<td>SW</td>
</tr>
</tbody>
</table>

**Teacher Survey.** Teacher survey data was collected and entered into a secure online data entry form and then exported into Excel and SPSS for analysis. Scores for the Modernity Scale (Schaefer & Edgerton, 1985) and the
Teacher Belief Survey (Burton et al., 1990) were created to reduce data to related constructs on teacher beliefs of developmentally appropriate practices. For the Modernity Scale, constructs for Traditional Beliefs and Progressive Beliefs were created by averaging the responses for the specific items representing each construct. For the Teacher Belief Scale, constructs were created for Developmentally Appropriate Beliefs and Traditional Beliefs by averaging the responses for the specific items representing each construct.

**Classroom observation.** Detailed field notes were recorded during each classroom observation. Classroom observation data were coded using MAXQDA and rated using the PRISM (Stevenson-Boyd et al., 2008). This rating instrument required the observer to note the existence of science materials (items 5-6) and the nature of teacher-child interactions around science materials and content (items 14-16). A description of the PRISM is as follows:

**PRISM.** The PRISM is an evaluation tool that is used to assess the extent to which instructional practices support early science and math learning. Although this tool is used to assess both science and math instruction, the rating items that directly related to the assessment of science instruction were used in this study (items 5-6 and 14-16) (See Appendix E). The PRISM assessed both the availability of materials in the classroom and the interactions between teachers and children. The rater checked off materials that the classroom was equipped with and recorded descriptions of how the classroom teacher engaged in planned or spontaneous interactions that supported children’s scientific
learning. The rater also gave a score, on a scale of 1 (low quality) through 7 (high quality), and recorded examples for each item.

**Data analysis.** Data analysis began immediately after collecting the first survey and completion of the first interview and observation. Therefore, in this study, data analysis occurred in conjunction with data collection (Maxwell, 2013).

Data analysis is the process of making sense out of the data collected (Merriam, 2009). There are many steps to this process, which include reading and indexing transcripts and field notes, writing memos, categorizing categories (i.e. coding), and connecting strategies (i.e. narrative analysis) (Maxwell, 2013). While there is no single way to analyze data, the analysis strategies used should fit the data collected, help answer research questions, and address potential validity threats.

In this study, data analysis was a multi-step process. This mixed methods study included both quantitative and qualitative data analysis techniques. Descriptive analyses (means, range, minimum, maximum, and frequency counts) were first used to describe the range of data collected with each different source. After carefully reviewing the descriptive data, quantitative inferential statistics, mixed methods pattern analysis, and qualitative co-occurrence of codes were used to identify patterns in the data in response to the research questions.

**Descriptive analyses.** Using SPSS, demographic data collected in the parent survey was analyzed using descriptive statistics to describe the participant
population in terms of demographic background characteristics and rankings of school readiness domains.

Using MAXQDA, descriptive analyses provided a frequency count for each code applied to teacher interviews and classroom observations.

The following is a description of how each research question was informed by analyses of various data sources:

**Research Question 1.** What early science learning values/beliefs do low-income Latino parents of preschool children endorse? How does science fit into their early learning values/beliefs?

*Descriptive analysis.* Descriptive data from surveys were carefully examined.

*Patterns by family demographics.* Patterns of school readiness domain rankings by parent demographics were investigated using inferential statistics. For example, ANOVA was used to identify group differences in rankings according to maternal country of birth, child gender, and home language. Correlation analyses indicated whether statistically significant associations existed between continuous demographic variables, such as household income and household density, with parents’ early learning rankings.

**Research question 2.** What early science learning values/beliefs do teachers of low-income Latino preschool children endorse? How does science fit into their early learning values/beliefs?
Descriptive analysis. Descriptive data from surveys and interviews were carefully examined. How teachers addressed science, in terms of their early learning values/beliefs were identified in the interviews.

Patterns by teacher demographics. Patterns of school readiness domain rankings by teacher demographics were investigated using inferential statistics. For example, ANOVA was used to identify group differences in rankings according to teacher country of birth, education level, and number of years of teaching. Correlation analyses indicated whether statistically significant associations existed between continuous demographic variables such as education level and number of years of teaching with teacher early learning rankings.

Research Question 3. In what ways do these values/beliefs shape the way teachers of low-income Latino preschool children approach activities that support children’s early science learning at school?

Descriptive analysis. Descriptive data from the surveys, interviews, and observations were carefully examined. Values/beliefs, articulated practices gathered from survey/interview were described and identified. Data from the PRISM, collected from the classroom observation were also described.

Patterns. Patterns of interview codes with PRISM scale scores, and survey data and were investigated.

Research question 4. How do low-income Latino parents of preschool children’s values/beliefs around early learning and early science learning
compare to the values/beliefs and practices of teachers of low-income Latino preschool children?

*Descriptive analysis.* Descriptive data from the surveys, interviews, and observations were carefully examined and compared. Values/beliefs from survey data were described and identified. Values/beliefs, articulated practices gathered from interviews were described and identified. Teacher practices gathered from the PRISM/classroom observation were described and identified. Parent data and teacher data from each data source were compared.

*Patterns.* Using SPSS and MAXQDA, patterns of interview codes, classroom observations codes, PRISM scores and survey data were also investigated.

**Limitations**

This study has limited generalizability. Since it took place within the context of one Head Start program in southern California, the results may not apply to schools in other regions or neighborhoods. Despite this potential limitation in generalizability, this study has important implications, both locally and more globally, for educational research, policy, and practice.

Also, because SES differences and ethnic differences in children’s home environments and developmental outcomes have been adequately documented, a comparison group of high or middle SES or White families, for example, will not be provided. Rather, the purpose was to examine within-group differences. While
this can be viewed as a limitation, it can be considered a strength and an initial and necessary step to begin to better understand low-income Latino families.

**Ethical Considerations**

The primary ethical obligation of a qualitative researcher is “to try to understand how the participants will perceive your actions and respond to these” (Maxwell, 2013, p. 92). As a preschool teacher, I was aware of the nuances associated with discussing sensitive topics with a researcher in ways that will be made public.

This study was designed in accordance with the policies and regulations of the UCSD Human Research Protection Program and was approved under the Institutional Review Board (IRB) approval of the larger study. Minimizing participants’ risk was a primary concern. Thus, maintaining confidentiality and obtaining informed consent were two essential components of minimizing risk (Esterberg, 2002). Prior to interviewing participants, the purpose of the study and all the confidentiality measures in place were explained to the participants. Most importantly, participants were assured that the study was not an evaluation of their parenting or teaching. Parents and teachers were given a week to consider the risks, ask any questions, and make a decision, at which time, they were asked to sign an informed consent. To protect the identity of participants, data was collected, transcribed, and coded using pseudonyms/IDs. The school itself was also assigned the pseudonym: Las Olas Head Start.
Positionality and Potential Biases

With all types of research it is important for the researcher to examine his/her positionality and any potential biases that may arise from this positionality. I have been a lead preschool teacher at a private preschool in San Diego County the past six years.

Because of my background in preschool teaching, I may have been considered an “insider” by the preschool teachers at Las Olas Head Start. However, I may also have been considered an “outsider” by the preschool teachers and parents at the school site, as I have never worked for Las Olas Head Start. My positionality as both an “insider” and an “outsider” may have presented a variety of benefits and challenges

Benefits. There is a chance that my positionality as an outsider may have been beneficial, as it may have allowed me to be more objective in reviewing parent/teacher survey data, and teacher interview data, and classroom observation data. My positionality as an “insider” may also have been beneficial since preschool teachers might have felt more comfortable discussing their true values/beliefs and practices of early science learning.

Challenges. However, my positionality may have also presented some challenges that I tried my best to address. Because of my positionality as an “insider,” the teachers that I interviewed may not have felt the need to fully explain terms or ideas that they believed to be common knowledge in the field of early childhood education. I addressed this challenge by asking teachers
strategic follow up questions that aim to clarify common terms used or thoughts on various topics.

There were also some challenges that could have came along with my positionality as an “outsider” as well. First, teachers may not have felt as comfortable sharing their values/beliefs and practices around early science learning with me, since I was not a teacher affiliated with the school. At any time a participant through verbal or non-verbal cues indicated that he or she was uncomfortable, I reminded the participant that all answers would be kept completely confidential and anonymous and that she was not required to answer any questions, and could stop the interview/observation at any time.

The act of transcription could also be quite problematic in terms of bias, as transcription is a subjective process that reflects the theoretical goals of the transcriber. When researchers transcribe interview data, they make choices about “whether and what to transcribe and how to represent it” (Lapadat & Lindsay, 1998, p.4). The choices researchers make when transcribing reflect the theories they hold, which have implications for the interpretations that can be derived from the data. Transcribers can influence the analysis, and therefore the trustworthiness and reliability of data as they transcribe talk to text. However, trustworthiness can be established by being upfront about the complexities of transcription. Also, because “analysis can occur in the act of transcription” (Tilley, 2003, p.770). I transcribed all of the teacher interviews verbatim.

In order to properly address issues trustworthiness and of validity, it was important to discuss strategies for enhancing validity. Steps were taken to
increase the validity of the study. I recognized that my experience as a preschool teacher may have created potential bias in this study, as my evaluation and interpretation of parents’ and teachers’ views/beliefs and practices on early science learning may have been influenced by my experience. To mitigate this bias, I enlisted the help of a few colleagues to check the coding of interview transcripts and classroom observations (Mertens, 2010). Some additional strategies that I used to increase the validity of my findings were employing multiple passes of coded transcripts and regular self-reflection (Maxwell, 2013).

And although the specific context of Las Olas Head Start may not allow the results of this study to be generalized across varied situations, this study adds to a research base that seeks to disentangle the relationships between parents’ values and practices in the home and teachers’ values and practices in the classroom, with a focus on early science learning.

Having a better understanding of parents’ early science learning values/beliefs and teachers’ early science learning values and practices can provide a better understanding of how children develop science knowledge in the home and at school. This understanding can help improve early science teaching and learning, which seems to be nonexistent or inherently lacking in preschools around the country (Greenfield, 2009; Tu, 2006). If more is done to learn about the values/beliefs parents and teachers endorse and the practices they engage in that support children’s science learning, we can create curriculum and instruction that that utilizes the expertise from both the home and the school, building on what families and teachers already do to support science learning.
children’s learning. Increasing the quality of early childhood science curriculum and instruction can better support low-income Latino children’s early science development and potentially provide an effective entry point to the STEM pipeline.
Chapter 4: Parent beliefs and practices around early science learning

The purpose of this study was to examine and compare the early learning and early science learning values/beliefs and practices of low-income Latino parents and their children’s preschool teachers. This chapter addresses the first of the study’s four research questions regarding parents’ early learning and early science learning values/beliefs and practices:

- What early learning values/beliefs do low-income Latino parents of preschool children endorse? How does science fit in to their early learning beliefs/values?

The second and third research questions, regarding teachers’ values/beliefs and practices will be addressed in Chapter 5. The fourth research question, regarding how parents’ and teachers’ values/beliefs and practices compare will be addressed in Chapter 6.

This study aimed to combat the commonly employed deficit approach in research with minority children that examine differences between groups, usually including a White comparison group. Instead, this study sought to highlight marked variability in terms of culture and ecological context within groups, more specifically within low-income Latino families. Therefore, from here forward, only data from the sample of self-identified Latino families (n = 52) at Las Olas Head Start will be reported and analyzed.
Describing parent rankings of school readiness domains

In order to gain a better understanding of parents’ early learning values/beliefs, parents were surveyed about their background/demographic information and what they believed was important for their child to learn about in preschool. Parents were asked to rank eight different school readiness domains (Morals/Ethics, Social Studies, Science, Math, Pre-writing, Pre-reading, Second language, and art) in order of importance. Although the majority of surveys were completed by mothers, (71%), some fathers (29%) also participated in the survey responses. There were no statistically significant differences between maternal or paternal survey responses. As such, all parent survey responses were analyzed together as one group.

Table 3 shows the average parent ranking of each school readiness domain. Science had one of the lowest average rankings among all eight curricular domains (M = 3.43, where 8 is the highest ranking). Curricular domains that are often considered “core subjects” (Reading, M = 6.28; Writing, M = 6.13; and Math, M = 6.28) had the highest average rankings.
Table 3. Descriptive Statistics on Parent School Readiness Rankings

<table>
<thead>
<tr>
<th>Domain</th>
<th>n</th>
<th>Min</th>
<th>Max</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>46</td>
<td>1.00</td>
<td>8.00</td>
<td>6.28</td>
<td>1.85</td>
</tr>
<tr>
<td>Writing</td>
<td>45</td>
<td>1.00</td>
<td>8.00</td>
<td>6.13</td>
<td>1.93</td>
</tr>
<tr>
<td>Math</td>
<td>44</td>
<td>2.00</td>
<td>8.00</td>
<td>5.70</td>
<td>1.84</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>43</td>
<td>1.00</td>
<td>8.00</td>
<td>5.02</td>
<td>2.52</td>
</tr>
<tr>
<td>Second Language</td>
<td>45</td>
<td>1.00</td>
<td>8.00</td>
<td>5.22</td>
<td>2.53</td>
</tr>
<tr>
<td>Social Studies</td>
<td>44</td>
<td>1.00</td>
<td>8.00</td>
<td>3.60</td>
<td>1.99</td>
</tr>
<tr>
<td>Science</td>
<td>44</td>
<td>1.00</td>
<td>8.00</td>
<td>3.43</td>
<td>2.15</td>
</tr>
<tr>
<td>Art</td>
<td>45</td>
<td>1.00</td>
<td>8.00</td>
<td>3.33</td>
<td>2.40</td>
</tr>
</tbody>
</table>

Note: 1 is low, 8 is high

Patterns by family demographics. To further examine parents’ values/beliefs about early learning and early science learning, patterns of parent ranking of school readiness domains by family demographics were investigated using inferential statistics. For example, ANOVA was used to identify group differences in parent ranking of school readiness domains by maternal education, paternal education, parent country of birth, home language, parent native language, parent gender, and child gender. Correlation analyses were used to indicate whether statistically significant associations existed between continuous demographic variables (i.e. household income and household density) and parent rankings of school readiness domains.
**Parent school readiness rankings by maternal and paternal education.** ANOVA with a Bonferroni’s post hoc analysis was used to see if there were group differences in parent ranking of school readiness domains by maternal education. Table 4 shows mean rankings by maternal education. Parent rankings of math significantly varied across levels of maternal education with higher Math rankings among mothers with a high school education versus post high school education, $F (2, 42) = 3.85, p < .05$. Additionally, there was a marginal pattern in parent rankings of Morals and Ethics by maternal education, with higher rankings among mothers who had a post high school education versus mothers who had only a high school education, $F (2, 41) = 2.76, p = .08$.

<table>
<thead>
<tr>
<th></th>
<th>Less than HS</th>
<th>HS</th>
<th>Post HS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Reading</td>
<td>6.13 (1.75)</td>
<td>6.79 (1.85)</td>
<td>5.88 (2.17)</td>
</tr>
<tr>
<td>Writing</td>
<td>5.78 (2.02)</td>
<td>6.64 (1.78)</td>
<td>6.25 (1.91)</td>
</tr>
<tr>
<td>Math*</td>
<td>6.23 (1.82)</td>
<td>5.64 (1.65)</td>
<td>4.38 (1.69)</td>
</tr>
<tr>
<td>Morals &amp; Ethics~</td>
<td>5.14 (2.67)</td>
<td>4.00 (2.45)</td>
<td>6.50 (1.41)</td>
</tr>
<tr>
<td>Second Language</td>
<td>5.17 (2.62)</td>
<td>5.50 (2.35)</td>
<td>4.88 (2.85)</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.82 (1.99)</td>
<td>3.71 (2.30)</td>
<td>2.75 (1.28)</td>
</tr>
<tr>
<td>Science</td>
<td>3.59 (2.32)</td>
<td>3.71 (2.30)</td>
<td>2.50 (1.07)</td>
</tr>
<tr>
<td>Art</td>
<td>3.39 (2.57)</td>
<td>3.50 (2.59)</td>
<td>2.88 (1.55)</td>
</tr>
</tbody>
</table>

~ $p < .10$, * $p < .05$
Patterns of group differences in parent school readiness rankings were also tested on paternal education. Although all ANOVA statistics were non-significant, there was one near significant trend (p = .08) such that parent rankings of Reading were higher when paternal education levels were below a high school graduate.

**Parents’ school readiness ranking by parent country of birth.** Parents were born in Mexico, the U.S., or Central America. The majority (74.5%) of parents in the sample were born outside of the US, with most originating from Mexico (see Table 5).

<table>
<thead>
<tr>
<th>Country</th>
<th>% (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>66.7% (34)</td>
</tr>
<tr>
<td>United States</td>
<td>25.5% (13)</td>
</tr>
<tr>
<td>Central America</td>
<td>7.8% (4)</td>
</tr>
</tbody>
</table>

An ANOVA with a Bonferroni post hoc was used to see if there were group differences in parent ranking of school readiness domains by parent country of birth. Significant group differences were found in parent ranking of math, second language learning, and science by parent country of birth.
Table 6 shows that there was a significant difference in parent ranking of Math by parent country of birth, F (2, 41) = 3.54, p < .05. Parents born in Central America ranked Math higher than parents who were born in the U.S.

<table>
<thead>
<tr>
<th></th>
<th>Mexico</th>
<th>United States</th>
<th>Central America</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Reading</td>
<td>6.13 (1.87)</td>
<td>6.38 (1.94)</td>
<td>7.33 (1.15)</td>
</tr>
<tr>
<td>Writing</td>
<td>5.90 (1.99)</td>
<td>6.50 (1.83)</td>
<td>7.00 (1.73)</td>
</tr>
<tr>
<td>Math</td>
<td>5.86 (1.98)</td>
<td>4.83 (1.11)</td>
<td>7.67* (.58)</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>4.68 (2.52)</td>
<td>5.42 (2.54)</td>
<td>6.67 (2.31)</td>
</tr>
<tr>
<td>Second Language</td>
<td>5.47 (2.43)</td>
<td>3.92 (2.43)</td>
<td>8.00* (.00)</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.55 (1.92)</td>
<td>3.08 (1.44)</td>
<td>6.00~ (3.46)</td>
</tr>
<tr>
<td>Science</td>
<td>3.21 (2.18)</td>
<td>3.25 (1.42)</td>
<td>6.33* (2.89)</td>
</tr>
<tr>
<td>Art</td>
<td>3.33 (2.26)</td>
<td>2.75 (2.14)</td>
<td>5.67 (4.04)</td>
</tr>
</tbody>
</table>

~ p < .10, * p < .05

There was also a significant difference in parent ranking of Second Language learning, F (2, 42) = 4.03, p < .05. Parents who were born in Central America ranked Second Language learning higher than parents who were born in the U.S. In fact, 100% of parents born in Central America ranked Second
Language learning as the most important school readiness domain their child should learn in preschool (M = 8.00).

Additionally, there was also a difference in parent ranking of Science, F (2, 41) = 3.24, p < .05. Parents who were born in Central America ranked Science higher than parents who were born in Mexico. Finally, there was a near significant trend when looking at parent ranking of Social Studies with parents born in Central America ranking Social Studies more highly than parents born either in Mexico or the United States, F (2, 41) = 2.81, p < .10.

*Parents school readiness by home language and parent native language.* In terms of home language, the majority (63.5 %) of families primarily spoke Spanish in the home. Less than a quarter (21.2 %) of the families primarily spoke a mix of both Spanish and English in the home, and 13.5 percent spoke primarily English in the home. Only one family indicated their primary home language as a language other than English and Spanish (an indigenous language from Mexico).

In terms of parent native language, the majority of parents (86.5 %) reported Spanish as their native language. Only 11.5 percent of parents reported English as their native language and one parent indicated a language other than English and Spanish (an indigenous language from Mexico) as their native language.

An ANOVA with Bonferroni’s post hoc was used to see if there were group differences in parent ranking of school readiness domains by home language. There were significant group differences in parents’ ranking of second language
learning by home language. Parents who reported their home language as Spanish ranked Second Language learning higher than parents reported their home language as English, \( F(2, 42) = 5.38, p < .01 \) (See Table 7 for mean rankings across home language groups). There were no other significant differences in school readiness ranking by home language. Similar patterns were evident when looking at parent native language, with parents whose native language was Spanish ranking Second Language learning more highly than parents whose native language was English, \( F(1, 43) = 4.98, p < .05 \).

Table 7. Parent School Readiness Rankings by Home Language

<table>
<thead>
<tr>
<th></th>
<th>Spanish M (SD)</th>
<th>English M (SD)</th>
<th>Spanish &amp; English M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>6.25 (1.87)</td>
<td>6.86 (.69)</td>
<td>6.00 (2.28)</td>
</tr>
<tr>
<td>Writing</td>
<td>6.07 (2.00)</td>
<td>7.14 (.90)</td>
<td>5.64 (2.11)</td>
</tr>
<tr>
<td>Math</td>
<td>5.89 (2.03)</td>
<td>4.86 (1.07)</td>
<td>5.80 (1.69)</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>4.85 (2.44)</td>
<td>4.86 (3.08)</td>
<td>5.67 (2.50)</td>
</tr>
<tr>
<td>Second Language</td>
<td>6.11 (2.26)</td>
<td>3.29 (2.56)</td>
<td>4.27** (2.28)</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.52 (2.12)</td>
<td>3.14 (1.21)</td>
<td>4.10 (2.13)</td>
</tr>
<tr>
<td>Science</td>
<td>3.33 (2.30)</td>
<td>3.14 (1.21)</td>
<td>3.90 (2.33)</td>
</tr>
<tr>
<td>Art</td>
<td>3.41 (2.39)</td>
<td>2.71 (1.70)</td>
<td>3.55 (2.88)</td>
</tr>
</tbody>
</table>

~ p < .10, * p < .05, **p < .01
Table 8. ANOVA Table Parent Native Language by Parent School Readiness Rankings

<table>
<thead>
<tr>
<th></th>
<th>Spanish M (SD)</th>
<th>English M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>6.23 (1.93)</td>
<td>6.33 (1.21)</td>
</tr>
<tr>
<td>Writing</td>
<td>6.08 (1.99)</td>
<td>6.5 (1.51)</td>
</tr>
<tr>
<td>Math</td>
<td>5.63 (1.89)</td>
<td>6.17 (1.47)</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>5.05 (2.48)</td>
<td>4.8 (3.11)</td>
</tr>
<tr>
<td>Second Language</td>
<td>5.53 (2.46)</td>
<td>3.17 (2.14)*</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.64 (2.11)</td>
<td>3.20 (.45)</td>
</tr>
<tr>
<td>Science</td>
<td>3.32 (2.21)</td>
<td>4.17 (1.72)</td>
</tr>
<tr>
<td>Art</td>
<td>3.46 (2.44)</td>
<td>2.50 (2.07)</td>
</tr>
</tbody>
</table>

*p < .05

Parent school readiness rankings by child gender. Group differences in parent ranking of school readiness domains by child gender were investigated using ANOVA. Overall parents of boys ranked all school readiness domains other than Writing and Morals and Ethics more highly than parents of girls (See Figure X). The ANOVA indicated that there were significant group differences in parent ranking of Math and Science by child gender and near significant patterns in parent ranking of Second Language learning. As shown in Table 9, parents of boys, ranked Math higher than parents of girls, F (1, 42) = 7.13, p < .05. Parents of boys also ranked Science higher than parents of girls, F (1, 42) = 5.52, p < .05. Parents of boys also ranked Second Language learning higher than parents of
girls, $F(1, 43) = 2.99, p = .09$. In other words, parents of boys ranked Math and Science as more important for their child to learn than did parents of girls.

![Figure 2. Parent school readiness rankings by child gender.](image)
### Table 9. ANOVA Table Child Gender by Parent School Readiness Rankings

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Reading</td>
<td>6.52 (1.97)</td>
<td>6.08 (1.75)</td>
</tr>
<tr>
<td>Writing</td>
<td>6.14 (2.01)</td>
<td>6.13 (1.90)</td>
</tr>
<tr>
<td>Math</td>
<td>6.43 (1.54)</td>
<td>5.04 (1.87)*</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>5.00 (2.96)</td>
<td>5.04 (2.14)</td>
</tr>
<tr>
<td>Second Language</td>
<td>5.53 (2.46)</td>
<td>3.17 (2.14)~</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.85 (2.39)</td>
<td>3.38 (1.61)</td>
</tr>
<tr>
<td>Science</td>
<td>4.19 (2.52)</td>
<td>2.74 (1.48)*</td>
</tr>
<tr>
<td>Art</td>
<td>3.86 (2.56)</td>
<td>2.88 (2.19)</td>
</tr>
</tbody>
</table>

*p < .05, ~ p < .10

**Child gender and parent native language by school readiness rankings.** An interaction effect was tested for parent native language by child gender. To test for interaction effects between child gender and parent native language a multivariate analysis of variance (MANOVA) with child gender and parent native language as independent variables and parent school readiness rankings as dependent variables was conducted.

While there was not a statistically significant interaction effect between child gender and parent native language by science ranking, a notable trend was evident: Spanish native parents ranked Science higher for their male children and English native parents ranked Science as higher for female children (see
Figure X). This finding indicates that gender may be an important factor in parent beliefs and values around school readiness development.

![Graph showing parent ranking of Science by gender and parent native language](image)

**Figure 3.** Parent ranking of Science by gender and parent native language

*Child gender and home language by school readiness rankings.*

While there was not a significant interaction effect between child gender and parent native language by parents ranking of Science, there was a significant interaction effect between child gender and primary home language by parents' ranking of Morals and Ethics, $F(1, 41) = 3.24$, $p < .05$. Parents who reported both English and Spanish as the primary home languages ranked Morals and Ethics higher for boys than girls. Parents who reported English as the primary home language ranked Morals and Ethics higher for girls than boys.
Figure 4. Parent ranking of Morals and Ethics by gender and primary home language.

Parent ranking of school readiness domains, household income, and household density. Household income ranged from below $15,000 to above $35,000, with the majority of families in the $15,000-$25,000 range (see Table X). Household density was defined by the number of people living in the home. The number of people in each household ranged from two to seven people (M = 4.76, SD = 1.1). Table 10 shows descriptive statistics of household density.
Table 10. Descriptive Statistics of Household Income

<table>
<thead>
<tr>
<th>Household income</th>
<th>% (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $15,000</td>
<td>21.70 (10)</td>
</tr>
<tr>
<td>$15,000- $25,000</td>
<td>43.50 (20)</td>
</tr>
<tr>
<td>$25,000- $35,000</td>
<td>28.30 (13)</td>
</tr>
<tr>
<td>&gt; $35,000</td>
<td>6.50 (3)</td>
</tr>
</tbody>
</table>

Table 11. Descriptive Statistics of Household density

<table>
<thead>
<tr>
<th>Household Density</th>
<th>% (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3.9 (2)</td>
</tr>
<tr>
<td>3</td>
<td>5.9 (3)</td>
</tr>
<tr>
<td>4</td>
<td>31.4 (16)</td>
</tr>
<tr>
<td>5</td>
<td>29.4 (15)</td>
</tr>
<tr>
<td>6</td>
<td>27.5 (14)</td>
</tr>
<tr>
<td>7</td>
<td>2 (1)</td>
</tr>
</tbody>
</table>

Pearson Product Moment Correlation was used to identify whether there was an association between parent rankings of school readiness domains, household income, and household density. Parents' ranking of Second Language learning was significantly negatively associated with household income, $r \ (39) = -0.33, p < .05$, indicating that the higher household income, the lower the ranking of Second Language. There were no significant associations between household density and parent rankings.
### Table 12. Correlation table for School Readiness Domains and Household Income

<table>
<thead>
<tr>
<th></th>
<th>Household Income</th>
<th># in household</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>.23</td>
<td>.24</td>
</tr>
<tr>
<td>Writing</td>
<td>.30</td>
<td>.13</td>
</tr>
<tr>
<td>Math</td>
<td>-.04</td>
<td>.13</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>-.06</td>
<td>.05</td>
</tr>
<tr>
<td>Second Language</td>
<td>-.33*</td>
<td>-.20</td>
</tr>
<tr>
<td>Social Studies</td>
<td>-.11</td>
<td>-.11</td>
</tr>
</tbody>
</table>

* p < .05, ~ p < .10

**Summary of Findings.** Examining the survey responses of only the Latino families at Las Olas Head Start revealed there were several areas of variation in the values/beliefs within Latino families, who are often thought of as homogeneous. This within group variation provides further evidence that culture goes beyond belonging to an ethnic group. Within group analysis of Latino families who participated in the survey allowed discourage the deficit-model of thinking, in which the cultural ways of others are judged from the cultural practices of the dominant group, and instead focus on characterizing the cultural ways of different groups.
Overall, there were group differences in parents’ ranking of school readiness domains by maternal education, parent country of birth, home language, parents native language, and child gender, and a relationship between parents rankings and household income. For example, families with a mother with less than a high school education ranked Math higher than families with a mother who had post high school education. Parents who were born in central America ranked Math and Second Language learning higher than parents who were born in the US and science higher than parents born in Mexico. Parents whose native language was Spanish ranked Second Language learning higher than Parents whose native language was English. Relatedly, parents whose primary home language was Spanish ranked Second Language learning higher than those whose home language was English. Parents with male children ranked Math and Science higher than parents with female children. And, parents whose primary home languages are both English and Spanish rank Morals and Ethics higher for their male children, while families whose primary home language is English ranked Morals and Ethics higher for their female children.

Specifically in terms of Science, parents ranked the domain relatively low overall, particularly by parents with female children. Parents of girls ranked Science lower than parents of boys. However, one group ranked Science higher: parents whose birth country was in Central America.
Chapter 5: Teachers’ values/beliefs and practices

This chapter addresses the second and third research questions regarding teachers’ early learning and early science learning values/beliefs and practices:

- What early learning values/beliefs do teachers of low-income Latino preschool children endorse? How does science fit in to their early learning beliefs/values?
- In what ways do these values/beliefs shape the way teachers of low-income Latino preschool children approach activities that support young children’s science learning in the classroom?

Describing teacher ranking of school readiness domains.

In order to gain a better understanding of teachers’ early learning values/beliefs, teachers were given a survey where they were asked questions about their background/demographic information and what they believed was important for child to learn in preschool. Teachers were asked what they thought was important for children to learn in preschool and ranked eight different curricular domains (Morals/Ethics, Social Studies, Science, Math, Pre-Writing, Pre-Reading, Second Language, and Art) in order of importance. Science had the lowest average ranking among all eight curricular domains (M = 2.00, where 8 was the highest ranking). Morals and Ethics (M = 6.63), Writing (M = 5.75) and Reading (M = 5.50) had the highest average rankings. Descriptive statistics of teacher school readiness rankings are presented in Table 13.
Describing teacher comfort level with school readiness domains

In addition to ranking school readiness domains in order of importance, teachers were also asked to rate their comfort level teaching each domain. Overall, teachers felt relatively comfortable teaching Writing (M = 4.75), Art (M = 4.57), Reading (M = 4.36), Morals and Ethics (M = 4.13), and Second Language (M=4.00). Teachers felt less comfortable teaching Social Studies (M=3.71) and math (M=3.00). Teachers felt the least comfortable teaching Science (M = 2.88). Descriptive statistics of teacher comfort level are presented in Table 14.
Table 14. Descriptive Statistics on Teacher Comfort Level with School Readiness Domains

<table>
<thead>
<tr>
<th>Domain</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>8</td>
<td>3.00</td>
<td>5.00</td>
<td>4.36</td>
<td>.75</td>
</tr>
<tr>
<td>Writing</td>
<td>8</td>
<td>4.00</td>
<td>5.00</td>
<td>4.75</td>
<td>.46</td>
</tr>
<tr>
<td>Math</td>
<td>8</td>
<td>1.00</td>
<td>5.00</td>
<td>3.00</td>
<td>1.60</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>8</td>
<td>3.00</td>
<td>5.00</td>
<td>4.13</td>
<td>.99</td>
</tr>
<tr>
<td>Second Language</td>
<td>7</td>
<td>1.00</td>
<td>8.00</td>
<td>4.00</td>
<td>1.53</td>
</tr>
<tr>
<td>Social Studies</td>
<td>7</td>
<td>1.00</td>
<td>5.00</td>
<td>3.71</td>
<td>1.60</td>
</tr>
<tr>
<td>Science</td>
<td>8</td>
<td>1.00</td>
<td>5.00</td>
<td>2.88</td>
<td>1.81</td>
</tr>
<tr>
<td>Art</td>
<td>7</td>
<td>3.00</td>
<td>5.00</td>
<td>4.57</td>
<td>.79</td>
</tr>
</tbody>
</table>

Note: 1 is low, 5 is high

Describing teacher progressive/traditional beliefs and developmentally appropriate beliefs

In order gain a better understanding of teacher belief patterns, we used elements of the Modernity Scale (Schaefer & Edgerton, 1985), which measured how progressive/ traditional teachers beliefs were and the Teacher Belief Survey (Burton et al., 1990), which measured how developmentally appropriate/inappropriate teacher beliefs were. Teachers were given statements that reflected either progressive or traditional beliefs about early learning and statements that reflected either developmentally appropriate or developmentally inappropriate beliefs about early learning and asked to rate to what extent they
believed each statement. Generally, teachers held more progressive beliefs (M = 4.26) than traditional beliefs (M = 3.52). Teachers also held more developmentally appropriate beliefs (M = 4.42) than developmentally inappropriate beliefs (M = 3.64). Descriptive statistics of the Modernity Scale scores and Teacher Belief Survey scores are presented below in Table 15.

**Table 15.** Descriptive Statistics of Teacher Modernity Scale (MS) Scores and Teacher Belief Survey (TB) Scores

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS: Traditional beliefs</td>
<td>8</td>
<td>1.55</td>
<td>4.50</td>
<td>3.52</td>
<td>1.10</td>
</tr>
<tr>
<td>MS: Progressive beliefs</td>
<td>8</td>
<td>3.40</td>
<td>4.80</td>
<td>4.26</td>
<td>.44</td>
</tr>
<tr>
<td>TB: Developmentally Appropriate beliefs</td>
<td>8</td>
<td>3.67</td>
<td>5.00</td>
<td>4.42</td>
<td>.46</td>
</tr>
<tr>
<td>TB: Developmentally inappropriate beliefs</td>
<td>8</td>
<td>1.80</td>
<td>4.80</td>
<td>3.64</td>
<td>1.09</td>
</tr>
</tbody>
</table>

**Patterns by teacher demographics**

**Modernity Scale and Teacher Belief Survey scores.** A correlation analysis was conducted to determine whether there was a statistically significant association between Modernity Scale scores and Teacher Belief Survey scores. There was a strong positive correlation between traditional belief scores on the Modernity Scale and developmentally inappropriate belief scores on Teacher
Belief Scale, $r = .90$, $p < .01$. This indicated that teachers who had higher progressive belief scores were more likely to have higher developmentally appropriate belief scores.

**Associations between Modernity Scale, Teacher Belief Survey scores and school readiness domain rankings.** A Pearson Product Moment Correlation was conducted to determine whether there was a statistically significant relationship between teacher Modernity Scale and Teacher Belief Survey scores versus teacher school readiness domain rankings. There was only one significant finding (See Table 16). There was a strong positive relationship between developmentally appropriate belief score and ranking of Art, $r = .78$, $p < .05$. Teachers who had higher developmentally appropriate belief scores ranked Art higher. There was no relationship between teacher ranking of Science and either Modernity Scale or Teacher Belief Survey scores. This indicates that teachers, regardless of their beliefs, ranked Science as low.
A correlation analysis was conducted to determine whether there were relationships between Modernity Scale Scores, Teacher Belief Survey scores, teacher ranking of Math and Science, and comfort level of teaching Math and Science. One significant finding was found. There was a strong positive relationship between teacher comfort level of teaching Math and comfort level of

Table 16. Correlation Table for Teacher School Readiness Domain Rankings, Teacher Modernity Scale (MS) Scores and Teacher Belief Survey (TB) Scores

<table>
<thead>
<tr>
<th>Domain</th>
<th>MS: Traditional Beliefs</th>
<th>MS: Progressive Beliefs</th>
<th>TB: Developmentally appropriate beliefs</th>
<th>TB: Developmentally inappropriate beliefs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>-.71</td>
<td>.23</td>
<td>.00</td>
<td>-.71</td>
</tr>
<tr>
<td>Writing</td>
<td>.77</td>
<td>.29</td>
<td>-.34</td>
<td>-.19</td>
</tr>
<tr>
<td>Math</td>
<td>-.09</td>
<td>.34</td>
<td>-.06</td>
<td>-.09</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>-.08</td>
<td>-.45</td>
<td>-.02</td>
<td>-.07</td>
</tr>
<tr>
<td>Second Language</td>
<td>.35</td>
<td>-.32</td>
<td>.11</td>
<td>.44</td>
</tr>
<tr>
<td>Social Studies</td>
<td>.27</td>
<td>.16</td>
<td>-.59</td>
<td>.11</td>
</tr>
<tr>
<td>Science</td>
<td>.07</td>
<td>.15</td>
<td>.00</td>
<td>.08</td>
</tr>
<tr>
<td>Art</td>
<td>-.38</td>
<td>-.17</td>
<td>.78*</td>
<td>-.19</td>
</tr>
</tbody>
</table>

*p<.05
teaching Science, $r = .94$, $p < .01$ This indicated that teachers who reported high comfort level teaching Science tended to report high comfort level teaching Math.

**Associations between Modernity Scale, Teacher Belief Survey scores and teacher comfort level.** A Pearson Product Moment Correlation was conducted to determine whether there was a statistically significant association between teacher beliefs as measured by the Modernity Scale and the Teacher Belief Survey with teacher comfort level teaching the various school readiness domains. There were no statistically significant associations. It is also important to note that there is no association between teacher comfort level with teaching science and teacher beliefs measured by either the modernity scale or teacher belief survey scores. This indicates that, overall, teachers, regardless of their beliefs, feel uncomfortable teaching science.

**Associations between Teacher comfort level and ranking of school readiness domains.** A Pearson Product Moment Correlation was conducted to determine whether there was a statistically significant association between teacher comfort level versus ranking of school readiness domains. There were a few significant associations (See Table 17). There was a strong negative association between ranking of Reading and comfort level with teaching Art, $r = -.92$, $p < .01$. There was a strong negative association between ranking of Science and comfort level with teaching Social Studies, $r = -.94$, $p < .01$. There was a strong positive association between ranking of Second Language learning and comfort level with teaching Social Studies, $r = .83$, $p < .05$. There was a strong negative association between ranking of Math and comfort level with
teaching Reading, $r = -.88$, $p < .01$. There was a strong positive association between ranking of Second Language learning and comfort level with teaching Reading, $r = .92$, $p < .01$. There was a strong negative relationship between ranking of Reading and comfort level with teaching Second Language, $r = -.92$, $p < .01$.

There was not a statistically significant relationship between teacher ranking of Science and their comfort level with teaching Science, $p=.73$, $r = -.15$. Generally, all teachers ranked Science as low and their comfort of their level with teaching Science as low.

**Patterns by teacher ethnicity.** Half of the teachers identified themselves as Hispanic/Latino ($n=4$). Two teachers identified themselves as Middle-Eastern. One teacher identified herself as Asian. One teacher identified herself as African-American.

An ANOVA was used to see if there were group differences in teacher ranking of school readiness domains by ethnicity (Latino/Not Latino). Significant group differences were found by teacher ranking of Morals and Ethics.

Table 18 shows that there was a significant difference in teacher ranking of Morals and Ethics by teacher ethnicity, $F (1, 6) = 6.39$, $p < .05$. Latino teachers ranked Morals and Ethics lower than teachers who were not Latino.
**Table 17. ANOVA Table Ethnicity by Teacher School Readiness Rankings**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Latino M (SD)</th>
<th>Not Latino M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>5.5 (1.00)</td>
<td>5.50 (1.29)</td>
</tr>
<tr>
<td>Writing</td>
<td>6.0 (2.31)</td>
<td>5.50 (1.00)</td>
</tr>
<tr>
<td>Math</td>
<td>4.25 (1.89)</td>
<td>2.75 (1.71)</td>
</tr>
<tr>
<td>Morals &amp; Ethics*</td>
<td>5.75 (1.26)</td>
<td>7.5 (.58)</td>
</tr>
<tr>
<td>Second Language</td>
<td>4.5 (3.51)</td>
<td>5.50 (2.65)</td>
</tr>
<tr>
<td>Social Studies</td>
<td>4.25 (2.87)</td>
<td>4.25 (2.87)</td>
</tr>
<tr>
<td>Science</td>
<td>1.75 (.96)</td>
<td>2.25 (1.26)</td>
</tr>
<tr>
<td>Art</td>
<td>4.00 (2.45)</td>
<td>4.75 (2.36)</td>
</tr>
</tbody>
</table>

*Note:* *p < .05

**Patterns by immigrant/non immigrant status.** The majority of teachers in this sample were immigrants (n = 6). Only two teachers were born in the U.S. (n = 2). An ANOVA was used to see if there were group differences in teacher ranking of school readiness domains by immigrant status (Immigrant/Not immigrant). Significant group differences were found by teacher ranking of Math, Science and Second Language learning.

Table 19 shows that there was a significant difference in teacher ranking of science by teacher immigrant status, F (1, 6) = 18.00, p < .01. Immigrant teachers tended to rank Science lower than teachers who were born in the U.S. There was also a significant difference in teacher ranking of Math by teacher immigrant status, F (1, 6) = 13.64, p < .05. Immigrant teachers tended to rank
Math lower than teachers who were born in the U.S. Lastly, there was a significant difference in teacher ranking of Second Language learning by teacher immigrant status, $F(1, 6) = 7.17, p < .05$. Immigrant teachers tended to rank Second Language as higher than teachers who were born in the U.S.

**Table 18.** ANOVA Table of Immigrant Status by Teacher School Readiness Rankings

<table>
<thead>
<tr>
<th></th>
<th>Immigrant M (SD)</th>
<th>Not Immigrant M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>5.33 (1.63)</td>
<td>6.00 (1.41)</td>
</tr>
<tr>
<td>Writing</td>
<td>7.00 (1.41)</td>
<td>7.00 (1.41)</td>
</tr>
<tr>
<td>Math*</td>
<td>2.67 (1.03)</td>
<td>6.00 (1.41)</td>
</tr>
<tr>
<td>Morals &amp; Ethics</td>
<td>6.83 (.75)</td>
<td>6.00 (2.83)</td>
</tr>
<tr>
<td>Second Language*</td>
<td>6.17 (2.32)</td>
<td>1.50 (.71)</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.83 (2.48)</td>
<td>1.50 (.71)</td>
</tr>
<tr>
<td>Science**</td>
<td>1.50 (.55)</td>
<td>3.5 (.71)</td>
</tr>
<tr>
<td>Art</td>
<td>4.38 (2.26)</td>
<td>4.50 (2.12)</td>
</tr>
</tbody>
</table>

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

**Patterns by years of experience.** Teachers varied in their years of experience. In terms of years of experience, teachers who were born in the U.S. had more years of experience ($M=18.5$) than teachers who were born outside of the U.S. ($M=10.75$). There were no statistically significant differences in years of experience by immigrant status, $p = .21$. 
Latino teachers had more years of experience (M = 14.75) than teachers who were not Latino (M = 10.63). There were no statistically significant differences in years of experience between Latino teachers and non-Latino teachers, p= .46.

Five teachers had a Child Development Associate Credential (CDA) permit and three did not. The teachers who did have a CDA permit had slightly less years of experience (M = 12.2) than teachers who did not have a CDA permit (M= 13.5). There were no statistically significant differences in years of experience by CDA permit status, p = .82.

Two teachers had some college, but no degree, two teachers had an AA/ two year degree, three teachers had a BA degree, and one teacher had at least one year of coursework beyond a BA degree. On average, teachers who had a AA/ two year degree had a slightly higher number of years of experience (M = 15.15), followed by post BA degree (M= 15), BA degree (M= 12.5) and some college (M = 9). There were no statistically significant differences in years of experience by teacher education level.

A Pearson Product Moment correlation analysis was conducted to determine if there were associations between years of experience and teacher comfort level of school readiness domains and teacher ranking of school readiness domains. There were no statistically significant associations. Years of teaching experience did not have a direct impact on teacher comfort level or ranking of school readiness domains.
The teaching staff at Las Olas Head Start was made up of primarily expert teachers and a few novice teachers. Expert teachers were described as teachers with ten or more years of experience in infant/toddler care. Novice teachers were described as teachers who had two or less years of experience in preschool or infant/toddler care. There were two novice teachers and six expert teachers in this sample. An ANOVA was conducted to determine if there were group differences in teacher ranking of school readiness domains, teacher comfort level of school readiness domains, Modernity Scale scores and Teacher Belief Survey scores between expert and novice teachers. There was one significant finding. There was a significant difference in progressive belief score on the Modernity Scale between expert and novice teachers, F (1, 6) = 33.71, p < .01. This indicated that expert teachers tended to have more progressive beliefs than novice teachers.

**Description of teachers and teacher values/beliefs.** The teachers in this study varied in terms of level of education, years of experience, and country of birth. They also varied in terms of the beliefs/values they endorsed. Some teachers endorsed more traditional values versus progressive values, as measured by their scores on the Modernity Scale. Some teachers endorsed more developmentally appropriate beliefs versus developmentally inappropriate beliefs. To provide a better understanding of the diversity of the teachers in this study, a brief description of each teacher (all pseudonyms) are as follows:
Ms. Vanesa. This teacher was born in Mexico and immigrated to the United States 31 years ago, when she was 28 years old. She described herself as Mexican American/Chicana. She completed an AA/two year degree in child development, had a CDA and had 14 years of experience in preschool or infant/toddler care. She had a mix of progressive and traditional beliefs, with notably higher progressive beliefs. She had a mix of both developmentally appropriate and developmentally inappropriate beliefs, but had notably higher developmentally inappropriate beliefs than developmentally appropriate beliefs.

Ms. Annie. This teacher was born in the United States and described herself as African American. She completed a bachelor’s degree in human development. She had 22 years in preschool or infant/toddler care. She had a mix of progressive and traditional beliefs with notably higher progressive beliefs. She had a mix of both developmentally appropriate and developmentally inappropriate beliefs, but had higher developmentally inappropriate beliefs than developmentally appropriate beliefs.

Ms. Saba. This teacher was born in South Asia and immigrated to the United States 28 years ago, when she was four years old. She completed a bachelor’s degree in child development. She did not have a CDA and had one and a half years experience in preschool or infant/toddler care. She had a relatively even mix of progressive and traditional beliefs. She also had a relatively

____________________________

1 All teacher names are pseudonyms
even mix of both developmentally appropriate and developmentally inappropriate beliefs.

*Ms. Farah.* This teacher was born in the Middle East and immigrated to the United States as an adult. She completed some college, but had not completed a degree. She did have a CDA credential, and had 2 years of experience in preschool or infant/toddler care. She had a mix of progressive and traditional beliefs with slightly higher progressive beliefs. She had a mix of both developmentally appropriate and developmentally inappropriate beliefs, but had notably higher developmentally inappropriate beliefs than developmentally appropriate beliefs.

*Ms. Patricia.* This teacher was born in the United States and described herself as Hispanic/Latino. She completed a bachelor’s degree in child development. She had a CDA, and had 15 years of experience in preschool or infant/toddler care. She had a mix of progressive and traditional beliefs with notably higher progressive beliefs. She had a mix of both developmentally appropriate and developmentally inappropriate beliefs, but had higher developmentally inappropriate beliefs than developmentally appropriate beliefs.

*Ms. Laura.* This teacher was born in Mexico and immigrated to the United States 20 years ago, when she was 32 years old. She described herself as Hispanic/Latino. She completed a bachelor’s degree in psychology. She had a CDA and had 14 years of experience in preschool or infant/toddler care. She had a mix of progressive and traditional beliefs with slightly higher progressive beliefs. She had a mix of both developmentally appropriate and developmentally inappropriate beliefs.
inappropriate beliefs, but had slightly higher developmentally inappropriate beliefs than developmentally appropriate beliefs.

Ms. Yuming. This teacher was born in South East Asia and immigrated to the United States 36 years ago as a young adult. She described herself as Chinese. She completed an AA degree in early childhood education. She did not have a CDA and had 17 years of experience in preschool or infant/toddler care. She had a mix of progressive and traditional beliefs with notably higher progressive beliefs. She had a mix of both developmentally appropriate and developmentally inappropriate beliefs, but had higher developmentally inappropriate beliefs than developmentally appropriate beliefs.

Ms. Madelene. This teacher was born in Mexico and immigrated to the United States 36 years ago as a young adult. She described herself as Mexican American/Chicana. She completed some college, but no degree. She had a CDA, and had 16 years of experience in preschool or infant/toddler care. She had a mix of progressive and traditional beliefs with notably higher progressive beliefs. She had a mix of both developmentally appropriate and developmentally inappropriate beliefs, but had higher developmentally inappropriate beliefs than developmentally appropriate beliefs.

**Description of teacher early learning and early science learning beliefs**

In addition to the survey, teachers were also asked to participate in an interview. During the interview, teachers were asked to explain how they ranked the school readiness domains included in the teacher survey and how they rated
their comfort level teaching each of these domains. They were also asked questions that centered around their past science learning experiences, their beliefs about science teaching and learning, their perceptions of parents’ beliefs of early learning, and the daily activities that children participate in that support science learning at school.

**Explanation of school readiness domain rankings.** Teachers were asked to refer to their ranking of school readiness domains and explain how they ranked each domain. Their explanations revealed that science was difficult to teach.

**Science as difficult.** Several teachers that were interviewed noted that science was “challenging,” “hard,” and “not easy.” When asked to explain how they ranked Science, some teachers mentioned that they ranked Science as low because it was difficult for them. For example, when asked to explain how she ranked Science, Ms. Yuming said, “Science? Oh, because science is not easy for me, and I put in there by the last. The last number.” Similarly, when asked about how she ranked Science, Ms. Laura said, “It’s challenging… It’s hard for me, so I put that last.” These teachers seemed to relate their ranking of Science with their level of comfort with Science.

**Barriers to effective science instruction.** When teachers were asked if they found teaching science challenging, all teachers mentioned that science was challenging to teach. Teachers described several barriers to effective science instruction, which fell into three main categories: fixed mindset in science
teaching capabilities, structural issues within the school, and the belief that science was developmentally inappropriate for preschool age children.

**Fixed mindset in science teaching capabilities.** When teachers described science as being difficult to teach, one barrier to effective science instruction was a fixed mindset in science teaching capabilities. Several teachers did not feel comfortable with their own knowledge of science. They felt that they did not know enough about science, and therefore found it challenging to implement effective science instruction with children. For example, Ms. Annie mentioned that she was not particularly skilled at science, and she found it hard to teach. She said, “I just don’t know a lot about science, I just didn’t get it. It wasn’t my thing, and it’s hard for me to get it right with the kids. Like what to do and… how to explain it.” Similarly, Ms. Patricia mentioned that her lack of science knowledge made it hard for her to teach science. She said, “Science. Yes, it is hard. It depends what it is. If it’s something I know how to do… but I don’t know too much about science myself.” Ms. Annie and Ms. Patricia demonstrated fixed mindsets in that they believed that they were not good at science, science was hard, and that science was something they did not know much about. They also talked about science as being made up of various activities that they had to “explain” and “do,” rather than a way of thinking about and exploring the world.

Other teachers did not feel comfortable with their knowledge of science pedagogy. These teachers felt that they did not know enough about teaching science to young children, and found effective science instruction challenging.
For example, Ms. Laura explained that teaching science in a way young children could understand was hard for her. She said,

"With the children, [it] is difficult because I need think [of] how [to] explain to them how [to] adapt...adapt [to] the situation [so] that they understand... Because science is not easy for me, maybe for that [it] is difficult show to them, but I try because it's very important.

Here, Ms. Laura demonstrated a fixed mindset in regards to her science teaching capabilities and talked about science as something to “show” and “explain” to children, rather than help them discover and explore. Although teachers most likely had had enough scientific expertise and pedagogical knowledge, they held fixed mindsets that they were not good at science, that science was not easy, and that they were not lacked science capabilities.

*Structural issues within school site.* Another perceived barrier to effective science instruction stemmed from structural issues within the school site. The organization of the school day, the expectations placed on the teachers by school administration, and the amount of paperwork teachers needed to produce, placed time constraints on teachers that made it difficult to engage in effective science instruction. Teachers were required to develop assessment portfolios using the Desired Results Developmental Profile (DRDP), an observation tool used by preschool teachers to record individual student progress, within 8 domains of development (Approaches to Learning/ Self Regulation, Social and Emotional Development, Language and Literacy Development, English Language Development, Cognition Including Math and Science, Physical Development and Health, History/Social Science, and Visual...
and Performing Arts). Teachers were required to assess each child on 56 measures within these eight domains, on a quarterly basis. Teachers described how the heavy expectations placed on teachers and amount of paperwork teachers were required to do took away from their ability to teach science. For example, Ms. Vanesa said,

> The kids enjoyed a lot, they do lots of art, lots of science but not right now. I really, really, really don't like the way that we have to get out of the classroom to [do] the paperwork. I don't like it, because I do my lesson plan and I [say] "Okay I'm going to do this, and this and this and this." And I don't have time to do that because they sent us [to work on paperwork] 2 days in the morning, 2 for me and 2 for the other teachers. And those days I miss time with the kids

Similarly Ms. Patricia mentioned, “But I'll be honest, it’s hard to find the time to teach science with all we have to do.” The structure of the program placed substantial expectations and responsibilities on teachers (i.e. student portfolio assessments and lesson plans), which teachers struggled to complete, on top of their planned instruction, during the working day. Teachers also found it difficult to find the time to teach science among other curricular domains, such as language and literacy, in addition to other responsibilities/tasks.

**Science as developmentally inappropriate.** A third barrier was the belief that science was meant for older children, and was thus developmentally inappropriate for preschool children. Some teachers mentioned that science was a curricular domain that children would approach later on in their schooling. For example, when Ms. Vanesa was asked to explain why she ranked science as the
least important curricular domain, she talked about science as a curricular
domain reserved for elementary school. She said,

    I think they [children] can get it [science] a little more in first grade,
or second grade, and you know it's when they're going to get very
interested and there, and they're gonna do it over there.

Similarly, Ms. Saba mentioned that science was a curricular domain
children will get “later on.” She said, “But science, you know, even if you don’t
[learn science] now [in preschool], you will get science, kids will learn science
more, later on.” These teachers talked about science as being developmentally
appropriate for older children in elementary school. This belief could ultimately
cause teachers to leave out science as a part of their instructional day.

**Integrating science into the daily curriculum.** In order to gain a better
understanding of teacher beliefs around science learning, teachers were also
asked to describe how science fit into the regular preschool day. When asked
how science fit into the daily curriculum, all teachers said that science was
integrated throughout the day with other curricular domains. However, teachers
often talked about science as a more discrete domain. They talked about science
as being separate from other primary domains such as language and math,
rather than a content area to develop language and numeracy skills. For
example, although Ms. Annie mentioned that science was “integrated” throughout
day within other curriculum domains, she also said, “Science? Well, I would say
they’re going to get that later on when they go on, go on to elementary school. I
worry about the reading and the writing right now. The science, that will come.”
Other teachers talked about science as a content domain that could only be
learned after the acquisition of other skills in different content domains. For example, Ms. Farah said, “Well the science, you can’t do the science unless you have the math, you know? If you can’t do the math, and the numbers, and counting, you can’t learn the science.” Similarly, Ms. Patricia said, “I believe before they can do that [science] they need to know a little bit about pre-reading and pre-writing. And math, too.” These teachers talked about science as a discrete domain that children could explore after they acquired pre-requisite skills, rather than an integrated content domain that could support the development of science, math, and language skills at the same time. It is also important to note that the prerequisite skills teachers mentioned were language and literacy and math skills, traditional curricular domains that teachers ranked as more important than science.

Also, because teachers say that their science instruction is integrated, but talk about science as a discrete content domain, suggest that teachers’ teachers are uncertain and are still grappling with how they think about science.

**The role of play in early learning.** All teachers mentioned that play was an important part of their teaching philosophy. Many teachers mentioned that children learned through play and that play was an important part of the preschool day. For example, when asked to describe her teaching philosophy, Ms. Patricia said, “My belief is that the kids learn through play. And they learn off each other when they play.” Similarly, when was asked to describe her teaching philosophy and Ms. Vanesa also mentioned that play was a key part of her teaching philosophy. She believed that children learned best through play and
play made learning fun. She said, “Play like makes it [learning] fun, making fun like with everything, is when they [children] are learning more. Oh and I love it, I just love it, when they playing, playing, but they’re learning.” Generally, like Ms. Vanesa, all teachers described play as an important venue for learning. Several teachers mentioned that children learn and learn develop various skills through play, specifically math and language and literacy skills. For example, Ms. Patricia explained that children learn mathematical skills like patterning and language and literacy skills like letter recognition through play. She said,

I believe kids learn through play. Because everything that they play with is teaches them to play...to learn how to do something. Like...this fun thing I do with them [points to a box of pattern bears with letters on them] I teach them about patterns. With patterns like red, orange, yellow, they keep on doing red, orange, yellow, doing patterns. Doing patterns, then counting, too. Cause when they count they’re still learning. And then, if they see something with letters while they play, they...they can practice writing their letters or saying the letters.

Here, she described children learning about patterns and letter writing/recognition by playing with pattern bears. Similarly, Ms. Vanesa also described math as being a part of play. She said,

Because when we play, [we say] “Oh look at the car. Oh look at the two red cars, one-two. Oh my goodness, there are 3 jackets.” And they, they get it from there. Of course we have all the curriculum all over the classroom, but you know playing here and playing there, they learn.

In this example, Ms. Vanesa demonstrated that math skills like cardinality, the understanding that the final number in a sequence refers to the total objects in a set, could be developed through play. It is important to note that math and language skills were frequently came up as teachers discussed play.
However, science was not mentioned when teachers described the skills children developed through play. While teachers noted a relationship between math and language skills and play, a relationship between science skills and science learning was not articulated. Perhaps teachers view science as a set activity that teachers do/demonstrate or that children need to be 'shown' rather than something they discover through play.

**Practices that support children’s science learning at school.**

To get a better sense of the science related practices that took place in teachers’ classrooms, teachers were asked to describe the science activities their students participated in. The science activities that teachers mentioned were mostly life science related (i.e. planting seeds, observing leaves, growing caterpillars), although some physical science activities were mentioned (i.e. sink/float, cooking, magnets). The majority of activities teachers mentioned were teacher-directed. For example, several teachers described experiments that teachers would demonstrate for children (i.e. volcano, cooking, making crystal trees). When asked how often teachers taught science, most teachers said they implemented a planned science activity once a week. However, several teachers mentioned that children had the opportunity to engage in science related activities everyday, as children had access to the science center during free play time. For example, Ms. Annie mentioned that she did not plan a science activity everyday, but provided children with science materials they could use. She said,
“We have a lot of science stuff in our class, but it’s not things that we just like target out, or address every day or stuff like that.”

Science was both a self-reported area of weakness and an observed area of weakness for teachers at Las Olas Head Start. The three classrooms were observed and rated using the PRISM. While each classroom scored relatively high in terms of the availability of science-related materials, with the exception of Item 6 (materials to support reading and writing about and representing science concepts), each classroom scored relatively low in terms of staff interactions around science. For example, each classroom received the highest score on measure 5 (Materials for biological or non-biological science explorations), meaning that these classrooms had “varied materials that invite close observation, comparison and/or sorting,” more than two sets of materials “that encourage children to explore cause and effect,” and observation tools that are “arranged in a logical way that fosters “exploration.”

In general, there were not many high-quality teacher-child interactions, where teachers asked open-ended questions, scaffolded vocabulary, or engaged in meaningful back-and-forth discussion, documented in the classroom observations. There were even fewer instances of science-related teacher-child interactions in the three classrooms observed. In fact, there were several missed opportunities where teachers did not capitalize on possible science-related interactions. For example, when a child looked through a view finder and asked the teacher about the animal he was looking at, she responded “baby frog” and told him to clean up and move to the next activity. In this example, the teacher
missed an authentic opportunity to build the child’s scientific vocabulary, knowledge of life cycles and cause and effect, and explanatory language.

Another example was when a child looked at seedpods on the ground and asked the teacher, “What’s that?” as he pointed to seedpods. She quickly looked down and responded, “They’re leaves, now go and play.” In a different classroom, the teacher did not engage in any planned science related activities during the time of the observation or the previous week and only engaged in one spontaneous science related activity/discussion during the observation. It is not surprising that teachers are not engaging in staff-child interactions around science more frequently as the demands of the job seem to limit the amount of time teachers can devote to engaging in these types of effective interactions.

Summary of Findings

Overall, teachers ranked Science as the least important school readiness domain. They also rated Science as the school readiness domain they felt least comfortable teaching. However, there was some variation in rankings among teachers by teacher ethnicity and immigrant/non-immigrant status.

All teachers mentioned that science was difficult to teach. Teachers described several barriers to effective science instruction, which fell into three main categories: fixed mindset in science teaching capabilities, structural issues within the school, and the belief that science was developmentally inappropriate for preschool age children. All teachers also stated that play was an important part of their teaching philosophy. Teachers mentioned that children developed
math and literacy skills through play, but did not mention science in their
discussion of play.

Science was both a self-reported area of weakness and an observed area
of weakness for teachers. There were very few science-related
activities/interactions observed and several “missed opportunities” for science-
related talk, play, or exploration across the three classrooms
Chapter 6: Comparing Parents and Teachers’ values/beliefs and practices

This chapter addresses the study’s fourth and final research question regarding how parents’ and teachers’ values/beliefs and practices compare:

- How do low-income Latino parents of preschool children’s values/beliefs and practices around early science learning compare to the values/beliefs and practices of teachers of low-income Latino preschool children?

Parent and teacher school readiness domain rankings

In order to gain a better understanding of how parents’ early learning values/beliefs compared to teachers’ early learning values/beliefs, parent and teacher rankings of school readiness domain were analyzed. Overall, parents ranked Reading, Writing, and Math as most important for their child to learn about in preschool, while teachers ranked Morals and Ethics, Writing, and Reading as most important. Both parents and teachers commonly ranked Writing and Reading highly, as Writing and Reading were included in both parents and teachers top three school readiness domains. Parents and teachers also commonly ranked Science as low. Science as ranked as either the last or second to last domain by both parents and teachers.

A Pearson Product Moment Correlation was conducted to determine whether there was a statistically significant association between parent ranking of school readiness domains and teacher ranking of school readiness domains. No statistically significant associations were found (See Table 20).
**Table 19.** Correlation Table for Teacher School Readiness Domain Rankings and Parent School Readiness Rankings

<table>
<thead>
<tr>
<th>Parent rankings</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teacher rankings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Reading</td>
<td>-.03</td>
<td>.03</td>
<td>-.00</td>
<td>-.01</td>
<td>-.01</td>
<td>.28</td>
<td>.03</td>
<td>-.03</td>
</tr>
<tr>
<td>2. Writing</td>
<td>.01</td>
<td>.22</td>
<td>.14</td>
<td>-.19</td>
<td>-.19</td>
<td>-.01</td>
<td>.22</td>
<td>.01</td>
</tr>
<tr>
<td>3. Math</td>
<td>-.09</td>
<td>-.16</td>
<td>-.17</td>
<td>.18</td>
<td>.18</td>
<td>.09</td>
<td>-.16</td>
<td>-.09</td>
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<tr>
<td>4. Morals &amp; Ethics</td>
<td>-.08</td>
<td>.04</td>
<td>-.04</td>
<td>.01</td>
<td>.01</td>
<td>.08</td>
<td>.04</td>
<td>-.08</td>
</tr>
<tr>
<td>5. Second Language</td>
<td>-.16</td>
<td>-.11</td>
<td>-.19</td>
<td>.17</td>
<td>.17</td>
<td>.16</td>
<td>-.11</td>
<td>-.16</td>
</tr>
<tr>
<td>6. Social Studies</td>
<td>-.21</td>
<td>-.01</td>
<td>-.16</td>
<td>.11</td>
<td>.11</td>
<td>.21</td>
<td>-.01</td>
<td>-.21</td>
</tr>
<tr>
<td>7. Science</td>
<td>-.19</td>
<td>.09</td>
<td>-.08</td>
<td>.02</td>
<td>.02</td>
<td>.19</td>
<td>.09</td>
<td>-.19</td>
</tr>
<tr>
<td>8. Art</td>
<td>-.28</td>
<td>.04</td>
<td>-.18</td>
<td>.10</td>
<td>.10</td>
<td>.28</td>
<td>.05</td>
<td>-.28</td>
</tr>
</tbody>
</table>
Parent rankings of school readiness domains also did not vary by classroom, $F(3, 47) = .78, p = .51$. This finding suggests that the parent beliefs about school readiness were not dependent on teacher beliefs or variations within classrooms.

**Teacher beliefs about parents**

During interviews, teachers were asked to consider how they believed parents’ school readiness rankings would compare to their own rankings. Most teachers mentioned that believed parents wanted their children to learn "basic skills" and "basic rules." Basic skills included skills like learning the ABCs, reading, and writing/fine motor skills (i.e. writing, cutting, coloring). For example, when asked about what parents thought were most important for their children to learn in preschool, Ms. Annie said, "I think it's the reading, the writing, spelling, like how to spell their name, write their names and stuff like that. I think those are the top priorities, reading and writing." Basic rules included rules like listening to adults, keeping your hands to yourself, and being nice to peers. Ms. Saba said, "[Parents] are just are looking for just the basic fundamentals of life skills like listening and not shoving, not pushing, you know your basic rules you have in the classroom."

Teachers were also asked specifically about parents and science. They were asked if parents engaged in science activities at home with their children and if so, what kinds of science-related activities families participated in. About half (50%) of teachers said that parents did engage in science-related activities,
but did so unknowingly. These teachers articulated more strengths-based orientation toward families. For example, when asked if she thought parents were engaging with science-related activities at home, she said,

I think they are, because they probably don't know what they're doing is science. But I believe they are...Some of the parents have told me that their child helps them when they're cooking. Or they're gardening. But they don't think that's science. They don't know that they're doing science.

Ms. Patricia seemed to have a broad definition of science as including everyday activities that explore science-related principles. Similarly, Ms. Madelene also believed that families participated in everyday science-related activities in the home. When asked what kind of activities families engaged in, she said, “Well, maybe cooking with their parents. Helping they mother in the kitchen. Maybe something in the garden outside they house. Watering plants.”

When Ms. Madelene described the activities families participated in at home, she also mentioned that parents “try teaching children [science], but probably don't know it's science,” articulating that families do science, but may not know that they are doing science.

While half (50%) of teachers reported that families participated in science at home, the other half reported that parents did not participate in science at home. These teachers articulated a more deficit orientation toward families. For example, Ms. Farah said,

They learn from the school teaching them, they learn about science more than at home because, like, when they brushing teeth, we have activity. "Why they are brushing teeth?" Like, now, they know. I...they [students] told me, "Teacher, we don't eat a lot sweet. If I eat sweet, I go after that brushing teeth." That's, from where come?
We doing with them practicing them about the teeth and brushing teeth. For example, I don't think at home, they just tell them, ‘Go brushing teeth’ Not like here.

Ms. Farah essentially believed that parents did not participate in science at home or engage in science-related talk at home. Similarly, Ms. Annie also mentioned that parents most likely do not engage in science activities in the home, but because of time restraints. When asked if parents engage in science at home she said,

No, probably not, because you know. If it is, it's limited just like anything else because due to the times that now is put on the families, the working, and the eating, and the bathing, and all that stuff. Parents barely have time to do it in the home.

When asked about the extent that parents talked with their children about science at home, she replied, “little to none.” Ms. Annie seemed to have a narrow definition of home science activities as a distinct activity, separate from the routine’s activities of the home. Ms. Annie suggested that parents simply did not have the time to talk about science or engage in science-related activities.

However, Ms. Laura attributed a lack of science talk and engagement to race/ethnicity. When asked if she thought families participated in science-related activities at home, she said,

I hope wrong, but I think so in Hispanics families not much. But in the Anglo Saxon or Asian families, I think so, yes. Because the parents involved more with the children. Even, maybe, Sunday we go to one museum, science museums or wherever, something like that. And unfortunately, Hispanic families not much.

Ms. Laura seemed to have a narrow definition of home science activities, as including only explicitly science-related activities, like going to a science
museum, as opposed to everyday activities that explore scientific principles that take place in the home. She also articulated that specific kinds of families were more involved with their children and only these families were engaging in explicit science activities, espousing a deficit orientation towards Latino families.

**Summary of Findings**

Overall, there was some overlap in parents and teachers’ ranking of school readiness domains. Parents ranked Reading, Writing, and Math as most important for their child to learn about in preschool, while teachers ranked Morals and Ethics, Writing, and Reading as most important. Both parents and teachers commonly ranked Writing and Reading highly, as Writing and Reading were included in both parents and teachers top three school readiness domains. Parents and teachers also commonly ranked Science as low. Science was ranked as either the last or second to last domain by both parents and teachers.

Teachers were divided in their thoughts about parents’ home science practices. About half (50%) of teachers said that parents did engage in science-related activities, but did so unknowingly. These teachers articulated more strengths-based orientation toward families. The other half reported that parents did not participate in science at home due to time constraints and race/ethnicity. These teachers articulated a more deficit orientation toward families and narrow definition of home science activities, as including explicitly science-related activities, like going to a science museum, as opposed to everyday activities that explore scientific principles in the home.
Chapter 7: Discussion of Findings, Conclusion, and Implications

Summary of Findings

The purpose of this study was to examine and compare the early learning and early science learning values/beliefs and practices of low-income Latino parents and their children’s preschool teachers in order to gain a more comprehensive view of low-income Latino children’s early science learning.

Parents ranked traditional school readiness domains (i.e. Reading, Writing, Math) as most important for their child to learn in preschool and ranked Science as one of the least important domains. There were group differences in parent school readiness domain rankings by maternal education, parent country of birth, and child gender.

Parent rankings of math significantly varied across levels of maternal education, with higher math rankings among mothers with a high school education versus post high school education higher math rankings among mothers with a high school education versus post high school education.

Parents born in Central America ranked math and second language learning higher than parents who were born in the U.S. Additionally, parents who were born in Central America ranked science higher than parents who were born in Mexico.

Parents of boys ranked all school readiness domains other than writing and morals and ethics more highly than parents of girls. More specifically, parents of boys ranked math and science as more important for their child to
learn than did parents of girls. Parents whose native language was Spanish also ranked science as higher for boys and parents whose native language was ranked science as higher for girls.

Teachers ranked Morals and Ethics, Reading, and Writing as most important for students to learn in preschool. They ranked Science as the least important school readiness domain children should learn about in preschool. They also ranked science was also ranked as the school readiness domain they felt least comfortable teaching.

Teachers mentioned several barriers to effective science instruction that fell into three main categories: a fixed mindset about their science teaching capabilities, structural issues at school site, and a belief that science was developmentally inappropriate for young children. These barriers related to teachers’ understanding of science for young children as procedural knowledge rather than a study of how the world works. Teachers described science as a compilation of discrete tasks, where teachers “show” and “explain” scientific principles to children instead of engaging in ways to support scientific thinking through play and exploration. In fact, although teachers valued play, they did not mention science when they discussed play. However, they did mention more traditional school readiness domains like language and literacy and math in their discussion of play.

Lack of effective science instruction was both a self-reported and observed area of weakness for teachers. There was little to no science activity in the classrooms observed. There were several missed opportunities where
teachers could have supported children’s science learning that were observed. Teachers’ fixed beliefs about science as procedural tasks seemed to influence the existence of missed opportunities, as spontaneous explorations of everyday phenomena do not likely fit into teachers’ understanding of science.

Overall, both parents and teachers commonly ranked more traditional school readiness domains, Writing and Reading highly, as Writing and Reading were included in both parents and teachers top three school readiness domains. Parents and teachers also commonly ranked Science as low. Science as ranked as either the last or second to last domain by both parents and teachers. However, no statistically significant associations were found between parent ranking of school readiness domains and teacher ranking of school readiness domains. Nor were there differences in parent rankings by classroom/classroom teacher. Although there is some agreement in the highest and lowest ranked items, there is little relationship between rankings of other school readiness domains.

Another finding was there was disconnect within teachers in regards to their beliefs about parents and how parents support/do not support their children’s science learning at home. About half (50%) of teachers said that parents did engage in science-related activities, but did so unknowingly. These teachers articulated more strengths-based orientation toward families and had a broader definition of science as including everyday activities that explore science-related principles. These teachers articulated that families were participating in science, but did not know that they were.
The other half of teachers reported that parents did not participate in science at home. These teachers articulated a more deficit orientation toward families that assumed parents did not participate in science at home or engage in science-related talk at home, mostly due to time restraints. However, one teacher attributed a lack of science talk and engagement to race/ethnicity. This teacher seemed to have a narrow definition of home science activities, as including only explicitly science-related activities, like going to a science museum, as opposed to everyday activities that explore scientific principles that take place in the home. She also articulated that specific kinds of families were more involved with their children and only these families were engaging in explicit science activities.

**Discussion of Findings**

This study helped illuminate parents values/beliefs and teachers values/beliefs and practices around early learning and early science learning. Juxtaposing parent values/beliefs and teacher values/beliefs and practices allowed valuable comparisons to be made, particularly in terms of prioritizing school readiness domains. Comparing these two cultural communities that directly influence a child’s life can aid in better understanding of the development of early science learning.

This study highlighted the lack of effective science instruction available in preschool classrooms. Although science materials are available, meaningful student-teacher interactions around science are few and far between.
This study shed light on three main barriers that prevented teachers from engaging in effective science instruction and unmasked teachers’ developmentally inappropriate, perceptions of science as different experiments/activities/tasks that teachers “do,” “show,” or “explain” to children, as opposed to a way of thinking about and exploring the world. This procedural view of science seemed to influence the way teachers think about science at school but also in the home.

In this study, about half of teachers had a more strengths-based orientation towards parents, broader definition of science, and believed that parents unknowingly engaged in science at home through everyday activities. The other half of teachers had more of a deficit orientation towards parents, and believed that parents did not engage in science in the home, due to various constraints (i.e. time, race and ethnicity).

**Parent early science learning beliefs**

Generally parents ranked more traditional school readiness domains, (i.e. Reading, Writing, Math) as more important for their children to learn about in preschool. Parents ranked Science as one of the least important domains children should learn about in preschool. This low parental prioritization of science is consistent with the findings of Sackes (2014) who also found that parents prioritized science as low in terms of importance. Sackes (2014) outlined several factors that could have been responsible for why parents ranked science lower than other curricular domains including lack of parental confidence with
children’s ability to learn scientific concepts and skills and socioeconomic status (SES). He argued that although parents with low-SES valued academic learning in general, they may not have had the necessary economical resources to support their child’s learning of science, tended to have negative experiences with learning science, and were less likely to have science-related education or careers in comparison to high-SES parents, which may have explained why parents of lower SES rated science as lower priority.

Although science was generally ranked as low priority among parents, there were several patterns that became evident in parent ranking of school readiness domains. One notable pattern was in regards to maternal education. Parent rankings of math significantly varied across levels of maternal education, with higher math rankings among mothers with a high school education versus post high school education. Additionally, there was a marginal pattern in parent rankings of morals and ethics by maternal education, with higher rankings among mothers who had a post high school education versus mothers who had only a high school education. It is likely parents with lower levels of education see traditional educational gains as being paramount for successful life outcomes. It could also be the case that mothers with less education tend to believe traditional academic subjects like math should be an important part of preschool, and learning centered on morals and ethics have a greater place in the home.

Another notable pattern was in regards to parental country of birth. Significant group differences were found in parent ranking of math, second language learning, and science by parent country of birth. Parents born in
Central America ranked math higher than parents who were born in the U.S. Parents who were born in Central America ranked second language learning higher than parents who were born in the U.S. In fact, 100% of parents born in Central America ranked second language learning as the most important school readiness domain their child should learn in preschool (M = 8.00). Additionally, parents who were born in Central America ranked science higher than parents who were born in Mexico. Finally, there was a near significant trend when looking at parent ranking of social studies with parents born in Central America ranking Social Studies more highly than parents born either in Mexico or the United States. It appeared that parents from Central America functioned as a distinct cultural community in which skills in these school readiness domains were valued for the development of their children. The parental goals of cultural communities directly relate to ideals for the development of their children (Rogoff, 2003).

Additionally, there was a pattern was in regards to gender. Overall parents of boys ranked all school readiness domains other than writing and morals and ethics more highly than parents of girls. More specifically, parents of boys ranked math and science as more important for their child to learn than did parents of girls. Parents whose native language was Spanish also ranked science higher for their male children and English native parents ranked science as higher for female children. Gender seemed to be an important factor in parent beliefs and values around school readiness skills, as parents seemed to hold gender-specific beliefs specifically around science and math. This is consistent with the findings of Sackes (2014), who also found that parents of boys were more likely to rank
science as more important than girls, which was congruent with previous studies on gender differences and parental expectations of content domains. For example, Andre, Whigham, Hendrickson, and Chambers (1999) found that parents perceived boys to be competent and eager to learn about science than girls. Gender roles develop from exposure to models daily life and are nurtured through the encouragement of gender-specific tasks and activities (Rogoff, 2003). Gender roles established within various cultural communities and are transmitted from generation to generation.

**Teachers early science learning beliefs and practices**

Generally, teachers ranked Science as the least important school readiness domain children should learn about in preschool. Science was also ranked in terms of teacher comfort level. These findings are consistent with that Greenfield et al. (2009) who found that preschool teachers' negative attitudes towards teaching science were largely due to teachers’ negative experiences with learning science, which was found to contribute to their lack of self-efficacy with science instruction. Teachers first prioritized Morals and Ethics which was congruent with the findings of Hatcher, Nuner, and Paulsel (2012) who found that preschool teachers associated readiness with social-emotional maturity and the ability to interact successfully with peers. Teachers also prioritized Reading and Writing, which was also consistent to the findings of Greenfield et al. (2009) who found that preschool teachers felt considerable pressure to focus on language
and literacy skills, which made finding the time to teach other readiness domains, like science, difficult.

Teachers mentioned several barriers to effective science instruction that fell into three main categories: a fixed mindset about science teaching capabilities, structural issues at school site, and a belief that science is developmentally inappropriate for young children. All of these barriers stem from teachers’ understanding of science for young children as procedural knowledge rather than a study of how the world works. Teachers described science as discrete tasks, such as standalone scientific experiments, where teachers have to “show” and “explain” scientific principles to children, as opposed to supporting a scientific way of thinking about the world through play and exploration. In fact, although teachers valued play, they did not mention science when they discussed play. They only mentioned more traditional school readiness domains like language and literacy and math play.

Lack of effective science instruction was both a self-reported and observed area of weakness for teachers. There was little to no science activity during all three classroom observations and there were several missed opportunities where teachers could have supported children’s science learning that were observed. Recall the example was when a child looked at seedpods on the ground and asked the teacher, “What’s that?” as he pointed to seedpods. She quickly looked down and responded, “They’re leaves, now go and play.” Teachers’ fixed beliefs about science as procedural tasks may influence the
existence of these kinds of missed opportunities, as spontaneous explorations of everyday phenomena do not likely fit into their understanding of science.

**Parent and teacher beliefs about early learning beliefs and practices**

Overall, both parents and teachers commonly ranked more traditional school readiness domains highly, as Writing and Reading were included in both parents and teachers top three school readiness domains. However, teachers first prioritized Morals and Ethics, suggesting that teachers prioritized a combination of cognitive/academic domains, while parents prioritized primarily cognitive/academic domains. Parents and teachers also commonly ranked Science as low. Science was ranked as either the last or second to last domain by both parents and teachers. However, no statistically significant associations were found between parent ranking of school readiness domains and teacher ranking of school readiness domains. Nor were there differences in parent rankings by classroom/classroom teacher.

Although there was agreement between parents and teachers in terms of school readiness domain ranking, there was an area of disconnect within teachers and their beliefs about parents supporting/not supporting children’s science learning at home. Teachers were split between having a strengths orientation or a deficit orientation towards parents’ engagement in science. Half (50%) of teachers said that parents did engage in science-related activities, but did so unknowingly. These teachers articulated more strengths-based orientation toward families and had a broader definition of science as including everyday
activities that explore science-related principles. These teachers articulated that families are participating in science, but may not know that they are. The other half of teachers reported that parents did not participate in science at home. These teachers articulated a more deficit orientation toward families that assumed parents did not participate in science at home or engage in science-related talk at home. Some teachers mentioned that parents most likely do not engage in science activities in the home due to time restraints.

Most concerning was one teacher with a strong deficit orientation causally linked to race/ethnicity.

“I hope wrong, but I think so in Hispanics families not much. But in the Anglo Saxon or Asian families, I think so, yes. Because the parents involved more with the children. Even, maybe, Sunday we go to one museum, science museums or wherever, something like that. And unfortunately, Hispanic families not much.”

This teacher seemed to have a narrow definition of home science activities, as including only explicitly science-related activities, like going to a science museum, as opposed to everyday activities that explore scientific principles that take place in the home. She also articulated that specific kinds of families were more involved with their children and only these families were engaging in explicit science activities. She espoused a deficit orientation towards Latino families, alluding that Latino families were not intentionally providing enriching activities and that the activities that the parents are engaging in are not enriching in the traditional or expected way. This deficit view is consistent with the belief that Latino parents’ early learning values and related practices are often considered deficits that lead to children’s low achievement. However,
studies of Latino families have shown parents’ early learning values and practices as strengths that actually support children’s achievement (Farver et al, 2006; Goldenberg et al., 2001; Reese et al., 1995). Goldenberg et al. (2001) examined Latino parents’ educational aspirations and expectations for their children and found that over the course of elementary school, Latino parents consistently expressed high aspirations for their children. The findings challenge the idea that Latino parents have low aspirations and expectations for their children and these aspirations and expectations lead to their children’s poor academic performance.

STEM and STEM education continue to be a topic of national importance as STEM skills have become part and parcel to economic prosperity and well-being. In the past decade, research on STEM has proliferated; greater attention has been paid to STEM experiences in preschool and STEM experiences of low-income Latino students separately. For example, there is little no research that examines the experiences of low-income Latino students in preschool. Additionally, there is little to no research that examines parent values/beliefs about early science learning beliefs in conjunction with teacher values/beliefs and practices around early science learning. This is particularly true with low-income Latino parents and their teachers of low-income Latino preschool children.

This study is the first of its kind, as it examined the early learning and early science learning beliefs and practices of low-income Latino parents and teachers of low-income Latino preschool children. This study looked particularly at low-income Latino parents and their preschool teachers, which added to the research
base on low-income minority families. In line with a strengths-based approach to research with minority families, this study examined within group variation among low-income Latino families. There is little known about the within-group variation in family education, income, beliefs and values, childrearing styles and the economic and social investments that families make for their children (Cabrera, 2013). Studying these within-group variations, like families’ values/beliefs, build understanding of how families think about early learning and early science learning. A strengths-based approach to teaching and learning acknowledges that there are multiple pathways to successful development and promotes what families are already thinking and doing within their cultural contexts (Cabrera 2013).

Implications for future research

A major goal of this study was to examine the values/beliefs and practices of low-income Latino parents and teachers of low-income Latino children. While data on the values/beliefs and practices of teachers of low-income Latino teachers was collected, only data on the values/beliefs of low-income Latino parents was collected. Therefore, the next steps of the larger project this study is embedded in is to examine the practices of low-income Latino parents through home visits, consisting of a parent interview and parent-child observation.

In addition, capitalizing on the positive development of minority children, and employing a strengths-based approach, future studies that examined the values/beliefs and practices around early science learning of families who ranked
science as high would be ideal. Also, it might be valuable to identify low-income Latino children who were high performing in science, by examining child outcomes, and examine the early science learning values/beliefs and practices of their parents and their preschool teachers.

Implications for policy and practice

In this study, it was found that teachers had a procedural understanding of science for young children that centered around “showing” children various science experiments/activities rather than a way of thinking about and exploring the world. This procedural understanding of science is inconsistent with what is considered developmentally appropriate science instruction. This finding suggests that teachers should be provided with professional development opportunities and training that teach teachers how to approach science for young children so they can move beyond a procedural understanding of science and engage in more meaningful scientific interactions with children.

In this study, teachers did not regularly engage in effective science instruction. Teachers believed science was difficult to teach and mentioned three main barriers (a fixed mindset about their science teaching capabilities, structural issues at school site, and a belief that science was developmentally inappropriate for young children). The first barrier, a fixed mindset about their own science teaching capabilities caused teachers to believe that teaching science was difficult and they were not particularly skilled at teaching science, and thus did not often teach science. This finding suggests that teachers be provided with
professional development opportunities and training that are geared toward breaking teachers' fixed mindset about their science teaching capabilities.

This study also found that both parents and teachers do not highly prioritize science. This finding suggests that parents and teachers should be made aware of the value of science, and its ability to be easily integrated across curricular domains, including traditional curricular domains that parents and teachers regard as more important. Ongoing coaching/training geared towards building teachers' understanding of science for young children as a way of thinking about the world would be critical for teachers. Parent workshops and easily accessible resources that promote a developmentally appropriate understanding of science for young children and provide activities to support children’s science learning through everyday activities at home would be critical for parents.

The practice of examining parent and teacher beliefs side by side is a valuable process that can help identify areas of overlap and mismatch that can be useful in planning parent development workshops and teacher professional development opportunities that support parent-teacher partnerships. Effective parent-teacher partnerships can further aid in eliminating the deficit orientation that surrounds low-income Latino families from their first years of schooling.

Conclusion

As previously mentioned, low-income Latinos are vastly underrepresented in STEM due to various leaks in the PK-20 STEM pipeline that begin as early as preschool. In order to improve the early science learning of low-income Latino
children, and to provide an effective entry point to the STEM pipeline, there is a need for further investigation of low-income Latino children’s early science learning experiences. Examining these children’s science experiences at home and at school, two contexts that have a great impact on a child’s development of science knowledge, contributed to a more holistic understanding. More specifically, studying the beliefs/values and practices of parents and teachers, at home and at school, provided a more detailed picture of how low-income Latino children develop science knowledge and how it can be supported, contributing a missing element to the relatively understudied, but growing knowledge base of early childhood science education.

However, developing a better understanding of the values/beliefs of low-income Latino parent and the values/beliefs and practices of teachers of low-income Latino students and how they compare is merely an important first step. Using what is known about parents and how they think about early learning/ early science learning and what is known about teachers and how teachers think about early learning/early science learning, can help design programs and resources that build parent and teachers’ understanding of developmentally appropriate ways to support children’s early science learning.
References


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National Science Teachers Association (2014). *Early childhood science*


Appendix A
Parent Survey

*Note: This survey was included as part of a larger survey administered by the UC Links Preschool Project, which this study is nested in.*

What do you think is important for your child to learn in preschool? Please rank the following content areas, with 1 next to the most important area and 8 being the least important area. Write the rank of each content area (From 1 to 8) in the box labeled “rank”

<table>
<thead>
<tr>
<th>Content Area</th>
<th>Rank</th>
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<tbody>
<tr>
<td>Math</td>
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</tr>
<tr>
<td>Art</td>
<td></td>
</tr>
<tr>
<td>Social Studies</td>
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<tr>
<td>Science</td>
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<tr>
<td>Morals and Ethics</td>
<td></td>
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<tr>
<td>Pre-reading</td>
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<tr>
<td>Pre-writing</td>
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<tr>
<td>Second Language</td>
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1 = least important       8 = most important
Appendix B

Teacher Survey

Note: This survey was included as part of a larger survey administered by the UC Links Preschool Project, which this study is nested in.

Professional/Demographics

1. What is the highest level of education you have completed? **Check only one**.

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<tr>
<td>a. Eighth grade or less</td>
<td>g. Bachelor’s degree</td>
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<tr>
<td>b. Some high school but no diploma</td>
<td>h. At least one year of course work beyond a BA</td>
</tr>
<tr>
<td>c. High school diploma or equivalent</td>
<td>i. Master’s degree</td>
</tr>
<tr>
<td>d. High school diploma or equivalent, <strong>plus</strong> technical training or certificate</td>
<td>j. Education specialist or professional diploma based on at least one year of course work beyond a Master’s degree</td>
</tr>
<tr>
<td>e. Some college but no degree</td>
<td>k. Doctoral degree</td>
</tr>
<tr>
<td>f. AA, AS, two-year degree</td>
<td>l. Other: <strong>Specify</strong>: ___________________________</td>
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</table>
2. What was your major when you received your highest degree? *Please check one.*

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<table>
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<tbody>
<tr>
<td>θ a. Early childhood education</td>
<td>θ e. Child development</td>
</tr>
<tr>
<td>θ b. Elementary education</td>
<td>θ f. N/A (no degree)</td>
</tr>
<tr>
<td>θ c. Special education</td>
<td>θ g. Other: <em>Specify:</em></td>
</tr>
<tr>
<td>θ d. English as a second language (ESL)</td>
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3. Do you have a Child Development Associate credential (CDA)? θ Yes θ No

4. Where did you take your college courses (if applicable)?

5. List your years of experience working professionally with children at each of the following levels. *Enter 0 if no experience.*

   a. Preschool or Infant/Toddler .....................   years

   b. Kindergarten ...........................................   years

   c. Above kindergarten .................................   years

6. In what year were you born? 19____
3. Check **all** the categories that describe your race/ethnicity:

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>a. Black/African-American</td>
<td>i. Chinese</td>
</tr>
<tr>
<td>b. Native American/Indian</td>
<td>j. Filipino</td>
</tr>
<tr>
<td>c. White/Caucasian</td>
<td>k. Japanese</td>
</tr>
<tr>
<td>d. Pacific Islander</td>
<td>l. Korean</td>
</tr>
<tr>
<td>e. Mexican American, Chicano</td>
<td>m. Vietnamese</td>
</tr>
<tr>
<td>f. Puerto Rican</td>
<td>n. Asian Indian</td>
</tr>
<tr>
<td>g. Cuban</td>
<td>o. Other Asian</td>
</tr>
<tr>
<td>h. Other Hispanic/Spanish/Latino</td>
<td>p. Other: <strong>Specify</strong>: __________________</td>
</tr>
</tbody>
</table>

4. **What is your country of origin (where were you born)?** __________________
   
   If not born in the US, how old were you when you moved here?
   
   __________________

5. **Where were your parents born (country and/or state)?** __________________
Your Students

6. How many children in your class/program are considered **Limited English Proficient** (LEP)? *(children with LEP are children whose native language is other than English and whose skills in listening, speaking, reading, or writing English are such that they have difficulty understanding school instructions in English).*

    ______ Limited English Proficient students

7. Which languages are spoken by children in your class/program? **Check all that apply.**
   o a. English  o b. Spanish  o c. Other Language(s)
   ______________________________________________________
   **please specify**

8. Which languages do you or your co-teachers speak *in the classroom*? **Check all that apply.**
   o a. English  o b. Spanish  o c. Other Language(s)
   ______________________________________________________
   **please specify**
## Ideas About Children

13. Please circle the answer that indicates how strongly you agree with the following statements.

*Please circle the appropriate number.*

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Mildly Disagree</th>
<th>Neither Agree or Disagree</th>
<th>Mildly Agree</th>
<th>Strongly Agree</th>
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</thead>
<tbody>
<tr>
<td>a. Since parents lack special training in education, they should not question the teacher’s teaching methods.</td>
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<td>b. Children should be treated the same regardless of differences among them.</td>
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<td>c. Children should always obey the teacher.</td>
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<td>d. Preparing for the future is more important for a child than enjoying today.</td>
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<td>e. Children will not do the right thing unless they must.</td>
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<td>f. Children should be allowed to disagree with their parents if they feel their own ideas are better.</td>
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<td>g. Children should be kept busy with work and study at home and at school.</td>
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<td>h. The major goal of education is to put basic information into the</td>
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minds of the children.

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Schaefer & Edgerton (1985)
14. Below are some statements that some teachers have made about how children should be taught and managed. Please indicate how each statement conforms with your personal beliefs about good teaching practice.

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<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
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<th>Strongly Agree</th>
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</thead>
<tbody>
<tr>
<td>Children should be allowed to select many of their own activities from a</td>
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<td>variety of learning areas that the teacher has prepared (writing, science</td>
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<td>center, etc.)</td>
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<td>Children should be allowed to cut their own shapes, perform their own</td>
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<td>steps in an experiment, and plan their own creative drama, art, and writing</td>
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<td>activities.</td>
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<td>Children should be involved in establishing rules for the classroom.</td>
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<td>Children should be instructed in recognizing the single letters of the</td>
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<td>alphabet, isolated from words.</td>
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<td>Children should learn to color within predefined lines.</td>
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<td>Children should learn to form letters correctly on a printed page.</td>
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<td>Children should dictate stories to the teacher.</td>
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<tr>
<td>Children should know their letter sounds before they learn to read.</td>
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<td>Children should form letters correctly before they are allowed to create</td>
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<td>a story.</td>
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Thank you for your time!
Appendix C

School Readiness Domain Ranking Activity

What do you think is important for children to learn in preschool? Look at the learning domains below:

Please rank the following content areas from 1 to 8, with 1 being the most important and 8 being the least important. For example, write the content area that you think is most important for your child to learn in preschool next to “1.”

For each content area ranked, please rate the how comfortable you feel teaching the content area on a scale of 1 to 5, with 1 being very comfortable, 3 being moderately comfortable, and 5 being not very comfortable.

1 = least important  8 = most important

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<thead>
<tr>
<th>Rank</th>
<th>Content Area</th>
<th>Comfort Level</th>
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<tbody>
<tr>
<td></td>
<td>Art</td>
<td>1 2 3 4 5</td>
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<tr>
<td></td>
<td>Morals &amp; Ethics</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td></td>
<td>Social Studies</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td></td>
<td>Math</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td></td>
<td>Science</td>
<td>1 2 3 4 5</td>
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<tr>
<td></td>
<td>Pre-reading</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td></td>
<td>Pre-writing</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td></td>
<td>Second Language</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
Appendix D

Teacher Interview Protocol

*Note: This survey was included as part of a larger interview administered by the UC Links Preschool Project, which this study is nested in*

**Introduction:**

- Thank teacher for agreeing to participate in the study. Explain that by interviewing preschool teachers we can better understand how teachers think about school readiness domains like science. Explain that the interview will last about one hour.
- Explain that while the interview will be taped, their responses are strictly confidential. Remind them that they may choose not to answer any question they like and that they can stop the interview at any time. Ask if the teacher has any questions before beginning.

---

**Questions:**

*History of science learning*

- Let’s think back to when you were a learner and you were learning science in school. Some students have very positive experiences with learning science, and some don’t. What were your past experiences with learning science?
- What do you remember about learning about science as a young student?

*Beliefs about science teaching*

*Note: Refer to teachers’ survey.*

- Let’s talk about how you ranked the content domains and why you decided on this order…
- Tell me about how you ranked these content areas this way...
  - Can you talk more about why you decided on that order?
- If parents were given this same opportunity (to rank the curricular domains), how do you think it compares to how parents might rank these content domains?
- You ranked science as _______. Tell me more about that
  - Why did you put science after _______
- In early childhood, early learning standards typically define science as the way children make sense of the world. What comes to mind when you think of early science learning?

*Activities that support science learning at school*

- Walk me through a typical day in your classroom.
There's a wide range in the amount of time that teachers spend teaching science. Some teachers spend a great deal of time teaching science, while others don't. Where does science fit into your typical day?
  - Is there a designated science time, or is it integrated across domains, or both.

How often do you teach science per week?

In the preschool classroom, science can take many forms, from taking care of a class pet to observing rocks in the science center. What does science look like in your classroom?

Some teachers find teaching science in preschool challenging, how about you?

Do you enjoy teaching science?

Science learning at home

- You've told me a great deal about how science is practiced in the classroom. Is science something that is practiced at home? In other words, do you think families are engaging in science related activities at home? What do you think they do? To what extent do you think parents are talking about science at home with their kids?
  - Do you think parents are strategically thinking their child science at home?

- Some teachers say that science can easily bridged with home experiences. What has been your experience with this? Can you speak about how science may or may not help connect with what happens at school and at home.

Conclusion

- At this time, please share with me anything about your experiences with science teaching and learning that we haven't covered yet...
## Appendix E

### Classroom Observation PRISM Scoring Sheets

#### PRISM Scoring Sheet (Science materials list)

**Tools & Materials - Science**

<table>
<thead>
<tr>
<th>Item 5: biological and non-biological science explorations</th>
<th>Item 6: Supporting reading, writing, representing science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand lens</td>
<td>Science themed books</td>
</tr>
<tr>
<td>Tabletop magnifier</td>
<td>Posters showing science concepts</td>
</tr>
<tr>
<td>Microscope (preschool)</td>
<td>Science themed computer games</td>
</tr>
<tr>
<td>Specimen jars with magnifiers</td>
<td>Science journals</td>
</tr>
<tr>
<td>Binoculars</td>
<td>Color sort graph</td>
</tr>
<tr>
<td>Specimen jars (empty) or other containers for children’s “finds”</td>
<td>Crayons/pencils &amp; paper in science area</td>
</tr>
<tr>
<td>Color paddles</td>
<td>Food pyramid</td>
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<tr>
<td>Class pet</td>
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<tr>
<td>Plants</td>
<td></td>
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<tr>
<td>Collections of objects – shells, leaves, pine cones, rocks</td>
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<tr>
<td>Flowers (cut or dried)</td>
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<tr>
<td>Seeds/seed pods, nuts, feathers, bird nest, insects</td>
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<tr>
<td>Nuts</td>
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<td>Feathers</td>
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<td>Bird nest</td>
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<td>Latches</td>
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<td>Keys</td>
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<td>Locks</td>
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<td>Wheels &amp; axles</td>
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<td>Pulleys</td>
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<td>Ramps</td>
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<td>Smell jars (olfactory observation)</td>
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<td>Sensory table</td>
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<td>Light table</td>
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<td>Flashlights/lights</td>
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<td>Mirrors</td>
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<td>Magnets</td>
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<td>Prisms</td>
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<td>Textured items</td>
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PRISM Scoring Sheet (Science items: 5-6,14-16)

5. Materials for biological and non-biological science explorations

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- Observation tools
- Materials to observe, compare, or sort
- Materials encouraging exploration of cause and effect

6. Materials to support reading, writing, and representing science

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- Content covered
- Learning Center
- Books
- Additional materials

14. Science Explorations, Experiments, and Discussions

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Encouraging children to think scientifically:

15. Observing & Predicting

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Encouraging children to observe and predict:
16. Recording Science Information

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Encouraging children to record science information: