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Family and Center Childcare Providers: Correlates Among Mathematics Anxiety/Attitudes toward Mathematics, Teacher Self-Efficacy, and Other Factors

Shawnee M. Hendershot

FAMILY AND CENTER CHILDCARE PROVIDERS: CORRELATES BETWEEN MATHEMATICS ANXIETY/ATTITUDES TOWARD MATHEMATICS, TEACHER SELF-EFFICACY, AND OTHER FACTORS

by

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ABSTRACT

Family and Center Childcare Providers: Correlates Among

Mathematics Anxiety/Attitudes toward Mathematics,

Teacher Self-Efficacy, and Other Factors

by

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Previous experiences with mathematics, particularly negative ones, can influence an individual's attitudes toward mathematics. Children's first experiences with mathematics are often in their childcare settings. Elementary teachers appear to have more mathematics anxiety than other professionals, but the level of mathematics anxiety among childcare providers is not known. The presence of mathematics anxiety correlates with lower teacher self-efficacy or the teacher's belief of how effective he/she is in influencing a student's learning. Grounded in Bandura's theory of self-efficacy, this study examined the level of mathematics anxiety and teacher self-efficacy among 122 licensed Utah childcare providers in center and family home childcare. Providers responded to a survey assessing their attitudes about mathematics, feelings of teacher self-efficacy, frequency of developmentally appropriate mathematics and reading

activities in the childcare program, and demographic information. Descriptive statistics, correlations, and one-way ANOVAs were calculated. Results indicate that the participants reported more favorable than anxious attitudes toward mathematics as well as moderately high feelings of teacher self-efficacy. There were no statistically significant differences in mathematics anxiety or teacher self-efficacy by the type of childcare provided, provider's level of education, or years of experience. Results of the ANOVAs revealed that the best predictors of mathematics anxiety were provider attitudes toward reading/literacy as well as the number of developmentally appropriate mathematics and reading activities provided. As providers showed an increase in favorable attitudes toward reading/literacy, they also expressed less mathematics anxiety. This is the first study of its kind to assess these variables among childcare providers.

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PUBLIC ABSTRACT

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Shawnee M. Hendershot, Doctor of Philosophy

Previous experiences with mathematics, particularly negative ones, can influence an individual's attitudes toward mathematics. Children's first experiences with mathematics are often in their childcare settings. Elementary teachers have been shown to have more mathematics anxiety than other professionals, but the level of mathematics anxiety among childcare providers is not known. The presence of mathematics anxiety has been correlated with lower teacher self-efficacy or the teacher's belief if how effective he/she is in influencing a student's learning. Grounded in Bandura's theory of self-efficacy, this study examined the level of mathematics anxiety and teacher self-efficacy among 122 licensed Utah providers in center and family childcare. Providers responded to a survey reporting their attitudes about mathematics, feelings of teacher self-efficacy, frequency of developmentally appropriate mathematics and reading activities, as well as demographic information. Descriptive statistics, correlations, and one-way ANOVAs were calculated. Results indicate that the participants reported more favorable than anxious attitudes toward mathematics as well as moderately high feelings of teacher self-efficacy. There were no statistically significant differences in mathematics anxiety or teacher self-efficacy when participants were compared by the

type of childcare provided, level of education, or years of experience. Results of the ANOVAs revealed that the best predictors of mathematics anxiety were provider attitudes toward reading/literacy as well as the number of developmentally appropriate mathematics and reading activities provided. As providers showed an increase in favorable attitudes toward reading/literacy, they also expressed less mathematics anxiety. This is the first study of its kind to assess these variables among childcare providers.

DEDICATION

I would like to dedicate this dissertation to my amazing mother who has encouraged me every step on this very long journey. When I first approached her with the idea of attending graduate school, she was immediately supportive. She has lifted me, listened to me, prayed for me, and shared crucial words of advice with me. I appreciate her dedicated example of achieving educational goals. May I one day be as great of a woman and teacher as she.

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CHAPTER I

INTRODUCTION

In the United States, 77% of children ages 0-4 whose mothers are employed are taken care of in nonparental childcare arrangements while the mother is at work (Federal Interagency Forum on Child and Family Statistics, 2011). Children of this demographic are usually taken care of: (a) in center-based care (24.1%), (b) by grandparents (20.5%), (c) by family childcare providers (individuals providing childcare in their homes; 14%), (d) by other nonrelated individuals (13.1%), or (e) by other nonparental relatives (5.3%). In the state of Utah, 59% of mothers with preschool-age children work outside the home, with an average of 33 hours worked per week (Langston, 2010). Lower SES children are more likely to be enrolled in noncenter-based childcare, where the caregiver is less likely to hold an advanced degree.

When children are enrolled in childcare, they are often exposed to school readiness curricula that include mathematics concepts. Looking at the variety of cognitive factors that are measured at school entry, Duncan and colleagues (Duncan et al., 2007) found that the best predictors of later school achievement are the mathematics scores of children at the beginning of kindergarten. Children may have their first formal experiences with mathematics while enrolled in kindergarten or a preschool or childcare program, yet many early childhood teachers and childcare providers are anxious about teaching mathematics because they may be underprepared themselves in mathematics (Brady & Bowd, 2005; Harper & Daane, 1998; Tobias, 1980), or may have had negative

experiences with mathematics classes when they were in school (Brady & Bowd, 2005; Harper & Daane, 1998).

Theoretical Framework

This study is grounded in Bandura's theory of self-efficacy (1993, 1997). Teacher self-efficacy, in particular, is the teacher's belief of how they influence his/her students' learning as well as individual differences in effective teaching (Dembo & Gibson, 1985). Bandura posited that a teacher's ability to create a learning environment that is encouraging heavily depends on that teacher's talent as well as his/her feelings of teacher self-efficacy. An instructor who has high teacher self-efficacy is one who believes that all students, even difficult ones, are reachable and teachable and that as a teacher, they have the skills to reach and teach all students (Bandura, 1997). In contrast, an instructor who has low teacher self-efficacy believes that there is not much they can do to motivate difficult students' learning (Bandura, 1997).

Pertinent to this study is a teacher's sense of teacher self-efficacy relative to teaching mathematics. In Enochs, Smith, and Huinker's (2000) study, preservice teachers had statistically significant correlations between high mathematics anxiety and low teacher self-efficacy. These findings are of grave concern given the work of Martinez (1987), Kelly and Tomhave, (1985), and Tsui and Mazzocoo, (2006) who found that when teachers have high mathematics anxiety, his/her teaching practices begin to inhibit children's learning and can lead to negative attitudes toward mathematics.

What is Known?

There are several factors that influence a childcare provider's interactions with children and the type of quality present in a childcare program. Center-based childcare typically happens in larger facilities that include larger groups of similar-aged children (Essa, 2013) and often higher quality care (Kontos, 1992) although Essa found that more "intimate" and "homelike" interactions typically take place in family childcare programs (2013, p. 8). Another factor that influences quality and learning is the level of provider education. When a provider has higher levels of formal education and training, his/her programs have higher quality levels (Weaver, 2002). When programs have higher quality ratings, the children enrolled in these programs typically have higher cognitive skills (Austin, Blevins-Knabe, Ota, Rowe, & Lindauer, 2011).

Mathematics anxiety is a general dread of mathematics (Richardson & Woolfolk, 1980) where a person is nervous, uneasy, and fearful about engaging in mathematics activities (Morris & Liebert, 1970). Researchers have found that teachers typically have more anxiety about mathematics than other professionals (Hembree, 1990; Kelly & Tomhave, 1985), and it has been shown that a child often adopts attitudes about mathematics from his/her teachers (Aiken & Dreger, 1961), even when the child does not have the same experiences with mathematics as his/her teachers. Further, when an individual has mathematics anxiety, it is likely that his/her mathematics scores will suffer because of the anxiety (Meece, Wigfield, & Eccles, 1990; Wechsler, 1944). It is important to understand the components of mathematics anxiety and especially those factors leadings to its reduction.

A teacher's self-efficacy, or their sense that they can influence how a child learns, is a factor in mathematics anxiety (Gibson & Dembo, 1984). Mathematics anxiety and lower teacher self-efficacy often co-occur (Meece, Wigfield, & Eccles, 1990). When a teacher has had negative experiences with mathematics previously, they often suffer lower teacher self-efficacy related to mathematics and higher anxiety about mathematics. Teachers who have a low sense of teacher self-efficacy usually feel they do not have control over how they teach, often because they do not understand the subject or do not know how to teach it to young children. These feelings of inadequacy tend to co-occur with more punitive classroom management and teaching styles (Gibson & Dembo, 1984).

What is Not Known?

There are many studies measuring mathematics anxiety among preservice teachers (those who are preparing to become teachers) and in-service teachers (those who are teachers; see Gibson & Dembo, 1984; Meece et al., 1990) as well as other college students (see Hembree, 1990; Kelly & Tomhave, 1985), but mathematics anxiety among center- and family-based childcare providers has never been addressed. Specifically, it is not known whether the same factors that predict or co-occur with mathematics anxiety for teachers of older children are the same for childcare providers or if anxiety varies by type of care provided or other factors. Center and family childcare providers may not feel that teaching mathematics is part of their role as a childcare provider. Additionally, because they are often not required to have an educational degree they might not be prepared to use appropriate methods of teaching mathematics. Drawing from existing

literature (Meece et al., 1990), lower levels of training often co-occur with higher mathematics anxiety and lower teacher self-efficacy when teaching mathematics.

With these studies in mind, this research will add to the literature by extending the investigation of mathematics anxiety and teacher self-efficacy to center and family childcare providers by assessing the relationship between the constructs of mathematics anxiety and teacher self-efficacy while taking into account the variables of formal education, in-service training, measured by the provider's "Career Ladder" level, and providers' day-to-day practices of teaching mathematics concepts in their childcare program. As a comparison, the language and literacy concepts taught in the program will also be recorded. This study will help us begin to understand the early mathematics climate the young child is exposed to as compared with providers' mathematics anxiety, teacher self-efficacy, education, in-service trainings, and day-to-day practices for perhaps it is during the preschool years that a child begins to develop his/her specific attitudes toward mathematics (see Aiken & Dreger, 1961).

Purpose of the Study

This study had five main goals and objectives. The first goal was to assess childcare providers' attitudes about mathematics in general and teaching mathematics in particular. The second objective was to evaluate childcare providers' sense of teacher self-efficacy. The third was to determine if there were differences in mathematics anxiety and teacher self-efficacy based on type of care program, education, in-service training and experience. The fourth objective was to assess providers' use of the types of

mathematics and reading/literacy activities in their childcare programs compared with those concepts and activities recommended in Utah's Early Childhood Core Standards for Mathematics and Reading/Literacy (Menlove, 2013) and to compare those activities with providers' reported anxiety, self-efficacy, education, training, and type of care program. The final objective was to assess what teachers felt they needed in order to be more successful at teaching mathematics to young children.

Research Questions

Pursuant the study's goals, the following research questions guided this study:

1. What is the level of mathematics anxiety among childcare providers as measured on the following scales: (a) Mathematics Anxiety Scale-UK (MAS-UK; Hunt, Clark-Carter, & Sheffield, 2011); (b) Factors Influencing Mathematics Anxiety (FIMA; Harper & Daane, 1998); and (c) Attitudes toward Mathematics (ATM; LeFevre et al., 2009)?

1a. Do center and family care providers differ significantly in their mathematics anxiety?

1b. How does experience and education vary with mathematics anxiety among center and family care providers?

2. What is the level of teacher self-efficacy as measured on the following measures: (a) Schwarzer Teacher Self-Efficacy Scale (Schwarzer, Schmitz, & Daytner, 1999); and (b) Woolfolk and Hoy's Teacher Efficacy Scale (Woolfolk & Hoy, 1990)?

2a. Do center and family care providers significantly differ in their teacher self-efficacy?

2b. Does experience and education relate to teacher self-efficacy among center and family care providers?

3. How do the following variables relate to mathematics anxiety: (a) teacher self-efficacy, (b) frequency of providing developmentally appropriate mathematics activities in the childcare program, (c) frequency of providing developmentally appropriate reading/literacy activities, (d) years of experience, (e) provider education, (f) type of childcare, (g) career ladder level, and (h) professional training meetings in the last six months? As a control, how do the preceding variables associate with attitudes toward literacy?

4. What do childcare providers feel they need in order to become better mathematics teachers?

CHAPTER II

LITERATURE REVIEW

This chapter begins with a review of the literature on the need for childcare programs. Statistics for national and Utah childcare programs are included. Next is a review of the characteristics of the provider including provider education and type of childcare program and how they relate to child outcomes. This is followed by a section on mathematics anxiety, focusing on teacher mathematics anxiety and mathematics teaching anxiety. A short summary of literacy in childcare settings is then examined to allow a comparison between mathematics and literacy. Next is an examination of teacher self-efficacy and how it is correlated with mathematics anxiety. The chapter concludes with the research questions that guided this study.

Childcare in the United States

Parents in the labor force are faced with the challenge of choosing appropriate childcare for their children. According to a recent nationally representative report, 61.3% of children ages birth through 4 years are in some type of childcare (Laughlin, 2013). Of those children, about half are taken care of by another family member. When that option is not available or desirable, they often turn to organized childcare programs/facilities, or nonrelative childcare (32.9%; Laughlin, 2013). Nationally, the organized childcare in which most children are enrolled is a childcare center (23.5%) followed by a nursery/preschool (6%) or a Head Start/other federally funded school program (5.6%). Another nonparental care option is a nonrelated individual watching the child in child's

home (3.7%) or in a family childcare program in the provider's own home (7.6%; Laughlin, 2013).

Many factors influence the type of care a parent chooses for his/her child such as price, location, and availability. Children in families who fall below the poverty level typically have multiple arrangements (25.7%; Laughlin, 2013) rather than being enrolled in only one type of care. Children in families at or above the poverty level also are more likely to have multiple childcare arrangements (27.4%). When enrolled in nonparental childcare, both children below and at/above the poverty line tend to be enrolled in childcare centers (16.1% and 23.5% respectively). Children living at or above poverty level are more likely to enroll in nursery/preschool (8.9%) than children living below the poverty level (3.4%; Laughlin, 2013).

Maternal employment status effects how much time a child spends in nonparental care. Eighty-eight percent of children aged birth through 4 whose mother was employed had at least one childcare arrangement on a regular basis (Laughlin, 2013). On average, these children spent 36 hours per week in nonparental care. Of the children of nonemployed mothers, 28% spent time in childcare on a regular basis. These children spent an average of 21 hours per week in nonparental care (Laughlin, 2013).

Program fees/tuition depend on the type of care and age of the child. Center-based care tends be more expensive, averaging yearly costs between $1,104 and $8,919 for before/after school care, $3,997 and $12,781 for a 4-year-old child, and $48,221 and $17,062 for an infant (Childcare Aware and Utah, 2015). For an infant of a two-parent family, yearly tuition in a center costs between 7-15% of the family income. For an

infant of a single parent, tuition is about 24-63% of his/her income. Family childcare's yearly average fees between $1,846 and $8,346 for before/after school, $3,675 and $10,030 for a 4-year-old, and $3,927 and $10,666 for an infant.

In the United States, there are close to 600,000 childcare providers (Childcare Aware and Utah, 2015). Their average yearly income is $21,710. In 2013, over 240,000 providers attended a training session provided through their local Childcare Resource and Referral office. Around 22,000 childcare programs also receive some kind of technical assistance.

Childcare in Utah

In Utah, there over 257,000 children ages birth through 4 (Childcare Aware and Utah, 2015). It is estimated that 153,615 children younger than 6 need some kind of childcare. As with national childcare, there are two main types of licensed nonparental childcare in Utah: (a) center-based childcare where children attend a facility, and (b) family childcare programs where the children are cared for in the provider's home. There are 284 licensed childcare centers, 875 licensed family childcare programs, and 405 other programs (e.g., school-age care). There are 39,282 spaces available for enrollment in licensed childcare programs, with 66% being in centers, 26% in family childcare programs, and 8% in some other kind of program (Childcare Aware and Utah, 2015).

Program fees/tuition in Utah also depend on the type of care and age of the child. Center-based care in Utah also tends be more expensive, averaging a yearly fee of $6,012 for before/after school care, $6,012 for a 4-year-old child, and $8,641 for an infant (Childcare Aware and Utah, 2015). For an infant of a married two-parent family, yearly

tuition in a center is about 12% of the family income. For an infant of a single mother, childcare costs are about 32% of her income. Family childcare's yearly average fee is $5,388 for before/after school, $5,724 for a 4-year-old, and $6,492 for an infant (Childcare Aware and Utah, 2015).

There are 5,640 childcare providers in Utah with their yearly average full-time income being $21,500 (Childcare Aware and Utah, 2015). During 2014, Utah's Childcare Resource and Referral offices offered 1,982 training sessions, with 3,203 providers taking part in the trainings. Over 300 childcare programs received some kind of technical assistance.

Childcare Provider Characteristics

Previous researchers found that there are several structural factors that influence a provider's interactions with children and the quality of the care provided (e.g., Essa, 2013; Kontos, Hsu, & Dunn, 1994; Weaver, 2002). These factors also impact children's outcomes. One factor is the type of the childcare program the child attends. Generally, family childcare takes place in the provider's home, where children of all ages are grouped together throughout the day yielding a more "intimate" and "homelike" atmosphere (Essa, 2013, p. 8). Center-based childcare is typically held in a larger facility with bigger groups of same-aged children (Essa, 2013). In center childcare, a child typically does not interact with children outside of his/her age group except perhaps during outdoor play.

Provider education level and attendance at ongoing informal trainings also relates to the quality of care a child receives. In a study by Weaver (2002), family childcare

providers were assessed on their education and how it impacted the quality of the care they provided. Sixty-five licensed family childcare providers were asked about their education and accumulated childcare training requirements. The researcher also assessed global quality of childcare via the Family Day Care Rating Scale (FDCRS: Harms & Clifford, 1989). Weaver found that the "factors in providers' lives that uniquely contributed to higher levels of quality care were higher levels of formal education and training [and] college coursework in ECE…" (2002, p. 265). Specifically, providers who had a Child Development Associate Credential (CDA) or worked in an accredited program provided considerably better quality care (Weaver 2002). Weaver referenced Carter and Curtis (1994) who suggest that these types of educational experiences may help a provider develop realistic expectations for children as well as how to create quality settings that nurture intellectual growth. In Utah the education level and in-service trainings a provider attends allow them to "climb" Utah's career ladder. Providers are offered the opportunity to attend professional development classes in order to "increase the quality of childcare" (Childcare Professional Development Institute, 2016, p. 4). Ladder levels range from 1 to 10 with higher levels requiring more training. Incentives are provided for providers to move up the career ladder.

Quality childcare has long been recognized as an important component in children's overall development. In a seminal study by Kontos and colleagues (1994), 117 children between 30 and 60 months of age were assessed on their cognitive and social skills and were compared based on the types of care they were enrolled in, family (30 providers) or center-based care (30 providers). Program quality was assessed using

the Early Childhood Rating Environment Scale (ECERS: Harms & Clifford, 1989) for centers and the FDCRS for family childcare (Harms & Clifford, 1989). Family providers, in comparison to center providers, scored lower on providing developmentally appropriate activities as well as on overall quality of care provided. In addition, center providers were more likely to have "specialized training in child development or childcare" (Kontos et al., 1994, p. 398). Kontos et al. found that the center-based programs provided more complex cognitive and social play. The amount of such play was also positively correlated with caregivers' specialized training.

Votruba-Drzal, Coley, Koury, and Miller (2013) used data from the Early Childhood Longitudinal Study, Birth Cohort (N = 6,350; Flanagan & West, 2004) whose sample included children who were born in the United States in 2001. Researchers assessed whether children from center care, family care, or parental care scored higher on various cognitive abilities at age 5. Children who were enrolled in center-based programs for preschool scored higher on the mathematics and reading skills than children who were in home-based or parental care. Using the same sample, a similar study (Votruba-Drzal, Coley, Collins, & Miller, 2015) was conducted on the implications of center-based preschool for children of immigrants. The results were comparable in that children who were enrolled for center-based preschool had higher reading and mathematics scores, especially compared to children who were being taken care of by their parents.

A study by Austin and colleagues (2011) assessed 109 children on letter awareness, receptive language, and mathematics knowledge. Comparisons of children's scores were done by type of care, family or center. Children in center care had higher

scores on both letter awareness and mathematics knowledge than children in family childcare programs and scored lower on overall school readiness assessments. Esplin and colleagues (Esplin et al., in press) assessed 89 children from center-based (n = 55) and family-based (n = 34) on several cognitive skills including their mathematics knowledge and number line performance. Children enrolled in center-based care had higher scores on number line skills, early mathematics skills, phonological awareness, verbal working memory, and executive functioning. Thus it appears that in the United States, children in family childcare may come to childcare with a lower overall skill level and/or be exposed to lower quality experiences while in care than center-based children. It is important to note, however, that studies involving children in family childcare are particularly sparse so these findings may not be indicative of all family childcare programs, especially those in different parts of the United States or other countries.

General Mathematics Anxiety

The concept of mathematics anxiety originates from the general theme of test anxiety (see Hembree, 1990) and is usually expressed in specific situations (Baloglu, 1999). Brush (1981), in particular, indicates that mathematics anxiety is another form of test anxiety. Richardson and Woolfolk (1980) go further in defining mathematics anxiety to include a general dread of mathematics and specifically of testing. Bessant (1995) states that mathematics anxiety is a combination of "debilitating test stress, low self-confidence, fear of failure, and negative attitudes toward mathematics learning" (p. 327). Symptoms of mathematics anxiety include: (a) avoiding mathematics instruction, (b)

becoming distressed when performing mathematics tasks, and (c) achieving poor test results (Brady & Bowd, 2005). Aiken and Dreger (1961), some of the first researchers to assess mathematics anxiety, describe it as a prominent fear "in the presence of arithmetic and mathematics, and other negative attitudes toward mathematics" (p. 19).

Mathematics anxiety can begin as early as prekindergarten (Arnold, Fisher, Doctoroff, & Dobbs, 2002) and is more prevalent among females (Adeyemi, 2015; Betz, 1978; Haynes, Mullins, & Stein, 2004; Hembree, 1990; Ho et al., 2000; Hunt et al., 2011). During the years of formal schooling, researchers have found that mathematics anxiety may be affected by the lack of constructive learning activities to which the child is exposed (Finlayson, 2014; Geist, 2010). Rather than allowing children to learn mathematics through their own construction, teachers often begin to impose other methods of getting the correct answers that aren't meaningful to individual children (Kelly & Tomhave, 1985).

The most probable reason for anxiety toward mathematics is from previous experiences while learning mathematics (Brady & Bowd, 2005; Harper & Daane, 1999; Tobias, 1980) where teachers and parents already have mathematics attitudes, sometimes negative, that are then often adopted by students (Aiken & Dreger, 1961). According to Cornell (1999), teacher malpractices might also influence student mathematics anxiety such as: (a) overemphasis on rote memorization; (b) assumption on the part of the teacher that certain mathematics concepts are easily understood and do not need much explanation; (c) not explaining unique terminology; or (d) not applying mathematics to real world situations. When teaching mathematics, teachers frequently use the following:

(a) repetition and speed (Kelly & Tomhave, 1985; Tsui & Mazzocco, 2006); (b) ambiguous vocabulary (Kelly & Tomhave, 1985); (c) difficult word problems (Kelly & Tomhave, 1985); and (d) a focus on the right answers alone rather than a correct procedure (Kelly & Tomhave, 1985), all practices that appear to inhibit children's natural learning processes and lead, in some cases, to adverse opinions toward mathematics (Kelly & Tomhave, 1985; Tsui & Mazzocco, 2006).

Aiken and Dreger (1961) tested the hypothesis that mathematics attitudes would affect student achievement by assessing reports from 310 college students about their attitudes toward mathematics. The researchers found that mathematics attitudes for females were highly predictive of mathematics achievement, but not as much for males. As part of their study, Aiken and Dreger also assessed what students thought their parents' and previous mathematics teachers' attitudes were toward mathematics. The researchers reported strong positive correlations between the student and parent/teacher mathematics attitudes, indicating that parents' and teachers' opinions about mathematics influences students' attitudes about mathematics. And, as stated previously, student attitudes toward mathematics influences their mathematics achievement, especially for girls.

In an earlier study, Dreger and Aiken (1957) assessed 704 college students who were enrolled in basic mathematics classes. The Taylor Scale of Manifest Anxiety (Taylor, 1953) was administered to the students at the end of a class where a graded mathematics exam was returned to them. Students were assessed on both the construct of number anxiety and on general anxiety. Number anxiety was present in 35% of the

students (n = 239). Ten randomly selected students from the following subcategories were chosen to take a portion of the Wechsler-Bellevue Intelligence Scale (Wechsler, 1944): (a) students high in general and number anxiety; (b) students high in general anxiety but low in number anxiety; (c) students high in number anxiety but low in general anxiety; and (d) students low in both general and number anxiety. Dreger and Aiken found that students anxious about numbers performed at a lower level on mathematics tests than students of equal IQ.

In a meta-analysis of 151 research studies (49 journal articles, 23 ERIC documents, 75 doctoral dissertations, and 4 reports from other sources), Hembree (1990) confirmed that mathematics anxiety affected student performance. Students who had high anxiety toward mathematics were less likely to take mathematics courses in high school and college. Additionally, students with mathematics anxiety often had lower levels of achievement on standardized assessments and mathematics courses (Meece et al., 1990).

Teachers with Mathematics Anxiety

In his analysis, Hembree (1990) compared mathematics anxiety across college majors. The highest mathematics anxiety was reported consistently among those planning to become school teachers (preservice teachers), particularly those planning to teach elementary school. Kelly and Tomhave (1985) purposely surveyed groups they thought would have "math avoiders" (p. 51). These groups included freshmen who had not taken a preparatory mathematics course (n = 12), freshmen who were in a college algebra class (n = 14), seniors who had not taken a mathematics course (n = 15), and

students who were enrolled in a workshop about mathematics anxiety (n = 10). Kelly and Tomhave also included a group of elementary education majors (n = 43) with only six of them having taken a mathematics class beyond the required college algebra. All of the students (N = 94) were given the Mathematics Anxiety Rating Scale (Richardson & Suinn, 1972) with the result that female elementary education majors had the highest mathematics anxiety.

A reoccurring message in extant literature is that the teaching environment is one of the most important elements in students' learning of mathematics. Martinez (1987) found that teachers' anxiousness toward mathematics was more detrimental to student learning than any other factor in the educational system. Hembree (1990) found that when students were highly anxious about mathematics, they reported their parents and teachers as "somewhat negative toward mathematics" (p. 38). Mizala, Martinez, and Martinez (2015) found that preservice elementary school teachers' mathematics anxiety negatively influenced their expectations and beliefs about their students. Further, Midgley, Feldlaufer, and Eccles (1989) wrote that teachers are the most crucial part of the classroom environment, influencing student motivation and achievement through observable behavior and understated forms of communication. Midgley et al. (1989) found that teacher beliefs about personal self-efficacy related significantly to students' motivation and achievement. In fact, Cruikshank and Sheffield (1992) stated that young children do not actually suffer from mathematics anxiety. Rather, the anxiety occurs because young children are taught mathematics through inappropriate teaching practices.

Teachers' attitudes about mathematics appear very early in a teacher's career. According to Lester (1984), many preservice teachers (students being trained to be teachers) have a weak understanding of mathematics that is exacerbated by negative attitudes and anxiety. In Hembree's analysis (1990) of the connections between mathematics anxiety and mathematics performance, he found that students' mathematics anxiety was negatively related to their mathematics scores. As mentioned previously, females report disproportionately more mathematics anxiety than males (see Adeyemi, 2015; Betz, 1978; Flessati & Jamieson, 1991; Hembree, 1990; Kelly & Tomhave, 1985; Maloney, Waechter, Risko, & Fugelsang, 2012; Tobias, 1980). Beilock, Gunderson, Ramierez, and Levine (2010) found that female students in particular are highly influenced by their female teachers' mathematics anxiety.

Harper and Daane (1998) assessed 53 elementary preservice teachers using the Factors Influencing Mathematics Anxiety (FIMA; Harper & Daane, 1998) and the Mathematics Anxiety Rating Scale (MARS; Richardson & Suinn, 1972) prior to a mathematics methods course. The FIMA is an assessment based on mathematics anxiety literature consisting of a checklist related to mathematics experiences both outside and inside the classroom. The MARS is a measure that measures mathematics anxiety "to provide a measure of anxiety associated with the single area of the manipulation of numbers and the use of mathematical concepts" (Richardson & Suinn, 1972, p. 551). It has also been used to assess mathematics anxiety before and after behavior therapy for said anxiety. When Harper and Daane analyzed the results of the FIMA and MARS, preservice teachers indicated that previous experiences in mathematics had a negative

impact on their mathematics anxiety. Preservice teachers reported that the following increased mathematics anxiety: (a) word problems (75% of students), (b) the emphasis on the right answers and the right method used when doing math (60%), (c) frustration with the time it took to do word problems (60%), and (d) fear of making mistakes (60%). Multiplication and long division caused the most mathematics anxiety in elementary school with geometry creating the most anxiety in high school.

Mizala and colleagues (2015) studied mathematics anxiety in 208 preservice elementary school teachers in Chile. In additional to being assessed on their mathematics anxiety, they were also asked for their expectations about their students' general achievement in mathematics and their perceptions of students' need for academic support including special education. Teachers who had higher mathematics anxiety, had lower mathematics achievement expectations for their students, particularly for their female students. The presence of mathematics anxiety also negatively influenced the preservice teachers' expectations in general academic achievement for females.

Although there are few studies assessing pre-K teachers' mathematics anxiety, it is well known that, relative to the gender differences reported above, most pre-K teachers are female. Further, the pre-K years lay the foundation for later mathematics achievement in elementary school and beyond (Austin, Blevins-Knabe, & Lokteff, 2013; Austin et al., 2011). It is critical to a variety of interests to understand the attitudes pre-K teachers have about mathematics. In this vein, Bates, Latham, and Kim (2013) assessed 89 early childhood (birth through 3rd grade) preservice teachers about their fears of teaching mathematics. Participants were asked questions about their greatest fears in

teaching mathematics and why they felt that way. Researchers found that 41.1% had some fear about their teaching ability, 32% had fears about students not succeeding, and 25% had fears about mathematics content.

Another study of 100 preservice preschool teachers (Aslan, 2013) compared their mathematics anxiety to 50 in-service preschool teachers ($N = 150$), or those already teaching preschool. Aslan used the Math Anxiety Scale-Revised (Bai, 2010) that has 14 questions about mathematics anxiety. The researcher found that in-service preschool teachers had more mathematics anxiety than preservice teachers. When looking at participant characteristics, in-service teachers had taken fewer high school mathematics courses than preservice teachers, which could have influenced their scores.

As mentioned previously, a teacher's mathematics anxiety can negatively influence a student's feelings about mathematics. Hembree (1990) found that when students have positive attitudes about mathematics, they have lower mathematics anxiety and more "self-confidence in the subject" (p. 38). To decrease the chance of a student adopting a teacher's mathematics anxiety, Cruikshank and Sheffield (1992) suggested that teachers should do the following when teaching mathematics: (a) show that they like mathematics; (b) make the subject pleasurable; (c) alter their curriculum to include students' interests; (d) show the use of mathematics in occupations and everyday circumstances; (e) offer activities in which students can be successful; (f) establish short-term, achievable objectives; and (g) use meaningful and applicable techniques of teaching so that mathematics makes sense. If these seven practices are used when teaching

mathematics, Cruikshank and Sheffield assert students will show less anxiety while learning mathematics.

Mathematics Teaching Anxiety

A study by Levine (1993) assessed a type of mathematics anxiety called anxiety for teaching mathematics, or mathematics teaching anxiety. This construct is related to mathematics anxiety but focuses on a teacher's "anxiety about their ability to *teach* mathematics" (Brown, Westenskow, & Moyer-Packenham, 2011, p. 2). For Levine's study (1993), 28 preservice elementary teachers were assessed on their expected mathematics teaching style, how they were taught mathematics in school, and their anxiety for teaching mathematics before and after taking a mathematics methods course. At the beginning of the course, Levine found that preservice elementary teachers typically planned to teach mathematics in the same why they were taught. The majority (17 of 28) of the preservice teachers indicated they planned to use a teacher-oriented style that used whole-class methods (e.g., teachers imposing methods of getting correct answers). These participants tended to have higher levels of anxiety for teaching mathematics. On the other hand, those who planned to use a student-oriented style indicated lower levels of anxiety for teaching mathematics. At the end of the course, four still planned to use teacher-oriented styles. Those that changed from teacher- to student-oriented styles had the greatest decrease in anxiety for teaching mathematics.

Adeyemi (2015) evaluated mathematics anxiety among 111 elementary preservice teachers via the Mathematics Anxiety Rating Scale (MARS; Richardson & Suinn, 1972). Also measured was the type of mathematics teaching anxiety the teachers experienced

(e.g., subject knowledge, teaching knowledge, self-confidence) via the Mathematics Teaching Anxiety Survey (MATAS; Peker, 2006). The majority of the participants (64%) had a moderate level of mathematics anxiety, 18.9% had high levels, and 17.1% had low levels. As found in other studies, females (78.4% of the sample) had higher mathematics anxiety than males. There was a statistically significant correlation ($r = .72$, $p < .01$) between mathematics anxiety and mathematics teaching anxiety indicating that as the participants had higher mathematics anxiety, they had higher anxiety about teaching mathematics.

Haciomeroglu (2014) measured 260 preservice elementary school teachers from Turkey on their mathematics anxiety via the Mathematics Anxiety Rating Scale-Short Version (MARS-SV; Suinn & Winston, 2003) and mathematics teaching anxiety via the MATAS (Peker, 2006). Overall, the participants reported low levels of mathematics anxiety and mathematics teaching anxiety. In Turkey, students wanting to enroll in elementary teacher education programs need to score high in mathematics on their entrance exams. The author stated that this could be the reason that the study's participants had lower scores than similar studies in other countries.

Brown et al. (2011) asked 53 preservice elementary teachers to write reflections about their prior mathematics experiences and their teaching mathematics experiences. The authors examined the assumption that previous mathematics anxiety leads to mathematics teaching anxiety. Results showed prior to the written reflection, 39.6% showed no previous mathematics anxiety and no mathematics teaching anxiety; 18.9% of the sample indicated having high mathematics anxiety but no mathematics teaching

anxiety; 17% showed no prior mathematics anxiety but showed mathematics teaching anxiety; and 20.8% exhibited prior mathematics anxiety and current mathematics teaching anxiety. The authors stated that based on these results, the relationship between mathematics anxiety and mathematics teaching anxiety is "not always the same for all preservice teachers, and in fact, is difficult to predict" (Brown et al., 2011, p. 11). It appears that when teachers experience mathematics teaching anxiety, it is not always correlated to their previous mathematics anxiety.

Literacy in Early Childhood Care Settings

When Blevins-Knabe and Musun-Miller (1996) asked childcare providers about the importance of topics to teach, they indicated that it is more important for children to develop reading and language skills than to develop mathematics skills. Researchers suggest that there is a connection between learning reading and language skills and mathematics skills (e.g., Austin et al., 2011; Purpura & Napoli, 2015). John-Steiner and Mahn (1996) used Vygotsky's theory to propose that signs and symbols, such as language, play a role in helping children understand other cultural tools, such as writing and counting. Austin et al. (2011) tested this theory by assessing 109 children on receptive language, letter awareness (LA), and mathematics knowledge and assessing whether or not letter awareness mediated receptive language and mathematics knowledge. The researchers suggested that the link between language and mathematics "would make sense since both tasks, early LA and early mathematics skills, rely on children's ability to use and manipulate symbols for concepts" (Austin et al., 2011, p.

1183). The researchers ran several models using receptive language as the independent variable and mathematics skills as the dependent variable and found that letter awareness fully mediated the relationship between the two variables. Similarly, Purpura and Napoli (2015) assessed 180 preschool children on print knowledge, vocabulary, informal numeracy, and numeral knowledge and found that "the relation between language and numeral knowledge is fully mediated by informal numeracy skills and the relation between informal numeracy skills and numeral knowledge skills is partially mediated by print knowledge" (Purpura & Napoli, 2015, p. 197).

Teacher Self-Efficacy

Dembo and Gibson (1985) define a teacher's sense of efficacy as the degree to which a teacher believes he/she can influence students' learning. It is also the variable that appears to account for much of the individual differences in effective teaching (Gibson & Dembo, 1984). Meece and colleagues (1990) state that when someone has previous academic failures, those failures often produce anxiety because of one's perceived lack of self-efficacy. Bandura (1993) felt that when uncertainty is present while teaching, the teacher is very unsettled. When an individual has low teacher self-efficacy, he/she is unprepared, uncertain, and uninformed about how to deal easily with unexpected occurrences. This can lead to anxiety, apathy, or despair (Bandura, 1993). On the other hand, when a person has high teacher self-efficacy, one is better prepared and adapts to unknowns easier. The individual is more in control of potential outcomes and is able to prevent unwanted ones. "The more people bring their influence to bear on

events in their lives, the more they can shape them to their liking" (Bandura, 1993, p. 2). These attitudes influence teachers' self-efficacy in the classroom environment. Bandura (1997) stated that a teacher's unique responsibility to create a learning environment conducive to learning relies on the teacher's talent as well as his/her feelings of teacher self-efficacy.

When a teacher has a high sense of teacher self-efficacy, he/she believes that all students are reachable and teachable, even the more difficult students (Bandura 1997). All that is required on the teacher's part is extra effort and appropriate teaching techniques. Teachers who have a low sense of teacher self-efficacy believe that when it comes to difficult students, there is not much they can do to motivate a student to learn (Bandura, 1997).

In Gibson and Dembo's (1984) study, 208 elementary school teachers were sampled about their opinions regarding their own teacher self-efficacy using their 30-item Teacher Efficacy Scale. The researchers then divided the group into a subsample of high self-efficacy teachers ($n = 4$) and low self-efficacy teachers ($n = 4$). The teachers were observed to examine academic and nonacademic activities and teachers' feedback practices. Gibson and Dembo found that teachers with high and low teacher self-efficacy were very different from each other. Those with high teacher self-efficacy were more likely than teachers with low teacher self-efficacy to use whole class instruction, less likely to use small group instruction, and spent more time checking and reviewing student work throughout the day. When teachers had a high sense of teacher self-efficacy, they spent more time in preparation activities and dedicated more time in the classroom to

academic activities throughout the day. Teachers with low teacher self-efficacy used more criticism when children gave incorrect answers. They continued teaching even when a child was having difficulty rather than taking time out for coaching the student along until the student got the correct answer. High self-efficacy teachers did not use criticism and were more persistent in coaching to help the student get the correct answer. Several researchers (see Barfield & Burlingame, 1974; Woolfolk, Rosoff, & Hoy, 1990) propose that teachers with low teacher self-efficacy may see control over students (i.e., using criticism) as a way to cope with their environmental demands.

Bandura (1997) noted that during the early years of education children form important conceptions about their own intellectual skills. According to Bandura, children's self-efficacy beliefs are influenced by three things: (a) mastery of and personal interpretation of mastery in various subjects, (b) frequent social comparisons with their peers' abilities, and (c) education expectations and evaluations offered by teachers. The way a teacher views his/her own teacher self-efficacy will most likely influence how a child views his or her own abilities (Bandura, 1997). One's teacher self-efficacy can also influence children's academic outcomes. Ashton and Webb (1986) observed veteran teachers who taught a basic skills course for individuals who had severe learning issues. Beliefs that teachers have about their teacher self-efficacy accurately predicted their students' achievement over the course of the school year. Students in classrooms with teachers who had high teacher self-efficacy learned more than students in the other classrooms. In addition, teachers with high teacher self-efficacy indicated that their

students, even the difficult ones, were teachable and reachable through ingenuity and extra effort.

Mathematics Anxiety and Self-Efficacy in Teaching Mathematics

Previous researchers found correlations between mathematics anxiety and feelings of teacher self-efficacy in teaching mathematics (e.g., Mizala et al., 2015). Gresham (2008) surveyed 156 elementary preservice teachers on their mathematics anxiety via the Mathematics Anxiety Rating Scale (MARS; Richardson & Suinn, 1972) and their sense of teacher self-efficacy with teaching mathematics via the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI; Enochs et al., 2000). The correlation between mathematics anxiety and teacher self-efficacy was significant ($r = -.475$, $p < .05$) indicating that those who had the lowest mathematics anxiety had the highest levels of mathematics teacher self-efficacy (Gresham, 2008). During interviews, the preservice elementary teachers also indicated a correlation between high mathematics anxiety and feelings of low mathematics teacher self-efficacy.

Swars, Daane, and Giesen (2006) investigated the relationship between mathematics anxiety and mathematics teacher self-efficacy among 28 preservice elementary school teachers. The participants were assessed on their mathematics anxiety via the Mathematics Anxiety Rating Scale (MARS; Richardson & Suinn, 1972) and their teacher self-efficacy via the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI; Enochs et al., 2000). Participants were also interviewed and asked more in-depth questions about their perceptions of their abilities and their mathematics teacher self-

efficacy. The researchers found that when the participants had higher mathematics teacher self-efficacy, they had lower mathematics anxiety. "The results of this study seem to suggest that mathematics anxiety, in general, has a negative relationship with a preservice teacher's belief in his or her skills and abilities to be an effective mathematics teacher" (Swars et al., p. 312)

Thirty-one Head Start Teachers (Geist, 2015) were asked to complete an open-ended survey about their comfort level with teaching mathematics and about how they taught mathematics. Questions included items such as how they felt while doing mathematics, what they liked/disliked about mathematics, and why they felt mathematics was important to learn during early childhood. Results from this study were similar to others in that teachers who reported more mathematics anxiety had less confidence in their abilities to teach mathematics (Geist, 2015). Teachers who felt they knew more about mathematics were more confident in their abilities and tended to like mathematics more. Also, if a teacher indicated more confidence in their abilities, it was more important for them to include mathematics in the classroom. They were also more likely to include plans to teach mathematics to children in developmentally appropriate ways.

Hadfield and Lillibridge (1991) provided a six-day summer workshop for 39 elementary school teachers. The workshop focused specifically on hands-on activities and improving attitudes toward teaching mathematics and science. Each day was spent in 60- to 90-minute meetings to gain experience with the manipulatives, and then in an additional two-hour session demonstrating and practicing teaching with the finished products. Teachers were assessed pre and postworkshop. They were asked about their

knowledge of mathematics manipulative use, confidence in mathematics, and attitudes toward mathematics (mathematics anxiety). Paired *t* tests were calculated to compare pre and postworkshop scores. There were significant increases in mathematics knowledge (pretest $M = 4.41$; posttest $M = 22.21$; $p < .001$) and confidence (pretest $M = 46.16$; posttest $M = 65.31$; $p < .001$) and a significant decrease in mathematics anxiety (pretest $M = 92.79$; posttest $M = 74.05$; $p < .0001$). When comparing the means of other characteristics, Hadfield and Lillibridge (1991) discovered that teachers from small schools (less than 250 students) had significantly higher mathematics anxiety ($M = 50.39$) than teachers from larger schools ($M = 40.13$). The researchers alleged this could be from the probable isolation felt when teaching at a smaller school, which might lead to a lack of confidence.

Following Bandura's (1993, 1997) reasoning, one way to support pre-K teachers' mathematics self-efficacy would be to help teachers become more knowledgeable in mathematics content areas and more systematic in matching activities with specific mathematics skill levels. Another way to support them might be to decrease their isolation, which could be especially challenging for home providers.

Mathematical Knowledge for Teaching (MKT)

Teachers have the responsibility to understand their subject well enough to teach it. Ball (1988) argues that the knowledge teachers have about mathematics as well as their "assumptions and explicit beliefs about teaching and learning…shape the ways in which they teach mathematics to students" (Ball, 1988, p. 6) and how effective their teaching is. Hill and Ball (2009) also state that the content knowledge that teachers need

to know is different than those working as mathematicians. Teachers need to understand how to teach mathematical concepts. When teachers have both the content knowledge (Subject Matter Knowledge) and the instructional knowledge (Pedagogical Content Knowledge), they then have mathematical knowledge for teaching (MKT; Hill & Ball, 2009). "Mathematical knowledge for teaching involves the ability to explain difficult mathematical concepts in multiple ways, and to describe the intuition behind mathematical reasoning instead of focusing exclusively on algorithms and procedures" (Rockoff, Jacob, Kane & Staiger, 2008, p. 7).

In a study by Rockoff and colleagues (2008), 418 new mathematics teachers in New York City were surveyed about their content knowledge, cognitive abilities, personality characteristics, and feelings of teacher self-efficacy. The outcomes measured were student achievement on standardized mathematics tests and teacher performance ratings. Student outcomes were significantly predicted by the teachers' MKT. Hill, Rowan, and Ball (2005) studied 334 first-grade and 365 third-grade teachers on the mathematics knowledge teachers used in classrooms rather than their general mathematics knowledge. The researchers also assessed the students' outcomes (1,190 first-grader and 1,773 third-graders, $N = 2{,}963$). "Twelve percent of teachers reported never having taken a mathematics content or methods course, 15% reported taking between one and three such courses, and 27% reported taking between two and six courses" (Hill et al., 2005, p. 391). The number of content courses taken did not affect student outcomes, but MKT significantly predicted student gains in both first- and third-

grade. The researchers found that MKT plays a role in students' learning even basic mathematics concepts.

The Utah core curriculum for preschool mathematics (Menlove, 2013) was designed to give childcare providers, preschool teachers, and parents the scope and sequence of mathematics concepts necessary for preschool mathematics development as well as to provide ideas for developmentally appropriate activities matched with specific content. In the current study childcare providers were asked about their mathematics teaching practices relative to the Utah core curriculum to gain a preliminary understanding of their MKT relative to preschoolers. In order to get a measure of provider preparation and knowledge, data were gathered on provider's level of formal education, the training hours they had accomplished over the past year, and their career ladder level. As noted in Chapter 1, career ladder level is dependent on a provider's formal education and the additional in-service training hours completed each year as required by the Utah Office of Childcare.

Summary

This chapter provided an overview of childcare in the U.S. and Utah, mathematics anxiety and teaching mathematics anxiety, and teacher self-efficacy. Early negative experiences with mathematics are shown to increase the likelihood of mathematics anxiety and mathematics anxiety appears to influence student achievement negatively. For the populations studied, mathematics anxiety tends to be higher for women and elementary education majors (preservice elementary teachers). No one has studied

childcare providers' and preschool teachers' mathematics anxiety, creating a serious gap in our understanding of the earliest years of children's mathematics development. Teacher self-efficacy is the belief that teachers have about how they can influence student learning. When there is a lack of teacher self-efficacy, teachers show more anxiety and are less adaptive in their behaviors. When teachers report high teacher self-efficacy, their students have higher achievement.

Based on this information, the following questions will guide the research:

1. What is the level of mathematics anxiety among childcare providers as measured on the following scales: (a) Mathematics Anxiety Scale-UK (MAS-UK; Hunt et al., 2011); (b) Factors Influencing Mathematics Anxiety (FIMA; Harper & Daane, 1998); and (c) Attitudes toward Mathematics (ATM; LeFevre et al., 2009)?

1a. Do center and family care providers differ significantly in their mathematics anxiety?

1b. How does experience and education vary with mathematics anxiety among center and family care providers?

2. What is the level of teacher self-efficacy as measured on the following measures: (a) Schwarzer Teacher Self-Efficacy Scale (Schwarzer et al., 1999); and (b) Woolfolk and Hoy's Teacher Efficacy Scale (Woolfolk & Hoy, 1990)?

2a. Do center and family care providers significantly differ in their teacher self-efficacy?

2b. Does experience and education relate to teacher self-efficacy among center and family care providers?

3. How do the following variables relate to mathematics anxiety: (a) teacher self-efficacy, (b) frequency of providing developmentally appropriate mathematics activities in the childcare program, (c) frequency of providing developmentally appropriate reading/literacy activities, (d) years of experience, (e) provider education, (f) type of childcare, (g) career ladder level, and (h) professional training meetings in the last six months? As a control how do the preceding variables associate with attitudes toward literacy?

4. What do childcare providers feel they need in order to become better mathematics teachers?

CHAPTER III

METHOD

This chapter includes the research methodology used in this study. It begins with a description of the specific objectives of the study and the recruitment methods. Next is the description of instruments used and the data collection process. The research questions are then presented. Finally, data analyses are described by research question followed by the incentives given for participation.

Objectives and Goals

The overall objective of the study was five-fold. The first goal was to assess childcare providers' attitudes about mathematics in general and teaching mathematics in particular. The second objective was to evaluate childcare providers' sense of teacher self-efficacy. Third was to distinguish if there were differences in mathematics anxiety and teacher self-efficacy based on provider type, education, and experience. The fourth objective was to measure providers' use of the types of mathematics and reading/literacy activities in their childcare programs based on Utah's Early Childhood Core Standards for Mathematics and Reading/Literacy (Menlove, 2013). A fifth objective was to determine what the providers thought would help them to better teach mathematics.

Participants

In Utah, there are 875 licensed family childcare providers and 284 licensed childcare centers (N = 1,159 childcare programs). Family childcare providers are further

split into two categories of family homes and family groups. Usually only one provider manages a family home program and therefore, fewer children are enrolled in the program. In family groups at least two providers manage the daily activities with more children are enrolled in the program.

Using G*Power version 3.1.9.2, a power analysis was run a priori to determine a target sample size. A small effect size of .15 was chosen as this is a newer area of study that needs to be assessed before a larger-scale study is conducted. With the .15 effect size for a linear multiple regression with two tails, the total sample size needed was 89.

Providers were recruited with the help of the state-level Childcare Professional Development Institute (CCPDI) for Utah. An email (see Appendix A) was sent via the Childcare Professional Development Institute (CCPDI) to all licensed center and family childcare providers in the State of Utah. The email included basic information about the study with a link to the survey. The first email elicited 84 responses. Two weeks after the first email was sent, a second email was again sent to all licensed providers. At this point, a total of 122 providers completed the study. Qualtrics, the program used to administer the survey, has the ability to track completed survey responses by emails so follow-up emails were sent to providers who started the survey, but did not finish it. This was to obtain as many complete surveys as possible. Efforts to send a third recruitment email were made, but the CCPDI did not respond to these attempts.

Research Design

As this study is one of the first of its kind and not much is known about the topics

of mathematics anxiety and teacher self-efficacy among childcare providers, this research study is descriptive in nature. This type of study helps to describe and determine "what is" for particular phenomena (Gall, Gall, & Borg, 2007, p. 301). The purpose of the study was to gain understanding about center and home childcare provider mathematics anxiety and teacher self-efficacy. The sample was cross-sectional in that the following participant characteristics could differ: (a) age, (b) years providing childcare, (c) career ladder level, (d) education obtained, (e) mathematics anxiety, and (d) teacher self-efficacy.

Measures

The following is a list of measures used with the center and family childcare providers. The survey was administered via Qualtrics, an online survey tool. The following measures are described in detail below: (a) provider demographics; (b) the Mathematics Anxiety Scale—UK (MAS-UK; Hunt et al., 2011); (c) Factors Influencing Mathematics Anxiety (FIMA; Harper & Daane, 1998); (d) Attitudes toward Mathematics (ATM; LeFevre et al., 2009); (e) the Schwarzer Teacher Self-Efficacy Scale (Schwarzer et al., 1999); (f) Woolfolk and Hoy's Teacher Efficacy (Woolfolk & Hoy, 1990); (g) Mathematics Activities (Blevins-Knabe & Musun-Miller; 1996; LeFevre et al., 2009; Menlove, 2013); (h) Reading/Literacy Activities (based on Menlove, 2013); (i) Attitudes toward Reading/Literacy (based on LeFevre et al., 2009); and (j) provider/program demographic information.

Caregiver Demographic Survey

The demographic survey (see Appendix J) solicited information about the following program characteristics: (a) number of children in their care, including the number of children on state subsidy; (b) program capacity; and (c) languages spoken in the program; The following provider characteristics were assessed: (a) number of years the provider has been providing childcare; (b) the number of training activities the provider has participated in during the previous six months; (c) the number of years of formal education; and (d) career ladder level (range of 0-10).

Mathematics Anxiety

Mathematics Anxiety Scale-UK. The Mathematics Anxiety Scale-UK (MAS-UK; Hunt et al., 2011; see Appendix B) was created to use with the UK population and has not been used with a US population. Upon inspection of the questions, it appears to cover the content being measured, also known as face validity (Nevo, 1985). Another reason for using this measure is that the questions assess mathematics anxiety in connection with mathematics courses. The key to choosing this measure is that it assesses general mathematics anxiety which is applicable to all audiences no matter their education and experience. Test-retest reliability is reported to be $r(129) = .89$, $p < .001$ (Hunt et al., 2011). As the scores for the test and retest were statistically significantly correlated in the original sample, the results were consistent over time. In order to validate the construct, correlations were run between this measure and trait anxiety (using the State-Trait Anxiety Inventory; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1984); these were significantly correlated at $r(281) = .22$, $p < .001$. Also, basic

mathematics performance was significantly negatively correlated with the measure at $r(281) = -.40$, $p < .001$ indicating that in the sample (Hunt et al., 2011), the higher one's mathematics anxiety, the lower their mathematics scores. With these psychometric properties in mind, the measure was considered appropriate for this study. This measure is also easily available via the Internet at no cost.

The instrument consists of 23 items on a 5-point Likert scale. Participants were asked to mark how anxious the example scenario would make them. Response options range from "Not at All" to "Very Much." Example questions include: (a) having someone watch you multiply 12 x 23 on paper; (b) being given a telephone number and having to remember it; (c) reading a math textbook; and (d) being asked to calculate three-fifths as a percentage. Permission to use this measure was obtained from Dr. Hunt, the author of the measure, via email on August 19, 2014.

Factors Influencing Mathematics Anxiety. Factors Influencing Mathematics Anxiety (FIMA; see Appendix C; Harper & Daane, 1998) assesses the link between previous mathematics experiences and mathematics anxiety. This measure was used because, like MAS-UK, it measures mathematics anxiety in connection with mathematics courses and previous mathematics experiences. FIMA is also easily available on the Internet. Psychometric properties reported for this measure were not reported; however, the survey was used because it assesses previous experiences with mathematics, especially experiences in mathematics classes, items that in the literature are often linked with mathematics anxiety. Harper and Daane (1998) reported that in their study, 60% of the respondents, (measured by MARS; $N = 53$), "math anxiety was caused by (a) an

emphasis on the right answers and the right method, (b) fear of making mistakes, and (c) frustration at the amount of time it took to do word problems" (p. 32). The FIMA has 26 questions and uses a 5-point Likert scale with options ranging from "Strongly Disagree" to "Strongly Agree." Permission to use this measure was obtained from Dr. Harper on August 28, 2014.

Attitudes toward Mathematics. Attitudes toward Mathematics (see Appendix D; LeFevre et al., 2009) is a 9-item questionnaire that is based on the mathematics survey used by LeFevre et al. (2009). This measure was used because the authors have been involved in similar research with childcare providers. The questions ask about a person's evaluation of his/her own mathematics abilities and skills, a common theme in the mathematics anxiety literature. One question asks specifically about whether the respondent feels that their career is related to mathematics. This question is important in understanding a provider's perceptions of his/her occupation in relation to the topics he/she teaches. Other questions include the following: (a) when I was in school, I was good at math; and (b) it is important for children to be exposed to math concepts every day. Responses range from "Strongly Disagree" to "Strongly Agree" on a 5-point Likert-type scale. Similar to the research design for the current study, the measure includes some questions about language arts to use for comparison/control. Although no reliability or validity scores for the measure were reported in the original study, it was used in this study for the reasons listed above.

Teacher Self-Efficacy

Schwarzer Teacher Self-Efficacy Scale. The Schwarzer Teacher Self-Efficacy

Scale (see Appendix E; Schwarzer et al., 1999) is a 10-item measure that assesses four major areas: (a) job accomplishment, (b) skill development on the job, (c) social interaction with children, parents, and colleagues, and (d) ability to cope with job stress. This measure was adopted for the study as it covers the teacher efficacy areas mentioned previously, is brief and parsimonious, and was readily available. Also, upon inspection of the questions, it appears to cover the content being measured (i.e., face validity; Nevo, 1985). Responses range from "Not True at All" to Exactly True" on a 4-point Likert-type scale. Example questions include: (a) even if I get disrupted while teaching, I am confident that I can maintain my composure and continue to teach well; (b) I know that I can motivate my students to participate in innovative projects; and (c) I am convinced that I am able to successfully teach all relevant subject content to even the most difficult students. Chronbach's alpha was reported to be between .76 and .82. According to Gall et al. (2007), a reliability score that is .80 or higher is "sufficiently reliable for most research purposes" (p. 200). No validity scores were reported.

Woolfolk and Hoy's Teacher Efficacy Scale. The Woolfolk and Hoy Teacher Efficacy Scale (see Appendix F; Woolfolk & Hoy, 1990) is another assessment of teacher self-efficacy based on Woolfolk and Hoy's research ($N = 55$). The questionnaire was originally constructed by Gibson and Dembo (1984) and had 30 items. After a factor analysis was published by Gibson and Dembo, Woolfolk and Hoy developed a shorter 22-item measure (retrieved from http://people.ehe.osu.edu/ahoy/files/2009/02/tes22.pdf). This measure was chosen as its questions are based on "Bandura's theory of the construct of teacher efficacy" and it was readily available (Gibson & Dembo, 1984, p. 570).

The measure assesses two types of efficacy, teaching (α = .74) and personal efficacy (α = .82). Example questions include the following: (a) when a student does better than usual, many times it is because I exert a little extra effort; (b) I have enough training to deal with almost any learning problem; (c) a teacher is very limited in what he/she can achieve because a student's home environment is a large influence on their achievement; and (d) when it comes right down to it, a teacher really cannot do much because most of a student's motivation and performance depends on their home environment. Response options on the 5-point Likert scale range from "Strongly Disagree" to "Strongly Agree."

Mathematics Activities

A survey assessing the types of mathematics activities (see Appendix G) used in the childcare program is based on Utah's Early Childhood Core Standards (Menlove, 2013). The majority of the questions (n = 47) were composed for this study based on the standards presented in the section on mathematics. Other questions (n = 20) are based on previous work by Blevins-Knabe and Musun-Miller (1996) and LeFevre et al. (2009).

Center and family childcare providers were asked to complete the 67-item survey assessing the mathematics activities they typically engage in with children in their care. Example items include: (a) show the difference between letters, numbers, and other symbols; (b) play with number refrigerator magnets; (c) determine which of two sets has more objects (e.g., a set of 5 or a set of 2); (d) talk about time with clocks and calendars, (e) sing counting songs (Five Little Monkeys); and (f) help children recognize that rearranging a group of objectives does not change the number of objects in that group.

Response categories include: (a) never, (b) monthly, (c) twice a month, (d) weekly, (e) 2-3 days per week, or (f) 4-5 days per week. For their set of questions, LeFevre et al. (2009) reported reliability scores ranging from .71 to .84 but did not report validity scores.

Reading/Literacy Activities

A survey assessing the types of reading/literacy activities (see Appendix H) in the care giving environment is based on Utah's Early Childhood Core Standards in the section for reading and literacy (Menlove, 2013). Center and family childcare providers were asked to complete the 30-item measure assessing the reading and literacy activities they typically employed with the children in their care. Example items include: (a) use pictures to identify words; (b) recite rhymes; (c) help the child identify the front cover, back cover, and title page of a book; (d) help the child recognize the difference between pictures and words on a page; and (e) help the child recognize print in everyday life (e.g., numbers, letters, names, words, familiar logos, and signs). Response categories include: (a) never, (b) monthly, (c) twice a month, (d) weekly, (e) 2-3 days per week, or (f) 4-5 days per week.

Attitudes Toward Reading/Literacy

Attitudes Toward Reading/Literacy (see Appendix I) is a 10-item questionnaire which was constructed for this particular study. In order to assess attitudes in line with similar provide a parallel measure with the Attitudes toward Mathematics measure (LeFevre et al., 2009). Questions address how the caregiver views his/her own reading

and literacy skills, particularly in relation to his/her previous class experiences. Example questions include: (a) I felt as if I could not keep up with other students in reading/literacy activities in all or most classes; and (b) I felt I was just not a good reader. Responses range from "Strongly Disagree" to "Strongly Agree" on a 5-point Likert scale.

Research Questions and Data Analyses

As stated in the previous chapter, the following research questions were investigated. The analysis for each question is also described. All data were entered into and analyzed in SPSS. The measures used, their acronym, authors, and reported psychometrics properties are shown in Table 1.

Question 1 Analyses

What is the level of mathematics anxiety among childcare providers as measured on the following scales: (a) Mathematics Anxiety Scale-UK (MAS-UK; Hunt et al., 2011); (b) Factors Influencing Mathematics Anxiety (FIMA; Harper & Daane, 1998); and (c) Attitudes toward Mathematics (ATM; LeFevre et al., 2009)? (1a) Do center and family care providers differ significantly in their mathematics anxiety? (1b) How does experience and education vary with mathematics anxiety among center and family care providers?

The goal of these questions is to measure the mathematics anxiety level among the sample by calculating descriptive statistics (ranges, means, standard deviations, etc.) the three mathematics anxiety measures. Total scores for each measure were calculated

Table 1

Construct, Measures, Authors, Psychometric Properties, and Number of Items for all Measures

Construct	Measure(s)	Author(s)	Psychometric properties	Number of items
Mathematics anxiety	MAS-UK	Hunt, Clark-Carter, & Sheffield, 2011		23
	FIMA	Harper & Daane, 1998		26
	ATM	LeFevre, Skwarchuk, Smith-Chant, Fast, Kamawar, & Bisanz, 2009		
Teacher self-efficacy	Schwarzer Teacher Self-Efficacy Scale	Schwarzer, Schmitz, & Daytner, 1999	α = .76 to .82 Test-retest α = .67	10
	Woolfolk & Hoy's Teacher Efficacy Scale	Woolfolk & Hoy, 1990 adapted from Gibson & Dembo, 1984	α = .74 to .82	22
Mathematics Activities	Mathematics Activities	Adapted from Blevins-Knabe & Musun-Miller, 1996; LeFevre et al., 2009); Menlove, 2013	α = .71 to .84 (LeFevre et al., 2009)	62
Reading/ Literacy Activities	Reading/ Literacy Activities	Adapted from Menlove, 2013		30
Attitudes toward Reading/ Literacy	Attitudes toward Reading/ Literacy	Adapted from LeFevre et al., 2009		10

(continuous scores). The sum scores for each measure were used to calculate the correlations between the three measures. Providers were divided into three categories

based on the type of care provided (center, family home, and family group) and their total mathematics anxiety scores for each measure were compared between the three groups using an ANOVA. Because the scoring was different on each measure, the sum scores for each measure were converted to *Z*-score scores. This was done in order to compare mathematics anxiety for each mathematics anxiety survey by provider experience and education by using an ANOVA. The dependent variable is the summed mathematics anxiety with the independent variables being experience and education, both formal and in-service, and career ladder.

Question 2 Analyses

What is the level of teacher self-efficacy as measured on the following measures: (a) Schwarzer Teacher Self-Efficacy Scale (Schwarzer et al., 1999); and (b) Woolfolk and Hoy's Teacher Efficacy Scale (Woolfolk & Hoy, 1990)? (2a) Do center and family care providers significantly differ in their teacher self-efficacy? (2b) Does experience and education relate to teacher self-efficacy among center and family care providers?

The objective of these questions is to determine the mean level of teacher self-efficacy within the overall sample and within center and family provider samples. This question was evaluated much the same as Question 1. Descriptive statistics (ranges, means, standard deviations, etc.) were figured on the two teacher self-efficacy measures. Total scores for each measure were calculated (continuous scores). Correlations were then run between the two measures. Teacher self-efficacy scores were compared between the three groups of care providers using an ANOVA. Because the scoring was different on each measure, the sum scores for each measure were converted to *Z*-score

scores. This was done in order to compare teacher self-efficacy on provider experience and education by using an ANOVA. The dependent variable was teacher self-efficacy with the independent variables being experience and education.

Question 3 Analyses

How do the following variables relate to mathematics anxiety: (a) teacher self-efficacy, (b) frequency of providing developmentally appropriate mathematics activities in the childcare program, (c) frequency of providing developmentally appropriate reading/literacy activities, (d) years of experience, (e) provider education, (f) type of childcare, (g) career ladder level, and (h) professional training meetings in the last six months? As a control how do the preceding variables associate with attitudes toward literacy?

Total scores for each measure were calculated (continuous scores). Because the scoring was different on each measure, the sum scores for each measure were converted to *Z*-score scores. This question was analyzed by running correlations using the *Z*-scores in order to determine the relationship between the variables. A stepwise linear multiple regression was then used to determine how mathematics anxiety is characterized by each variable.

Question 4 Analyses

What do childcare providers feel they need in order to become better mathematics teachers? This question was an open-ended question so that providers could write their own responses rather than choosing from a list of limited options. The qualitative

responses were analyzed for themes. This was done by reading all responses and looking for patterns. Similar phrases were manually highlighted and then grouped to further analyze. Once themes were discovered, the number of times the theme was mentioned was counted to determine what percentage of the sample mentioned the theme.

Incentives

Incentives were included in order to increase likelihood of participation and completion rates. All providers who completed the entire survey received $10 and were entered into a drawing to receive an iPad. One provider was randomly selected to receive the iPad.

CHAPTER IV

RESULTS

The following chapter reviews the statistical analysis and results used to answer each of the four research questions. The analyses include descriptive statistics with means, standard deviations, ranges, and frequencies of key variables. ANOVAs compared variables between childcare provider groups based on type of care, education, and years of experience. Stepwise linear regressions were included to depict predictor variables for mathematics anxiety and attitudes toward reading/literacy. Tables and figures helped to depict the results. Data for this study were collected using Qualtrics, an online survey software package. Once all surveys had been submitted, the data were downloaded into SPSS. All analyses were done using SPSS 22.0.

Sample Demographics

There were 122 providers who responded to the survey, including those who completed only a portion of the survey, for a response rate of 10.5%. Of the 122, 58 (47.5%) were family childcare home providers, 12 (9.8%) were family childcare group providers, 48 (39.3%) were center providers. Four (3.3%) did not indicate a type of childcare program and were removed from the analysis. Table 2 shows the means and standard deviations for program enrollment, the training activities in which the provider participated during the previous six months, years of experience providing childcare, and their level on the career ladder. Table 3 displays the education levels by each type of childcare. For two centers more than one provider responded as follows: from one

Table 2

Provider Demographic Means and Standard Deviations by Type of Care Provided

	Childcare type	*n*	Program enrollment # children	Training activities in last 6 mo.	Years of experience	Current career ladder
M (SD)	Family home	58	10 (8)	4.50 (9.32)	11.16 (10.02)	4.38 (3.92)
	Family group	12	16 (4)	4.17 (4.13)	16.96 (10.91)	6.50 (3.18)
	Center	48	89 (50)	3.02 (1.92)	11.06 (7.74)	5.42 (3.84)

Table 3

Provider Education by Type of Care Provided

Childcare type	*n*	High school/ GED	Assoc./ 2-year degree	Technical degree	4-year degree	Master's degree	Prof. degree*
Family home	58	26	16	1	13	1	1
Family group	12	7	1	2	2	0	0
Center	48	11	13	1	14	8	1
No type reported**	4	0	1	0	0	0	0

Note: *Includes JD, MD, PhD, etc. **Only 1 provider responded to all questions.

center, there were three respondents and from the other there were two respondents. Because the identifying information was not connected to the data it was impossible to identify the duplicate respondents; therefore, all participants were included in the analysis.

Descriptive statistics for the variables other than mathematics anxiety and teacher self-efficacy are shown in Table 4. All data reported (including providers who did not report a type of care provided) are included in the descriptive statistics. The range for actual career ladder level was 0 to 10 with an average of 4.97 (*SD* = 3.86). The average years of experience was 11.71 (*SD* = 9.31) with the range of 0 to 40 years. Table 2 (Chapter 3) shows the level of education by type of care provided. For Table 19 (see pg. 77), the level of education was dummy coded as follows including the frequency and percentage of each level: (a) 1 = high school/GED (*n* = 44, 36.1%); (b) 2 = assoc./two-year degree (*n* = 31, 25.4%); (c) 3 = technical degree (*n* = 4, 3.3%); (d) 4 = four-year degree (*n* = 29, 23.8%); (e) 5 = master's degree (*n* = 9, 7.4%); 6 = professional degree (*n* = 2, 1.6%). There were three who did not indicate their level of education (2.5%). The average level of education was 2.45 (*SD* = 1.49). The average number of training activities during the previous six months was reported to be 3.83 (*SD* = 6.70, range = 0 to 66).

Question 1

What is the level of mathematics anxiety among childcare providers as measured on the following scales: (a) Mathematics Anxiety Scale-UK (MAS-UK; et al., 2011); (b) Factors Influencing Mathematics Anxiety (FIMA; Harper & Daane, 1998); and (c) Attitudes toward Mathematics (ATM; LeFevre et al., 2009)? Table 5 shows the descriptive statistics and reliability scores for the mathematics anxiety measures. In this study, a higher score on all three measures indicates a better and more favorable attitude

Table 4

Provider Means (SD), Potential Range, Actual Range, and Chronbach's Alphas for All Measures except Mathematics Anxiety and Teacher Self-Efficacy

		Range		
Measure	*M (SD)*	Potential	Actual	α
Career ladder level	4.97 (3.86)	0 to 10	0 to 10	--
Years of experience	11.71 (9.31)	--	0 to 40	--
Education*	2.45 (1.49)	1 to 7	1 to 7	--
Training activities during last 6 months	3.83 (6.70)	--	0 to 66	--
Mathematics activities	236.23 (64.23)	61 to 366	106 to 359	.98
Reading activities	136.42 (28.47)	29 to 174	68 to 174	.96
Reading attitudes	40.99 (8.15)	10 to 50	10 to 50	.90

Note: *1 = High School/GED; 2 = Assoc./two-year degree; 3 = Technical degree; 4 = four-year degree; 5 = Master's degree; 6 = Professional degree (including JD, MD, PhD, etc.)

toward mathematics or less mathematics anxiety. The average score on the MAS-UK was 90.31 (SD = 21.04,α = .96) with the range of actual responses being between 37 and 115. This indicates that the sample's attitudes toward mathematics were more favorable than anxious. Figure 1 shows the distribution of sum scores for the MAS-UK. The distribution is slightly negatively skewed, demonstrating that the participants tended to

Table 5

Potential Range, Actual Range, Mean Scores (Standard Deviations), and Cronbach's Alphas for the Mathematics Anxiety Measures

		Range		
Measure	*M* *(SD)*	Potential	Actual	α
Mathematics Anxiety Scale-UK (MAS-UK)	90.31 (21.04)	23-115	37-115	.96
Factors Influencing Mathematics Anxiety (FIMA)	80.84 (23.17)	26-130	26-125	.96
Attitudes toward Mathematics (ATM)	34.82 (5.96)	9-45	11-45	.77

have higher average sum scores or lower mathematics anxiety. The MAS-UK had a Chronbach alpha of .96. According to Spector, "reliability assures that a scale can consistently measure something" (1992, p. 6) and is usually a positive number between 0 to "just under 1.0, where larger values indicate higher levels of internal consistency" (p. 32). Nunnally (1978) stated that an alpha should be .70 or higher to demonstrate internal consistency. With regard to these standards, the scores for the MAS-UK had a high internal consistency or reliability for this sample.

The average sum score on the FIMA was 80.84 (SD = 23.17, α = .96) with the range of actual responses (26-125) encompassing the majority of the potential range of sum scores (26-130). To explore why the actual range was so large, a simple dot plot as well as a frequency table were constructed. There were a couple of outliers. One family home childcare provider scored the lowest possible score of 26, while the highest score of 125 was achieved by a different family home provider. The rest of the participants scored between 34 and 120. Figure 2 shows the distribution of sum scores for the FIMA

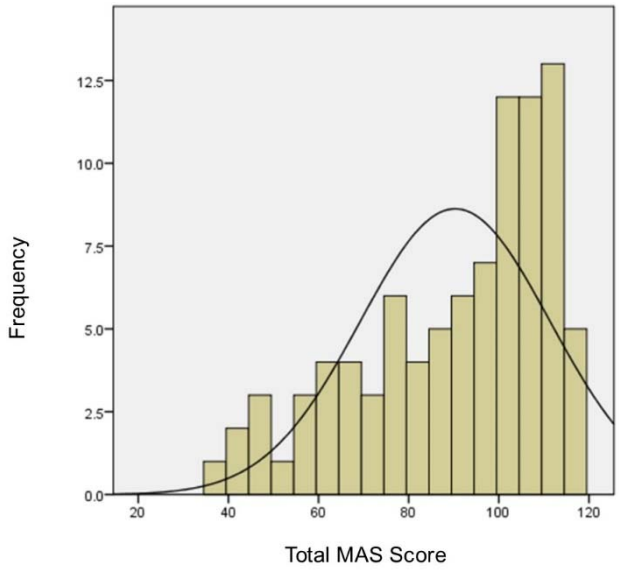

Figure 1. Frequency of provider scores (n = 91, M = 90.31, SD = 21.04) on the Mathematics Anxiety Scale (MAS-UK).

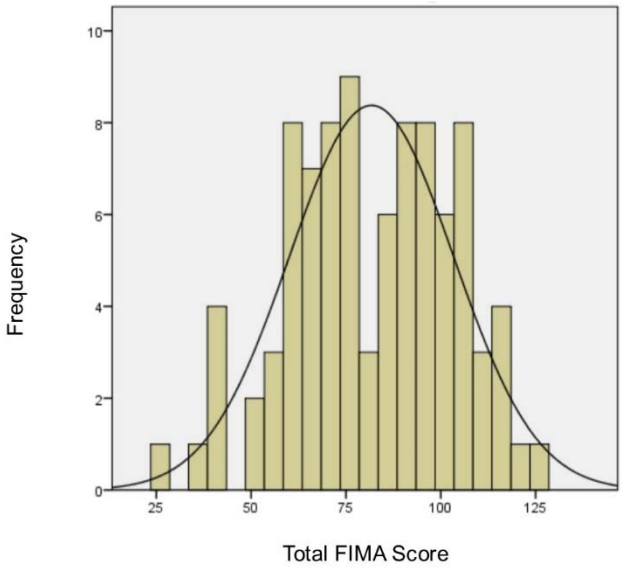

Figure 2. Frequency of provider scores (n = 91, M = 81.73, SD = 21.67) on Factors Influencing Mathematics Anxiety (FIMA).

measure, which was normally distributed. This denotes that 68% of the sample scored within one standard deviation of the mean, or between the scores of 57.67 and 104.01. The alpha for the FIMA was .96 indicating high reliability in this sample.

On the ATM, the average sum score was 34.82 (SD = 5.96, α = .77). Potential range of scores was 9 to 45, actually range was 11-45. To further examine this finding, a simple dot plot and frequency table were analyzed. There was one outlier: a center childcare provider who had the lowest score of 11. The rest of the sample scored between 22 and 45. Figure 3 shows the distribution of scores for the ATM measure, which was also normally distributed. This indicates that 68% of the sample scored within one standard deviation of the mean, or between the scores 28.86 and 40.78. The Chronbach alpha for the ATM was .77. The alpha, while lower than the other two

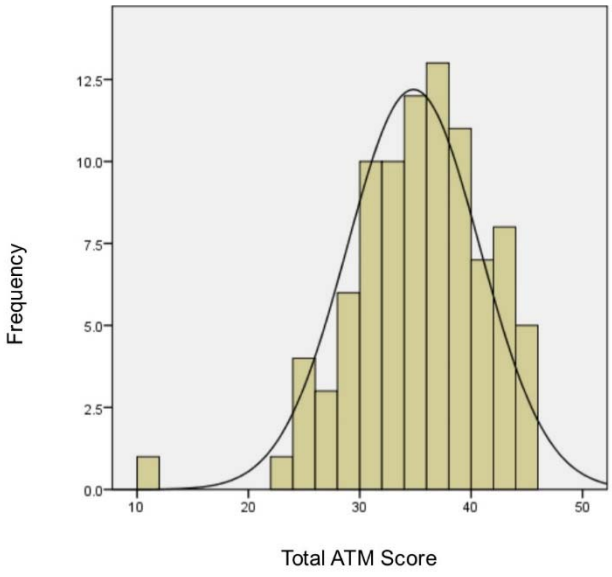

Figure 3. Frequency of provider scores (n = 91, M = 34.82, SD = 5.96) on Attitudes toward Mathematics (ATM).

measures, is still above the .70 prescribed by Nunnally (1978). Nunnally and Bernstein (1994) suggest that an alpha may be lower when a questionnaire is shorter rather than longer.

To assess the potential linear relationships between the measures and to calculate how strongly the measures were related, correlations were calculated. Table 6 shows the correlations between the three mathematics anxiety measures. All three measures had statistically significant correlations with each other ($p \leq .001$), indicating that there is less than .10% chance that the relationships between the three measures happened by chance. Also, the measures' variances are linked. As a score increases on one measure, the scores on the other two measures also increase. To check the variances of each of the measures, three one-way ANOVAs were run with the program type as the independent variable and scores for each mathematics anxiety measure being the dependent variable. Variances were statistically equal for the mathematics anxiety measures.

Table 6

Correlations for the Mathematics Anxiety Measures

	Mathematics Anxiety Scale-UK (MAS-UK)	Factors Influencing Mathematics Anxiety (FIMA)
Factors Influencing Mathematics Anxiety (FIMA)	.77***	
Attitudes toward Mathematics (ATM)	.40***	.51***

***$p \leq .001$

In summary, the participant scores indicated more favorable than anxious attitudes toward mathematics. The scores for each measure were highly reliable, meaning that the surveys were consistent in measuring the same construct (Spector, 1992). The measure that had the highest average sum score was the MAS-UK (90.31 out of 115), followed by the ATM (34.82 out of 45), with FIMA having the lowest average (80.84 out of 130). FIMA and ATM had normal distribution of scores. MAS-UK was slightly negatively skewed, signifying that providers had higher average sum scores on this measure or lower mathematics anxiety. All three mathematics anxiety measures were statistically significantly correlated with each other.

Question 1a

Do center and family care providers differ significantly in their mathematics anxiety? Providers were divided into three categories based on the type of care they provided: (a) family childcare home (n = 58), (b) family childcare group (n = 12), (c) center (n = 48). The family childcare providers who provided care in their homes were kept separate from those from the family childcare group category because the makeup of the programs are very different. Those in the first category have one provider and eight or fewer children in their care. Those in the second category have at least two providers and more than eight children enrolled in their program.

Providers were compared on the various measures of mathematics anxiety to determine whether there were any significant differences between the groups based on the type of care provided. Of the 122 respondents, 91 completed the mathematics anxiety surveys. Table 7 shows the means by provider category for each mathematics anxiety

measure. On the MAS-UK (Hunt et al., 2011), the potential range for sum scores was 23 to 115. The group to score the highest mean of sum scores, or the lowest mathematics anxiety, was family home providers (M = 93.45, SD = 20.88) followed by center providers (M = 87.71, SD = 21.31) and family group providers (M = 87.56, SD = 20.36).

The participants had similar results on the FIMA (Harper & Daane, 1998). The potential range for sum scores was 26 to 130 with higher scores indicating less mathematics anxiety. The family home providers indicated the least mathematics anxiety (M = 86.50, SD = 21.91). The group with the next lowest mathematics anxiety was the family group providers (M = 79.78, SD = 13.23) followed by the center providers (M = 77.69, SD = 22.69).

Table 7

Provider Means (SD) for the Mathematics Anxiety Measures by the Type of Childcare with Higher Scores Indicating Lower Mathematics Anxiety Scores

	Childcare type	*n*	Mathematics Anxiety Scale-UK (MAS-UK)	Factors Influencing Mathematics Anxiety (FIMA)	Attitudes toward Mathematics (ATM)
M (SD)	Family home	44	93.45 (20.88)	86.50 (21.91)	35.80 (5.77)
	Family group	9	87.56 (20.36)	79.78 (13.23)	35.00 (2.29)
	Center	35	87.71 (21.31)	77.69 (22.69)	33.69 (6.73)

As the family childcare group did not have enough participants to run a parametric design (ANOVA), a Kruskal-Wallis H Test was run (nonparametric The participant's scores on the ATM (LeFevre et al., 2009) also had similar results. The potential range for sum scores was 9 to 45 with higher score representing more favorable attitudes toward mathematics. Family home providers had the most favorable attitudes toward mathematics of the four groups (M = 35.80, SD = 5.77). Family group providers were next in showing favorable attitudes (M = 35.00, SD = 2.29). Center providers had an average score of 33.69 (SD = 6.73).equivalent to an ANOVA) to test the null hypotheses with regard to mathematics anxiety and childcare type. Because the mathematics anxiety measures had different scoring systems, z-scores were calculated for each of the three measures in order to compare mathematics anxiety based on childcare type. The two inferred null hypotheses were: (a) there were no statistically significant differences between the three identified types of childcare, and (b) there were no statistically significant differences within the three identified types of childcare. The providers who did not report what type of childcare they provided were dropped from the analysis. The type of care was the independent variable and the three mathematics anxiety surveys were the dependent variables. As shown in Table 8, for the 87 who reported their type of childcare and completed all three mathematics anxiety measures, there were no statistically significant differences between or within the groups on each of the three mathematics anxiety measures (MAS-UK: χ^2= 2.25, p = .32; FIMA: χ^2 = 3.60, p = .17; ATM: χ^2 = 2.63, p = .2730). As there were no significant differences, the null hypothesis that there were no statistical differences between or within groups based on

childcare type was not rejected. In other words, the null hypotheses were accepted: there were no statistically significant differences between or within groups on the mathematics anxiety measures based on the childcare type.

In summary, family home providers had the highest scores on the three mathematics anxiety measures, designating more favorable attitudes toward mathematics and lower mathematics anxiety. When the providers were compared on their mathematics anxiety, there were no statistically significant differences between or within each childcare category.

Question 1b

How do experience and education vary with mathematics anxiety among center and family care providers? Providers were split into three different groups based on the years of experience they had providing childcare. The first group (n = 58) included

Table 8

Kruskal-Wallis H Test Results for the Mathematics Anxiety Measures Comparing Results Between and Within Groups Based on Type of Childcare

Measure	χ^2	*df*	*p*
Mathematics Anxiety Scale-UK (MAS-UK)	2.25	2	.32
Factors Influencing Mathematics Anxiety (FIMA)	3.59	2	.17
Attitudes toward Mathematics (ATM)	2.63	2	.27

providers who had 0 to 9 years of experience. Forty-three (74%) of these participants completed the three mathematics anxiety measures. The second group (n = 32) included the providers who had 10 to 19 years of experience. Of this group, 26 (81%) completed all of the surveys. The third and final group (n = 27) included providers who had 20 or more years of experience. Twenty-six providers (96%) in this group completed all of the measures. Two providers who did not indicate the number of years of experience completed the mathematics anxiety measures.

MAS-UK. Table 9 shows the average sum scores for each experience group on the three mathematics anxiety measures. The potential sum scores for the MAS-UK was 23 to 115 with a higher score representing lower mathematics anxiety. The group with the highest score, or lowest mathematics anxiety, included those who did not report their years of experience (M = 97.00, SD = 14.14) followed by those with 0 to 9 years of experience (M = 91.07, SD = 22.08). The last two groups differed on their average sum score by .36 with those who had 10 to 19 years' experience scoring higher (M = 89.46, SD = 19.94). The group with the lowest score, or highest mathematics anxiety, was the group with 20+ years of experience (M = 89.10, SD = 21.86).

FIMA. The potential sum score range for the FIMA was 26 to 130. The group indicating the lowest mathematics anxiety, or those with the highest average sum score, was the group with 0 to 9 years' experience (M = 82.72, SD = 22.54). Those with 20+ years' experience (M = 82.65, SD = 20.13), had the second highest score and were only .07 lower than the first group. The third group was those with 10 to 19 years of experience (M = 80.31, SD = 22.55). The group with the highest mathematics anxiety on

Table 9

Provider Means (SD) for the Mathematics Anxiety Measures by the Years of Experience with Higher Scores Indicating Lower Mathematics Anxiety

	Provider Experience (yrs)	*n*	Mathematics Anxiety Scale-UK (MAS-UK)	Factors Influencing Mathematics Anxiety (FIMA)	Attitudes toward Mathematics (ATM)
M (SD)	0 to 9	43	91.07 (22.08)	82.72 (22.54)	35.35 (6.58)
	10 to 19	26	89.46 (19.94)	80.31 (22.55)	34.00 (5.73)
	20 to 29	20	89.10 (21.86)	82.65 (20.13)	34.70 (4.93)
	No experience provided	2	97.00 (14.14)	69.50 (9.19)	35.50 (7.78)

the FIMA was the group that did not provide their years of experience (M = 69.50, SD = 9.19).

ATM. The ATM had the potential sum range of 9 to 45. Those who did not provide their years of experience scored the highest on this measure (M = 35.50, SD = 7.78). Those who had 0 to 9 years of experience had the next highest average sum score (M = 35.35, SD = 6.58). The final two groups had a nonsignificant .70 difference on their average sum scores. Those with 20+ years' experience were the third highest scoring group (M = 34.70, SD = 4.93). The group that indicated the highest mathematics anxiety on the ATM was those with 10 to 19 years of experience (M = 34.00, SD = 5.73).

Differences in anxiety scores by experience. Given that the mathematics anxiety measures had different scoring schemes, z-scores were calculated for each of the mathematics anxiety measures in order to compare mathematics anxiety by provider

experience through three separate one-way ANOVAs. The implied null hypotheses in regards to the provider experience and mathematics anxiety were: (a) there were no statistically significant differences between the three identified groups based on experience, and (b) there were no statistically significant differences within the three identified experience groups. The dependent variable was mathematics anxiety with the independent variable being the three experience levels. As shown in Table 10, for the 88 who reported their years of experience and completed all three mathematics anxiety measures there were no significant differences between or within groups based on years of experience (MAS-UK: $F = .08$, $p = .93$; FIMA: $F = .11$, $p = .90$; ATM: $F = .41$, $p = .66$). As there were no significant differences between or within experience groups on mathematics anxiety, the null hypotheses were not rejected.

Table 10

ANOVA Results for the Mathematics Anxiety Measures Comparing Results Between and Within Groups Based on Provider Experience

	Mathematics Anxiety Scale-UK (MAS-UK)			Factors Influencing Mathematics Anxiety (FIMA)			Attitudes toward Mathematics (ATM)		
	df	*F*	*p*	*df*	*F*	*p*	*df*	*F*	*p*
Between groups	2	.08	.93	2	.11	.90	2	.41	.66
Within groups	86			86			86		
Total	88			88			88		

Differences in anxiety scores by provider education. Next, providers were split into three different groups based on their education (see Table 11). The first group (n = 44) included providers whose highest obtained education was a high school diploma or GED. Of the 44 participants, 30 (68%) completed the mathematics anxiety measures. The second group (n = 35) consisted of providers who had obtained an associate's degree, a two-year degree, or a technical degree. Of the 35 participants, 28 (80%) completed the mathematics anxiety measures. The final group (n = 40) contained those providers who had obtained a four-year, masters, PhD, or professional degree. Of the 40 participants, 31 (76%) completed the mathematics anxiety measures. Two providers did not indicate their level of education and were removed from this analysis. As indicated in Table 10, there were not significant differences among education groups on the mathematics anxiety measures.

MAS-UK. As shown in Table 11, the group with the lowest mathematics anxiety scores on the MAS-UK was the group with the highest level of education (M = 93.13, SD = 17.41) followed by those with associate/2 year/technical degrees (M = 90.96, SD = 22.29). The group with the lowest mean, or the highest levels of mathematics anxiety, was the group with a high school diploma/GED (M = 86.33, SD = 23.72).

FIMA. On the FIMA, the group with the high average sum score, or lowest mathematics anxiety, included those with associate/2 year/technical degrees (M = 83.29, SD = 21.16) followed by those with a high school diploma/GED (M = 81.77, SD = 24.39) and the group with the highest levels of education (M = 81.06, SD = 20.37).

Table 11

Provider Means (SD) for the Mathematics Anxiety Measures by Provider Education with Higher Scores Indicating Lower Mathematics Anxiety

	Provider Education	*n*	Mathematics Anxiety Scale-UK (MAS-UK)	Factors Influencing Mathematics Anxiety (FIMA)	Attitudes toward Mathematics (ATM)
M (SD)	HS/GED	30	86.33 (23.72)	81.77 (24.39)	35.70 (5.89)
	Asoc/2 yr/ Tech Degree	28	90.96 (22.29)	83.29 (21.16)	33.93 (7.21)
	4 yr/PhD/ Prof Degree	31	93.13 (17.41)	81.06 (20.37)	34.74 (4.75)

ATM. On the ATM, the group with the highest score or lowest mathematics anxiety level included those with a high school diploma/GED (M = 35.70, SD = 5.89) followed by the group with the highest level of education (M = 34.74, SD = 4.75). The group with the lowest score, or the highest mathematics anxiety, was the group with associate/2 year/technical degrees (M = 33.93, SD = 7.21).

As the measures had different scoring methods, z-scores for each of the mathematics anxiety measures were calculated in order to compare mathematics anxiety and education in three separate one-way ANOVAs. The dependent variable was mathematics anxiety with the independent variable being education level. The two null hypotheses for these ANOVAs were: (a) there were no statistically significant differences between groups based on education, and b) there were no statistically significant differences within the three education groups. As shown in Table 12, there were no significant differences on mathematics anxiety between or within groups based on

Table 12

ANOVA Results for the Mathematics Anxiety Measures Comparing Results Between and Within Groups Based on Provider Education

	Mathematics Anxiety Scale-UK (MAS-UK)			Factors Influencing Mathematics Anxiety (FIMA)			Attitudes toward Mathematics (ATM)		
	df	*F*	*p*	*df*	*F*	*p*	*df*	*F*	*p*
Between groups	2	.81	.45	2	.08	.93	2	.64	.53
Within groups	86			86			86		
Total	88			88			88		

provider education (MAS-UK: $F = .81$, $p = .45$; FIMA: $F = .08$, $p = .93$; ATM: $F = .64$, $p = .53$), thus the null hypotheses were not rejected.

In summary, there was no one experience group that scored the highest or lowest on each mathematics anxiety measure. When the means were compared via one-way ANOVAs, there were no statistically significant differences between or within each experience category. Results based on education were the same. There was no one education category that consistently scored the highest or lowest on the scales. Also, when the means were compared on their mathematics anxiety, there were no statistically significant differences between or within category groups.

In regards to mathematics anxiety among all participants, there were no differences based on type of care provided, experience, nor education. In general, providers had somewhat high means, indicating this sample had more favorable than anxious attitudes toward mathematics. Family home providers had the least mathematics

anxiety on the three measures. When grouped by experience and education, there was no one group that consistently scored the highest or lowest.

Question 2

What is the level of teacher self-efficacy as measured on the following measures: (a) Schwarzer Teacher Self-Efficacy Scale (Schwarzer et al., 1999); and (b) Woolfolk and Hoy's Teacher Efficacy Scale (Woolfolk & Hoy, 1990)? Table 13 shows the descriptive statistics and internal reliability scores for the two teacher self-efficacy measures. For both of the measures, a higher score indicates a higher teacher self-efficacy.

Schwarzer Teacher Self-Efficacy Scale. The average sum score on the Schwarzer measure was 35.50 (SD = 4.11, α = .84) with the actual range (10 to 40) covering the entire possible range (10 to 40). To further investigate this finding, a simple dot plot and frequency table were examined. There was one outlier on the low end of the scale. A family home provider had the lowest score of 10. The next lowest score was a 26. The calculated mean indicates that on average, the providers had relatively high teacher self-efficacy as measured by the Schwarzer measure.

Figure 4 shows the distribution of sum scores for the Schwarzer measure. The distribution is slightly negatively skewed, displaying that the participants were more likely to have high average sum scores indicating higher teacher self-efficacy. For this sample, the Schwarzer survey had a reliability of .84, which is above the .70 mark suggested by Nunnally (1978).

Table 13

Potential Range, Acutal Range, Mean Scores (SD), and Chronbach's Alpha for the Teacher Self-Efficacy Scales

Measure	*M* (*SD*)	Range		α
		Potential	Actual	
Schwarzer Teacher Self-Efficacy Scale	35.50 (4.11)	10 to 40	10 to 40	.84
Woolfolk and Hoy's Teacher Efficacy Scale	86.90 (14.38)	22 to 132	22 to 125	.87

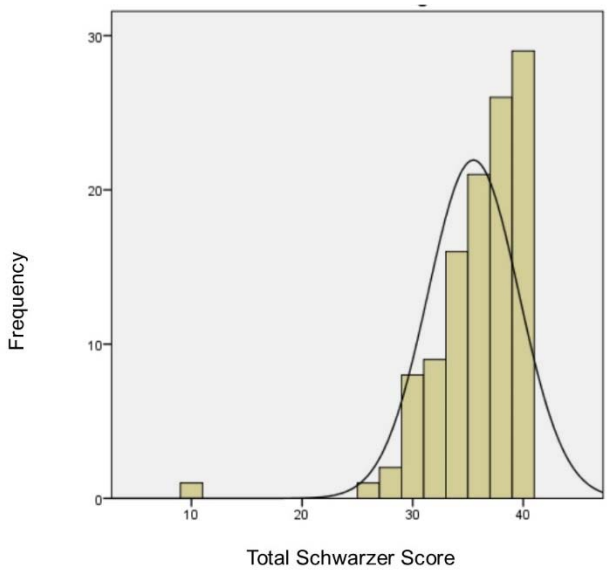

Figure 4. Frequency of provider scores (n = 113, M = 35.50, SD = 4.11) on the Schwarzer Teacher Self-Efficacy Scale.

Woolfolk and Hoy Teacher Efficacy Scale. The average sum score on the Woolfolk and Hoy measure was 86.90 (SD = 14.38, α = .87) with the range of actual

responses being 22 to 125. To further examine the range of actual scores, a simple dot plot and frequency table were calculated and analyzed. There were a couple of outliers on both sides of the scale. A center provider had a score of 22, with another center provider scoring a 33. The two highest scores, 125 and 123, were for family home providers. The rest of the sample fell within the range of 56 to 108. Figure 5 displays the distribution of the average sum score, which was normally distributed. This indicates that 68% of the sample scored within one standard deviation of the mean, or between the scores 72.52 and 101.28. The internal reliability score for the Woolfolk and Hoy survey was .87. While not as high as some of the other measures, it is still above .70 (Nunnally, 1978).

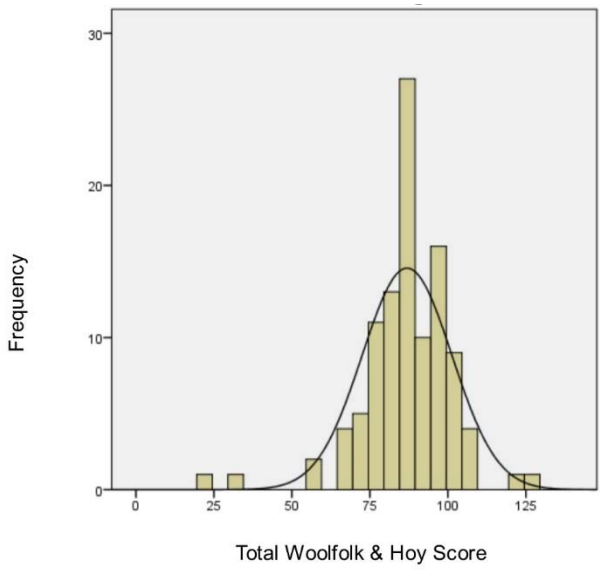

Figure 5. Frequency of provider scores (n = 105, M = 86.90, SD = 14.38) on the Woolfolk and Hoy's Teacher Efficacy Scale.

Comparison of Schwarzer and Woolfolk and Hoy Measures. To assess the potential linear relationships between the measures and to analyze how strongly the measures were related, correlations were calculated. Correlations were run between the Schwarzer and the Woolfolk and Hoy teacher self-efficacy scales. The results were not significant at $r = .09$, $p = .36$ indicating that the two measures do not vary together. In other words, the scores of one measure do not relate to the other. Having one score on the Schwarzer does not increase the chance of a similar score on the Woolfolk and Hoy and vice versa. Because of this, the measures were kept separate in the subsequent analyses.

In summary, the participants had relatively high average sum scores indicating higher teacher self-efficacy. The scores for each measure were highly reliable, indicating that within each measure, the items were consistent in measuring the same construct (Spector, 1992). The survey that had the highest average sum score in relation to the potential high score was the Schwarzer (35.50 out of 40). The average sum score for the Woolfolk & Hoy measure was 86.90 (out of 132). The distribution for the Schwarzer measure was slightly negatively skewed, indicating that providers tended to have higher means or higher teacher self-efficacy scores on this measure. The distribution for the Woolfolk & Hoy scale was normally distributed. The two teacher self-efficacy measures were not statistically significantly correlated.

Question 2a

Do center and family care providers significantly differ in their teacher self-efficacy? As was done with the previous question, childcare providers were divided into

four categories based on the type of care they provided: (a) family childcare home (n = 58), (b) family childcare group (n = 12), and (c) center (n = 48). Providers were compared on the two measures of teacher self-efficacy to determine whether there were significant differences among the groups.

Schwarzer and Provider Care Setting. Table 14 shows the mean scores for each provider category on the teacher self-efficacy measures. For the Schwarzer Teacher Self-Efficacy measure (Schwarzer et al., 1999), the potential range of sum scores was 10 to 40 which a higher score representing a higher level of teacher self-efficacy. Center providers (M = 36.26, SD = 2.93) and family home providers (M = 35.02, SD = 4.97). The group with the lowest score, or the lowest teacher self-efficacy, on the Schwarzer was the family group providers (M = 34.50, SD = 3.26).

Woolfolk and Hoy and Provider Care Setting. On the Woolfolk and Hoy assessment (1990), the potential range of sum scores was 22 to 132. The group with the highest average sum score and therefore the highest self-efficacy was family home childcare providers (M = 89.31, SD = 13.77). The family group providers scored the next highest average sum (M = 85.33, SD = 10.27) followed by those providing care in centers (M = 84.69, SD = 16.33).

Analysis by Care Setting. Table 15 shows the results of the two one-way ANOVAs where the type of care was the independent variable and the teacher self-efficacy measures the dependent variables. Because the two teacher self-efficacy mathematics measures had different scoring methods, z-scores were calculated for each measure in order to compare teacher self-efficacy and childcare type. The providers who

Table 14

Provider Means (SD) for the Teacher Self-Efficacy Measures by the Type of Childcare with Higher Scores Indicating Higher Teacher Self-Efficacy

	Childcare type	*n*	Schwarzer Teacher Self-Efficacy	Woolfolk and Hoy's Teacher Efficacy
M (SD)	Family home	56	35.02 (4.97)	89.31 (13.77)
	Family group	12	34.50 (3.26)	85.33 (10.27)
	Center	42	36.26 (2.93)	84.69 (16.33)

Table 15

ANOVA Results for the Teacher Self-Efficacy Measures Comparing Results Between and Within Groups Based on Type of Childcare

Groups	Schwarzer Teacher Self-Efficacy			Woolfolk and Hoy's Teacher Efficacy		
	df	*F*	*p*	*df*	*F*	*p*
Between groups	2	1.43	.24	2	1.22	.30
Within groups	107			99		
Total	109			101		

did not indicate their type of care were dropped from the analysis. For each measure of teacher self-efficacy, the scores for the providers for the different types of childcare were not statistically significant in their differences. The null hypotheses that there were no statistical differences between or within groups based on childcare type were not rejected.

In summary, providers scored similarly on the teacher self-efficacy measure despite care setting. There were no statistically significant differences between or within each childcare category.

Question 2b

Does experience and education relate to teacher self-efficacy among center and family care providers? The three experience groups from Question 1b were used to frame these analyses. The first group (n = 58) comprised the providers who had 0 to 9 years of experience. Of the 58 in this group, 52 responded (90%) to all the questions on the two teacher self-efficacy measures. The second group (n = 32) consisted of providers who had 10 to 19 years of experience. Twenty-seven in this group (84%) responded to both surveys. The third group (n = 27) included providers who had 20 to 29 years of experience. In this group, 22 answered all questions (81%) to both measures. There were 4 who did not indicate the number of years of experience providing care, and they were removed from the analyses. Table 16 displays the average sum scores (means) and standard deviations for each experience group on the Schwarzer and Woolfolk and Hoy scales.

Schwarzer measure and care setting. The potential sum score range on the Schwarzer was 10 to 40 with higher scores representing higher teacher self-efficacy. The first and second groups were .12 apart in their means with the group with 10 to 19 years of experience (M = 35.68, SD = 3.33) scoring just higher than those with 0 to 9 years of experience (M = 35.57, SD = 4.84). The group with the lowest scores, representing lower teacher self-efficacy, was the group with 20+ years of experience (M = 34.91, SD = 3.52).

Table 16

Provider Means (SD) for the Teacher Self-Efficacy Measures by the Years of Experience with Higher Scores Indicating Higher Teacher Self-Efficacy

	Provider Experience (Years)	*n*	Schwarzer Teacher Self-Efficacy	Woolfolk and Hoy's Teacher Efficacy
M (SD)	0 – 9	52	35.56 (4.84)	86.79 (14.74)
	10 – 19	27	35.68 (3.33)	84.41 (14.14)
	20 – 29	22	34.91 (3.52)	89.77 (14.59)

Woolfolk and Hoy measure and care setting. On the Woolfolk and Hoy scale, the potential range for sum scores was 22 to 132. The higher the score, the higher teacher self-efficacy. Those with 20+ years of experience indicated the highest teacher self-efficacy for this measure ($M = 89.77$, $SD = 14.59$). The next highest scoring group was for those with 0 to 9 years of experience ($M = 86.79$, $SD = 14.74$). The group with the lowest sum score on the Woolfolk and Hoy was those who had 10 to 19 years of experience ($M = 84.41$, $SD = 14.14$).

Z-scores were calculated on the two teacher self-efficacy measures and were used in two one-way ANOVAs to compare teacher self-efficacy by provider experience. The independent variable was years of experience with the dependent variables being the two teacher self-efficacy measures. The null hypotheses for these variables were as follows: (a) there were no statistically significant differences between the three identified experience groups on their teacher self-efficacy scores, and (b) there were no statistically significant differences within the three groups of experience on their teacher self-efficacy

scores. As shown in Table 17, there were no statistically significant differences between or within the groups on each of teacher self-efficacy measure. Thus, the null hypothesis was not rejected.

Analyses by provider education. The three education groups were used from Question 1b. The first group (n = 44) included providers whose highest obtained education was a high school diploma or GED. Of the 44 in this group, 38 responded (86%) to both teacher self-efficacy measures. The second group (n = 35) consisted of providers who had obtained an associate's degree, a two-year degree, or a technical degree. Of the 35 participants in this group, 31 responded (89%) to both measures. The final group (n = 40) contained those providers who had obtained a four-year, masters, PhD, or professional degree. Of these 40, 34 responded (85%) to the questions for both measures. Two participants who did not report their level of education were not included in the analyses.

Table 17

ANOVA Results for the Teacher Self-Efficacy Measures Comparing Results Between and Within Groups Based on Years of Experience

Groups	Schwarzer Teacher Self-Efficacy			Woolfolk and Hoy's Teacher Efficacy		
	df	*F*	*p*	*df*	*F*	*p*
Between groups	2	3	1	2	.82	4
Within groups	106			98		
Total	108			100		

Schwarzer and Provider Education. The possible sum scores for the Schwarzer ranged from 10 to 40. As shown in Table 18 the three education groups were within less than a point of each other on their average sum scores. The group with the lowest teacher self-efficacy scores on the Schwarzer was the group with HS/GED degrees (M = 35.28, SD = 3.31), although this score was not significantly different than those of the other two groups.

Woolfolk and Hoy and Provider Care Setting. The possible sum scores for the Woolfolk and Hoy scale were 22 to 132. The group with the highest average sum score on the Woolfolk and Hoy measure was those with associate/2 year/technical degrees (M = 90.48, SD = 11.63) followed by the group with the highest level of education (M = 87.09, SD = 13.37) and those with a HS/GED degree (M = 84.08, SD = 17.01).

Z-scores were calculated for the teacher self-efficacy measures and used in two one-way ANOVAs to compare teacher self-efficacy by provider education. The independent variable was education with the dependent variables being the teacher self-

Table 18

Provider Means (SD) for the Teacher Self-Efficacy Measures by Provider Education with Higher Scores Indicating Higher Teacher Self-Efficacy

	Provider Education	*n*	Schwarzer Teacher Self-Efficacy	Woolfolk and Hoy's Teacher Efficacy
M (SD)	HS/GED	38	35.28 (3.31)	84.08 (17.01)
	Asoc/2 yr/ Tech degree	31	35.82 (3.59)	90.48 (11.63)
	4 yr/PhD/ Prof degree	34	35.32 (5.28)	87.09 (13.37)

efficacy measures. The two null hypotheses were: (a) there were no statistically significant differences between the three identified education groups on their teacher self-efficacy scores, and (b) there were no statistically significant differences within the three education groups on the teacher self-efficacy measures. Table 19 shows the results for the ANOVA based on education. There were no statistically significant differences between or within the education groups on each of the teacher self-efficacy surveys; therefore, the null hypotheses was not rejected.

In summary, there was no one experience group that scored the highest or lowest on the Schwarzer and Woolfolk and Hoy measures. When the means were compared via one-way ANOVAs, there were no statistically significant differences between or within each experience category. Results based on education were the same. No one education category consistently scored the highest or lowest on the scales. Also, when the means

Table 19

ANOVA Results for the Teacher Self-Efficacy Measures Comparing Results Between and Within Groups Based on Education

Groups	Schwarzer Teacher Self-Efficacy			Woolfolk and Hoy's Teacher Efficacy		
	df	*F*	*p*	*df*	*F*	*p*
Between groups	2	.18	.83	2	1.70	.20
Within groups	108			100		
Total	110			102		

were compared on teacher self-efficacy, there were no statistically significant differences between or within category groups.

With regard to teacher self-efficacy among all participants, there were no differences based on type of care provided, experience, or education. In general, providers had somewhat high means, indicating higher rather than lower teacher self-efficacy. When grouped by childcare type, experience, and education, no one group consistently scored the highest or lowest.

Question 3

How do the following variables relate to mathematics anxiety: (a) teacher self-efficacy, (b) frequency of providing developmentally appropriate mathematics activities in the childcare program, (c) frequency of providing developmentally appropriate reading/literacy activities, (d) years of experience, (e) provider education, (f) type of childcare, (g) career ladder level, and (h) professional training meetings in the last six months? As a control how do the preceding variables associate with attitudes toward literacy?

The average number of mathematics activities that providers offered was 236.42 (*SD* = 64.23, range = 106 to 359). The average number of reading activities was 136.42 (*SD* = 28.47, range = 68 to 174). The higher the score, the more favorable the attitudes about reading activities. The average score for this measure was 40.99 (*SD* = 8.15, range 10 to 50).

The data were further analyzed by running correlations in order to determine the

relationship between the variables. Table 20 shows the correlations for the various measures. The variables that were significantly correlated with the three mathematics anxiety measures were mathematics activities, the Schwarzer Teacher Self-Efficacy Scale, reading activities, and reading attitudes. The strongest correlations with the teacher self-efficacy measures (Schwarzer Teacher Self-Efficacy Scale, Schwarzer et al., 1999; Woolfolk and Hoy, 1990) were the mathematics activities, ATM, reading activities, and reading attitudes. Mathematics activities and reading activities ($r = .78$, $p \leq .001$) were also significantly correlated with each other.

To further analyze this question and to calculate the best predictor for mathematics anxiety, a 58-item combined measure of mathematics anxiety was created by combining the three mathematics anxiety measures (MAS-UK, FIMA, and ATM). Cronbach's Alpha was calculated for scores on this combined measure $\alpha = .97$ which meets prescription set by Nunnally (1978). Next, a stepwise linear regression was executed with the combined mathematics anxiety measure being the outcome variable and the other measures as the predictor variables. Results of this regression are reported in Table 21. There were three variables that were statistically significant in this regression model: attitudes toward reading/literacy, mathematics activities, and reading activities. Attitudes toward reading/literacy alone explained 19% of the variance in the mathematics anxiety construct. As providers showed an increase in favorable attitudes toward reading/literacy, they also expressed less mathematics anxiety. An additional 8% of the variance was explained when mathematics activities were included in the model. A third variable, reading activities, added 5% when included for a total of 32% of the

Table 20
Correlations Between Variables

	Measure	1	2	3	4	5	Teacher self-efficacy 6	7	8	9	10	11	Mathematics anxiety 12	13
	1. Program type													
	2. Career ladder level	.13												
	3. Years of experience	.00	.24**											
	4. Education	.25**	.35***	-.15										
	5. Training activities	-.10	.01	-.11	-.11									
Teacher self-efficacy	6. Schwarzer	.14	-.07	-.06	.04	-.03								
Teacher self-efficacy	7. Woolfolk & Hoy	-.15	-.07	-.01	.04	-.09	.09							
Teacher self-efficacy	8. Reading activities	.12	-.15	-.26*	.09	.04	.49***	.05						
Teacher self-efficacy	9. Reading attitudes	-.12	-.11	-.24*	.06	.13	.19	.28*	.13					
Teacher self-efficacy	10 Modernity	.09	.13	.02	.29**	.08	-.02	.06	.12	.30*				
Teacher self-efficacy	11. Mathematics activities	-.01	-.18	-.11	.28	-.09	.56***	.13	.78***	.06	-.12			
Mathematics anxiety	12. MAS-UK	-.13	-.11	-.02	.15	-.06	.18	.16	.05	.33**	.22*	.19		
Mathematics anxiety	13. FIMA	-.19	-.09	-.02	-.01	-.04	.06	.20	.11	.42***	.16	.21	.77***	
Mathematics anxiety	14. ATM	-.17	-.10	-.10	-.04	.05	.30**	.06	.38**	.30*	-.19	.46***	.40***	.51***

*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

Table 21

Predictors of Mathematics Anxiety Including Attitudes Toward Reading/Literacy, Mathematics Activities, and Reading Activities

	Model 1		Model 2		Model 3	
Variable	*B*	*β*	*B*	*β*	*B*	*β*
Constant	112.75***		73.02*		108.78**	
Attitudes toward reading/ literacy	2.30***	.43	2.18***	.41	2.15***	.40
Mathematics activities			.19*	.29	.40**	.60
Reading activities					-.62*	-.39
R^2	.19		.27		.32	
F	13.89***		10.91***		9.21***	

*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

variance explained. As shown in Table 21, Model 1 was the most parsimonious model. The best predictor of the combined mathematics anxiety construct was attitudes toward reading/literacy.

As a comparison, the stepwise regression was rerun with attitudes toward reading/literacy being the outcome variable with the combined mathematics anxiety construct being included with the other predictor variables. Results of this regression are reported in Table 22. Two variables were statistically significant in this regression model: the combined mathematics anxiety construct (MAS-UK, FIMA, and ATM) and the Woolfolk and Hoy's Teacher Efficacy scale (teacher self-efficacy). The combined mathematics anxiety explained 19% of the variance of attitudes toward reading/literacy.

Table 22

Predictors of Attitudes Toward Reading/Literacy Including Mathematics Anxiety and the Woolfolk & Hoy Teacher Efficacy Measure

	Model 1		Model 2	
Variable	*B*	β	*B*	β
Constant	24.27***		15.64*	
Mathematics Anxiety	.08***	.43	.07**	.37
Woolfolk & Hoy			.13*	.24
R^2	.19		.24	
F	13.89***		9.35***	

*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

An additional 5% of the variance was explained when Woolfolk and Hoy Teacher Efficacy was included in the model. As can be seen in Table 22, Model 1 was the most parsimonious model including the combined mathematics anxiety construct.

In summary, several measures had statistically significant correlations with the summed mathematics anxiety measures. The measures that were highly correlated were mathematics activities, Schwarzer Teacher Self-Efficacy, reading activities, and reading attitudes. The measures that were statistically significantly correlated with the teacher self-efficacy measures were mathematics activities, ATM, reading activities, and reading attitudes. When analyzing which measure was the best predictor for mathematics anxiety, the measure that had the most statistical significance was attitudes toward reading/literacy.

Question 4

What do childcare providers feel they need in order to become better mathematics teachers? The childcare providers were asked the open-ended question, "What would you need to feel more prepared and confident to teach mathematics in early childhood settings (training, collaborations, etc.)?" Of the 122 participants surveyed, 58 answered (48%) the question. Of those 58, 39 (67%) responded that they would need more training or refresher courses. Fourteen (24%) said that they would like to receive recommendations on curriculum ideas and materials as well as suggestions about developmentally appropriate activities to use. Three (5%) felt they needed nothing or already felt prepared to teach mathematics in early childhood settings. One suggested that collaborating with other teachers would be beneficial, and one proposed having a Smart Board would help them be able to teach mathematics concepts.

CHAPTER V

DISCUSSION

This chapter includes a discussion of the results to each of the four research questions. The limitations of the study are then discussed, followed by a discussion of the unique contributions as well as the impacts and future implications. The final section is a general summary of the chapter.

Question 1

The first research question was about the level of mathematics anxiety among childcare providers based on type of childcare provided, provider education, and provider experience. It has been shown in previous research that teachers' and childcare providers' mathematics attitudes are based on their previous experiences (Brady & Bowd, 2005; Harper & Daane, 1999; Tobias, 1980). These attitudes are sometimes negative and might be adopted by the children in the teachers'/providers' classes or programs (Aiken & Dreger, 1961). In this study, providers were asked to rate their feelings according to their previous formal mathematics class experiences (e.g., in high school or college) as well as various mathematics topics (e.g., calculating a percentage, problem solving). Three mathematics anxiety measures were completed by providers with the highest mean (indicating lower anxiety) on the ATM followed by the MAS-UK and the FIMA. The higher the scores on the measures, the lower the providers' mathematics anxiety or the more positive their attitudes toward mathematics. Overall, the providers, regardless of care setting, had more favorable than anxious attitudes toward mathematics, a finding that

has positive implications for preschool children. All three mathematics anxiety measures were significantly correlated with each other, indicating a cohesive and positive attitude toward mathematics. Moreover, the standard deviations on the mathematics anxiety measures were relatively small for all three care settings indicating that providers were fairly similar in their more positive attitudes toward mathematics.

On the Mathematics Anxiety Scale-UK (MAS-UK; Hunt et al., 2011), providers expressed the most anxiety for the question on being given a surprise math test in class and taking a math exam. The two questions that the respondents had the most favorable feelings about were: "Reading the word 'algebra'" and "Working out how much time you have left before you set off to work or place of study."

On the Factors Influencing Mathematics Anxiety (FIMA; Harper & Daane, 1998), the question the providers felt most negatively toward was, "There was an emphasis on the right answers and the right method." Two other questions were similar in provider response: "There was an emphasis on timed tests" and "There was an emphasis on drill and practice." Cornell (1999) found that these types of teaching strategies often negatively influence mathematics attitudes. The question that received the highest score, indicating the most agreement, was "I felt math was not useful." This result is important in that it serves as a reminder that providers, parents, and teachers need to emphasize more often the utility of mathematics rather than the anxiety-producing outcomes of speed and the correct answer. The results of this study indicate that having to perform mathematics tasks under pressure and having to produce a specific outcome (the correct answer and method) were the events most anxiety-producing for providers. On the other

hand, they were able to perform life-skills tasks and, surprisingly, had a positive attitude about the term "algebra." Both of these findings have important implications for preschool practitioners. Mathematics activities likely work best when there are no timed elements and when children learn how to use math to make sense of and order, their environment (for example, counting the number of children with brown shoes; learning that when they have five minutes left to play rather than two minutes they have more play time, etc). Utah's Early Childhood State Standards (Menlove, 2013) includes guidelines for helping young children develop "algebraic thinking" (p. 60). Some have questioned the use of the term "algebra" in this context, thinking that it might "intimidate" providers. The results of this study should reassure anyone concerned that algebra is an acceptable and even welcome term for certain aspects of mathematics preschoolers are asked to do.

Attitudes toward Mathematics (ATM; LeFevre et al., 2009) assessed mathematics and literacy attitudes. Although providers expressed favorable attitudes toward mathematics, they expressed less anxiety toward reading than toward mathematics. As shown in previous research (e.g., Arnold et al., 2002), mathematics anxiety can begin as early as prekindergarten and is influenced in part by teachers' attitudes toward mathematics (Aiken & Dreger, 1961).

Extant literature indicates that there are differences in children's cognitive outcomes based on the type of care enrolled in (Austin et al., 2011) as well as provider education (Harding Weaver, 2002). In this study, there were no significant differences by provider type on the mathematics anxiety measures even when taking into account providers' years of experience and education. Even though the differences were not

significant, the more favorable responses toward mathematics were given by family group providers and center providers rather than family home providers. In this sample, the typical family home program has only one provider taking care of the children. It could be that since family group and center providers are more likely to work with other providers in the program, they might receive more support and help, thus potentially decreasing their mathematics anxiety.

The MAS-UK positively and significantly correlated with attitudes toward reading/literacy and the other two mathematics anxiety measures (FIMA and ATM). The more favorably providers felt toward mathematics, the more favorable were their attitudes toward reading/literacy. A strength of this study is that both reading and mathematics attitudes were assessed, not just mathematics anxiety, thus enabling a valuable comparison. The FIMA also positively and significantly correlated with attitudes toward reading/literacy and the other two mathematics anxiety scales. The ATM was the mathematics anxiety measure that had the most significant correlations with the other measures and positively and significantly correlated with the Schwarzer teacher self-efficacy scale, reading activities, attitudes toward reading/literacy and numeracy activities, and the other two mathematics anxiety scales. Specifically, the lower a provider's mathematics anxiety on the ATM, the higher their teacher self-efficacy, the more favorable their attitudes toward reading, and the more reading and numeracy activities they provided.

The findings also indicated that childcare providers who reported lower mathematics anxiety on the ATM were significantly more likely to provide mathematics

activities for the children in their care. Similarly, Brady and Bowd (2005) found that preservice elementary teachers who had higher mathematics anxiety tended to avoid mathematics instruction. In this study, mathematics activities were not statistically significantly correlated with the sum scores from the other two mathematics anxiety measures, but several individual items on the other two mathematics anxiety measures, were significantly correlated with provision of mathematics activities for children. The questions on the FIMA that were significantly correlated were as follows: (a) I found word problems to be difficult; (b) I rarely had the opportunity to work with manipulatives or concrete materials; (c) I felt as if I could not keep up with other students in math; (d) I felt helpless in problem solving; (e) I felt I was just not good at math; and (f) I felt frustrated at the amount of time it took to work problems. Individual items from MAS-UK that were significantly correlated with mathematics activities were: (a) being asked to write an answer on the board at the front of a math class; (b) taking a math exam; (c) being given a surprise math test in a class; and (d) being asked a math question by a teacher in front of class. These types of mathematics practices tend to increase mathematics anxiety, as shown in previous studies with college students (see Cornell, 1999) and might negatively influence how often a provider offers mathematics experiences to the children in his/her care.

In the current study, providers were only assessed on general teacher self-efficacy and not on their mathematics teacher self-efficacy similar to the early childhood/elementary education preservice (Greshman, 2008) and elementary school teachers (Hadfield & Lillibridge, 1991) in previous studies. Nevertheless, these results

do fall in line with the previous research where the lower a teacher's mathematics anxiety, the higher their teacher self-efficacy. It appears that mathematics anxiety might relate to lower self-efficacy in multiple subjects (see Gresham, 2008). It might also mean that teacher self-efficacy is generalizable to overall duties as a teacher.

Question 2

The second research question regarded level of teacher self-efficacy among childcare providers based on type of childcare provided, provider education, and provider experience. Bandura stated that when a teacher has high teacher self-efficacy, they feel that they are able to teach all students effectively (Bandura, 1997). How teachers feel about their abilities will likely impact how their students feel about their own skills and abilities, at least in part (Bandura, 1997) and their academic achievements (Ashton & Webb, 1986).

The Schwarzer Teacher Self-Efficacy Scale and the Woolfolk and Hoy's Teacher Efficacy Scale had high reliability scores but were not statistically significantly correlated with each other, suggesting either that they measured different aspects of self-efficacy or that one scale was more valid than the other relative to teacher self-efficacy. There were no statistically significant differences by provider type on teacher self-efficacy scores even when considering their years of experience and education. The Schwarzer Teacher Self-Efficacy Scale had one question that had the highest mean, indicating higher teacher self-efficacy: "If I try hard enough, I know that I can exert a positive influence on both the personal and academic development of the children." The question that had the

lowest rating, signifying lower teacher self-efficacy was "I am convinced that I am able to successfully teach all relevant subject content to even the most difficult children." Providers thus mostly agreed with each other that they could exert a positive influence on child development, but were less sure that they could teach all subjects to every child. It is possible that providers were responding more to the caregiving aspects of their job, implied in part by the first question rather than the academic aspects implied by the second question. This result is important in that it is most helpful to all children when providers have teaching-self efficacy in all subjects as well as overall teaching and child guidance so they can be more prepared to deal with the unexpected and to avoid anxiety while teaching (Bandura, 1993). As a provider's teacher self-efficacy increases, he/she is better able to create an atmosphere that is more conducive to learning (Bandura, 1997).

The Woolfolk and Hoy Teacher Efficacy Scale had two questions with the lowest provider-rated agreement with the statements: "When a child is having difficulty with a task, I am usually able to adjust it to his/her level" and "My provider training program and/or experience has given me the necessary skills to be an effective teacher." These are two areas that provider trainings might concentrate on to build teacher self-efficacy. The comment that the providers most strongly disagreed with was "Providers are not a very powerful influence on children's achievement when all factors are considered." This finding is particularly important because it reveals that providers recognize they have an impact on children and their learning. This indicates that they have an understanding of their importance and this understanding can be capitalized on during in-service trainings on mathematics development.

The Schwarzer Teacher Self-Efficacy Scale statistically significantly correlated with mathematics activities, reading activities, and Attitudes toward Mathematics (ATM). Specifically, the higher providers' teacher self-efficacy, the more mathematics and reading activities they provided and the more favorable attitudes they reported toward mathematics. As mentioned previously, this coincides with results from other studies (i.e., Gresham, 2008; Hadfield & Lillibridge, 1997). The Woolfolk and Hoy Teacher Efficacy Scale was significantly correlated with reading attitudes suggesting that as teachers have higher teacher self-efficacy scores they had more favorable attitudes about reading. The teacher self-efficacy measures were not significantly related to Factors Influencing Mathematics Anxiety (FIMA) or the Mathematics Anxiety Scale (MAS-UK). As suggested previously, it could be that when providers are less comfortable with mathematics, they feel they are not as skillful in teaching mathematics (see Gresham, 2008).

Question 3

Question three asked which, if any, of the other measures related to mathematics anxiety. Attitudes toward reading/literacy were statistically significantly correlated to all three measures. Additionally, the Schwarzer Teacher Self-Efficacy scale along with reading and mathematics activities was significantly correlated with the ATM.

A stepwise linear regression was run to look at the predictors of mathematics anxiety. In understanding what leads to mathematics anxiety, researchers might better understand what needs to take place in order to alleviate the presence of mathematics

anxiety among childcare providers. In this study, attitudes toward reading/literacy explained a large amount of the variance in the mathematics anxiety construct (19%). As providers expressed more favorable attitudes toward reading/literacy, they also expressed less mathematics anxiety. John-Steiner and Mahn (1996) suggested that signs and symbols, such as language, play a role in helping individuals understand other cultural tools, such as writing and counting. This might be the case with this sample. An additional 8% of the variance was explained when the variable, mathematics activities, was included in the model. A third variable, reading activities, added 5% when included for a total of 32% of the variance explained. It is interesting to note that teacher self-efficacy, which was statistically significantly correlated with mathematics anxiety, was not powerful enough to surface in the regression as a factor that helped explain mathematics anxiety.

Question three also concerned how the various measures related to attitudes toward literacy. It is shown in extant literature that childcare providers feel that teaching reading is more important than teaching mathematics (Blevins-Knabe & Musun-Miller, 1996). It was beneficial to analyze attitudes toward reading/literacy to see if providers indicated more favorable attitudes toward reading/literacy than mathematics. In our sample, providers on average had more favorable attitudes toward reading/literacy than mathematics. Two measures, other than the mathematics anxiety measures, were statistically significantly correlated with reading/literacy: years of experience and the Schwarzer Teacher Self-Efficacy Scale. A stepwise linear regression was calculated in order to assess what measures best predicted attitudes toward literacy. There were two

variables that were the best predictors of attitudes toward literacy/reading. The first was the combined mathematics anxiety construct which explained 19% of the variance. The second was the Woolfolk and Hoy's Teacher Efficacy Scale that explained an additional 5% of the variance.

Question 4

Research question four concerned what childcare providers felt they needed in order to become better mathematics teachers. The most frequent response was that they wanted more training. Others suggested receiving recommendations on developmentally appropriate curriculum ideas to help teach mathematics. Levine (1993) found that preservice teachers, before taking a mathematics pedagogy workshop, typically planned to teach mathematics using the same methods they were taught, which typically included teacher-oriented styles. After the training, more of the preservice teachers planned to teach in a student-oriented style that is more effective. In connection with Levine's study, it would be useful to study how much training is necessary to overcome negative mathematics attitudes as well as if current training methods adequately prepare childcare providers to teach mathematics. The providers in this sample scored moderately high on teaching self-efficacy and fairly low on mathematics anxiety, indicating a more favorable situation than anticipated toward teaching mathematics and mathematics in general. However, for providers who struggle, according to self-efficacy theory (Bandura, 1993), as they learn to teach mathematics appropriately, their teaching-self efficacy might improve due to their increased preparation and their adaptability in the classroom.

Limitations

Although this study clearly makes a unique contribution, there are limitations that should be noted. Providers for this study were recruited via an email sent by the state's childcare office. Regular emails are sent from this office, and providers may be accustomed to not reading said emails, thus limiting the potential sample size. Of the 1,159 programs contacted via email, 122 providers volunteered for the study, a response rate of 10.5%. The low response rate could have been influenced by the method of recruitment which was an email from the state-level Childcare Professional Development Institute (CCPDI) for Utah. A link was provided in the emails that required providers to visit a website in order to sign up for the study. Even though the email came from a recognized source, the email recipients might have been hesitant about opening an unknown website, thus further limiting the potential sample size. Another factor that might have influenced the low response rate was the time required to complete the survey. In the recruitment materials, it was indicated that about 40 minutes would be needed to complete the survey. Providers may have felt that they did not have enough time to complete the questionnaire.

Another limitation of the study is the length of the questionnaire. When providers visited the survey site, instructions indicated that the survey would take about 40 minutes to complete. Time to complete the survey ranged between 12 minutes and 5 hours 43 minutes. Providers did have the option of starting the survey and coming back to complete it as they had time. There is no way to know exactly how long it took each

provider to complete the survey, but with 207 items requiring answers, the survey could seem daunting, thus lowering the potential response rate. Of the 122 providers who started the survey, 69 completed all of the questions (57%). Although efforts were made to email those who did not complete the survey, responses to these emails were minimal. The survey was lengthy, but there are many additional factors that potentially influence mathematics anxiety.

Contributions, Implications, and Future Research

Although there were many null and statistically nonsignificant findings, there are several contributions this study makes. There are many studies that analyze preservice and in-service teachers' mathematics anxiety and teacher self-efficacy (e.g., Gresham, 2008; Mizala et al., 2015; Swars et al., 2006). This is one of the first studies of its kind in measuring the both concept of mathematics anxiety and teacher self-efficacy among childcare providers. Geist (2015) analyzed these concepts among Head Start Teachers and found connections between mathematics anxiety and teacher self-efficacy. Similarly to the present study, Geist found that teachers who indicated more mathematics anxiety indicated less confidence in their abilities to teach mathematics. Different from Geist's study, the current study surveyed childcare providers (but not Head Start teachers) from center-type care settings as well as family childcare.

This study adds to previous research in assessing mathematics anxiety and teacher self-efficacy among childcare providers. Providers in this study reported lower mathematics anxiety than expected, nonetheless, it still exists and is apparent especially

when asked about previous experiences in mathematics classes, especially when there were timed tests or an emphasis on drill, practice, and right answers. More specific to provider anxiety, Aiken and Dreger (1961) found that college students' mathematics anxiety was influenced by their parents' and teachers' opinions about mathematics. If the findings of their study were compared with this study, it is possible mathematics anxiety might be adopted by the young children as early as preschool. These attitudes can have long-lasting effects and can influence academic outcomes (see Hembree, 1990). To further investigate this line of research, it would be helpful to assess young children, their providers, and parents on their attitudes toward mathematics to determine if there are any correlates among the three groups.

Other researchers indicated high mathematics anxiety among their samples of preservice elementary education majors and females (e.g., Adeyemi, 2015). In contrast, the respondents to this study, mostly female, generally had more favorable attitudes toward mathematics and less anxiety. It could be that other childcare providers also have similar results, or it might be that this sample was unique in that only providers with positive attitudes toward mathematics participated in the survey.

Training in mathematics is available for childcare providers, but trainings need to be updated as new information becomes available in the field. For example, mathematics anxiety could be discussed, including recommendations for teaching mathematics when anxiety is present. Provider trainings now are usually emphasizing the importance of teaching mathematics early on in the preschool years, but this message needs to continue. In particular, providers need continually updated, research-based information on

providing mathematics activities in childcare settings. As indicated by the providers' responses in this study, they feel that, to be better mathematics teachers, they would like to receive more training on developmentally appropriate mathematics activities.

This study is only the beginning of understanding mathematics anxiety and teacher self-efficacy among childcare providers. It would be helpful to use varying measurements that assess mathematics anxiety and teacher self-efficacy in assortment variety of ways, thus rounding out our understanding of how the constructs are related. Research should also continue to assess the various aspects of the combination of mathematics anxiety and teacher self-efficacy, as well as the potential factors that influence these constructs. One such potential influence would be childcare provider's stress. It would be beneficial to understand if and to what extent stress influences mathematics anxiety and teacher self-efficacy or vice versa. A major contribution to the field would be the development of assessments of mathematics anxiety among young children enrolled in childcare coupled with an investigation of the extent to which their providers and their parents influence their attitudes toward math. The next steps would then include potential interventions for both providers and children to help lessen anxiety toward mathematics and to increase providers' teacher self-efficacy when teaching mathematics.

Summary

There is ample research about mathematics anxiety and teacher self-efficacy among college students and preservice, elementary, and secondary teachers. There has

been no research to date measuring these concepts among childcare providers. Teachers' mathematics attitudes influence those they teach and their students often adopt those attitudes. This can then effect students' mathematics achievement (see Aiken & Dreger, 1961; Hembree, 1990; Meece et al., 1990). Although it is not known if childcare providers convey mathematics attitudes to the children in their care like teachers in elementary and secondary school often do, it is likely they might, given that mathematics concepts are also taught in childcare programs. This study is a necessary first step in guiding future researchers to determine whether childcare providers, like other teachers, influence young children's mathematics anxiety and if they do, to what extend those beliefs influence children's academic outcomes.

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APPENDICES

Appendix A.

Email for Recruitment





Center and Family Child Care providers of children between 3 1/2 to 5 years old ...

...We need your help to better understand children's early learning experiences in mathematics and literacy.

What: We are asking you to take a survey about math and reading/ literacy activities in your child care program.

Where: The survey is completely online and will take about 40 minutes. There will be no in-person visits or child assessments.

Why: You will help us understand how to better help young children learn critical early mathematics and literacy concepts.

The first 100 providers to complete the survey will receive $10. All respondents will be entered into a drawing to win an iPad.

Interested? Please log onto the survey here: https://usu.co1.qualtrics.com/SE/?SID=SV_eFC3wrrbJuW6DtP The password for the survey is: child

Questions? Contact Shawnee Hendershot, Doctoral Student:
s.hendershot@aggiemail.usu.edu or **435-554-8052**
or Dr. Ann Austin, Professor: **ann.austin@usu.edu**

USU Family, Consumer &
Human Development Department

UtahStateUniversity
EMMA ECCLES JONES
COLLEGE OF EDUCATION & HUMAN SERVICES

Appendix B.

Mathematics Anxiety Scale-UK (MAS-UK)

Mathematics Anxiety Scale-UK (MAS-UK)

How anxious would you feel in the following situations? Please circle the appropriate numbers below.

	Not at all	Slightly	A fair amount	Much	Very much
1. Having someone watch you multiply 12 x 23 on paper.	1	2	3	4	5
2. Adding up a pile of change.	1	2	3	4	5
3. Being asked to write an answer on the board at the front of a math class.	1	2	3	4	5
4. Being asked to add up the number of people in a room.	1	2	3	4	5
5. Calculating how many days until a person's birthday.	1	2	3	4	5
6. Taking a math exam.	1	2	3	4	5
7. Being asked to calculate $9.36 divided by four in front of several people.	1	2	3	4	5
8. Being given a telephone number and having to remember it.	1	2	3	4	5
9. Reading the word "algebra".	1	2	3	4	5
10. Calculating a series of multiplication problems on paper.	1	2	3	4	5
11. Working out how much time you have left before you set off to work or place of study.	1	2	3	4	5
12. Listening to someone talk about math.	1	2	3	4	5
13. Working out how much change a cashier should have given you in a shop after buying several items.	1	2	3	4	5
14. Deciding how much each person should give you after you buy an object that you are all sharing the cost of.	1	2	3	4	5
15. Reading a math textbook.	1	2	3	4	5
16. Watching someone work out an algebra problem.	1	2	3	4	5
17. Sitting in a math class.	1	2	3	4	5
18. Being given a surprise math test in a class.	1	2	3	4	5
19. Being asked to memorize a multiplication table.	1	2	3	4	5
20. Watching a teacher/lecturer write equations on the board.	1	2	3	4	5
21. Being asked to calculate three fifths as a percentage.	1	2	3	4	5

22. Working out how much your shopping bill comes to.	1	2	3	4	5
23. Being asked a math question by a teacher in front of a class.	1	2	3	4	5

Taken from Hunt, T. E., Clark-Carter-D., & Sheffield, D. (2011). The development and part-validation of a U.K scale for mathematics anxiety. *Journal of Psychoeducational Assessment*, 29, 455-466.

Permission to use measurement for this dissertation was given by Dr. Thomas Hunt on August 19, 2014.

Appendix C.

Factors Influencing Mathematics Anxiety (FIMA)

Factors Influencing Mathematics Anxiety (FIMA)

Childcare Program _____

Here are some statements about how you may feel about some math class experiences and math topics. Mark how much you agree/disagree with each statement.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I rarely had the opportunity to work in groups, so I felt isolated in math class.					
2	I felt math was not useful.					
3	I lacked an understanding of the vocabulary used in math.					
4	I found word problems to be difficult.					
5	There was an emphasis on drill and practice.					
6	There was an emphasis on the right answers and the right method.					
7	There was an emphasis on timed tests.					
8	I rarely had the opportunity to work with manipulatives or concrete materials.					
9	I felt as if I could not keep up with other students in math.					
10	I felt math classes did not relate math to the real world.					
11	I felt helpless in problem solving.					
12	I lacked an understanding of the material.					
13	I lacked an interest in math.					
14	I had a fear of making mistakes.					
15	I felt insecure and inferior when it came to math.					
16	I felt dumb when I was unable or slow to solve a math problem.					
17	I felt I was just not good at math.					
18	My mother or father was not good in math.					
19	I felt that males were better than females in math.					
20	I was not confident in my math ability.					
21	I knew I could never work hard enough to do math well.					

22	There was an emphasis on memorizing rules and applying those rules.					
23	I felt frustrated at the amount of time it took to work problems.					
24	I had previous math teacher(s) demonstrate negative attitudes toward math.					
25	I had bad experiences with past math teachers.					
26	I had embarrassing or negative experiences in past math classes.					

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Appendix D.

Attitudes Toward Mathematics (ATM)

Attitudes toward Mathematics (ATM)

Childcare Program _____

Please read the following statements. Using the following five-point scale, please indicate the degree to which you agree/disagree with the statement.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	When I was in school, I was **good** at math.					
2	When I was in school, I **enjoyed** math.					
3	The career path I have chosen is math related.					
4	When I was in school, I was **good** at language arts activities such as reading.					
5	When I was in school, I **enjoyed** language arts activities such as reading.					
6	I find math activities enjoyable.					
7	I find reading enjoyable.					
8	It is important for children to be exposed to math concepts every day.					
9	It is important for children to read/be read to every day.					

Reference:

LeFevre, J. A., Skwarchuk, S. L., Smith-Chant, B. L., Fast, L., Kamawar, D., & Bisanz, J. (2009). Home numeracy experiences and children's math performance in the early school years. *Canadian Journal of Behavioural Science/Revue Canadienne des Sciences du Comportement*, *41*(2), 55. doi: http://dx.doi.org/ 10.1037/a0014532

Appendix E.

Schwarzer Teacher Self-Efficacy Scale

Schwarzer Teacher Self-Efficacy Scale

Child ID _____
Childcare Program _____
Child Date of Birth _____

		Not at all true	Barely true	Moderately true	Exactly true
1	I am convinced that I am able to successfully teach all relevant subject content to even the most difficult students.				
2	I know that I can maintain a positive relationship with parents even when tensions arise.				
3	When I try really hard, I am able to reach even the most difficult students.				
4	I am convinced that, as time goes by, I will continue to become more and more capable of helping to address my students' needs.				
5	Even if I get disrupted while teaching, I am confident that I can maintain my composure and continue to teach well.				
6	I am confident in my ability to be responsive to my students' needs even if I am having a bad day.				
7	If I try hard enough, I know that I can exert a positive influence on both the personal and academic development of my students.				
8	I am convinced that I can develop creative ways to cope with system constraints (such as budget cuts and other administrative problems) and continue to teach well.				
9	I know that I can motivate my students to participate in innovative projects.				
10	I know that I can carry out innovative projects even when I am opposed by skeptical colleagues.				

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Schmitz, G.S. & Schwarzer, R. (2000). Selbstwirksamkeitserwartung von Lehrern: Längsschnittbefunde mit einem neuen Instrument [Perceived self-efficacy of teachers: Longitudinal findings with a new instrument]. Zeitschrift für Pädagogische Psychologie, 14 (1), 12-25.

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Appendix F.

Woolfolk and Hoy's Teacher Efficacy Scale

Woolfolk and Hoy's Teacher Efficacy Scale

Child ID _____
Childcare Program _____
Child Date of Birth _____

A number of statements about organizations, people, and teaching are presented below. The purpose is to gather information regarding the actual attitudes of educators concerning these statements. There are no correct or incorrect answers. We are interested only in your frank opinions. Your responses will remain confidential.

		Strongly Agree	Moderately Agree	Agree slightly more than disagree	Disagree slightly more than agree	Moderately disagree	Strongly disagree
1	When a student does better than usually, many times it is because I exert a little extra effort.						
2	The hours in my class have little influence on students compared to the influence of their home environment.						
3	The amount a student can learn is primarily related to family background.						
4	If students aren't disciplined at home, they aren't likely to accept any discipline.						
5	I have enough training to deal with almost any learning problem.						
6	When a student is having difficulty with an assignment, I am usually able to adjust it to his/her level.						
7	When a student gets a better grade that they usually get, it is usually because I found better						

	ways of teaching that student.						
8	When I really try, I can get through to most difficult students.						
9	A teacher is very limited in what they can achieve because a student's home environment is a large influence on their achievement.						
10	Teachers are not a very powerful influence on student achievement when all factors are considered.						
11	When the grades of my students improve, it is usually because I found more effective approaches.						
12	If a student masters a new concept quickly, this might be because I knew the necessary steps in teaching that concept.						
13	If parents would do more for their children, I could do more.						
14	If a student did not remember information I gave in a previous lesson, I would know how to increase their retention in the next lesson.						
15	The influences of a student's home experiences can be overcome by good teaching.						
16	If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect them quickly.						

17	Even a teacher with good teaching abilities may not reach many students.						
18	If one of my students couldn't do a class assignment, I would be able to accurately assess whether the assignment was at the correct level of difficulty.						
19	If I really try hard, I can get through to even the most difficult or unmotivated students.						
20	When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on their home environment.						
21	Some students need to be placed in slower groups so they are not subjected to unrealistic expectations.						
22	My teacher training program and/or experience has given me the necessary skills to be an effective teacher.						

Reference:

Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, *82*(1), 81. doi: http://dx.doi.org/10.1037/0022-0663.82.1.81

Appendix G.

Mathematics Activities

Mathematics Activities

Childcare Program _____

Dear Provider: We are interested in the mathematics activities that you do with the children in your care. Understanding the kinds of mathematics activities providers typically do will help us and the Office of Childcare plan future trainings. Following is a list of math activities that you may/may not do. Please mark how frequently you do the following activities with the children or provide the opportunity for the children to do on their own.

		0 Never	1 Monthly	2 2 Times a month	3 Weekly	4 2-3 days per week	5 4-5 days per week
1	Use number or arithmetic flashcards.						
2	Play with refrigerator number magnets.						
3	Count objects.						
4	Count backwards (10, 9, 8, 7....).						
5	Count to 10 by ones.						
6	Count to 20 by ones.						
7	Count a number of objects 0-10 and associate with a written numeral.						
8	Show the difference between letters, numbers, and other symbols.						
9	Demonstrate that numbers have a certain order *(*1, 2, 3, etc.*)*.						
10	When talking about numbers between 1 and 10, show that certain numbers come “before” or “after” one another.						
11	Use one-to-one correspondence when counting up to 5 objects (e.g. point to one object per number						

	or saying one number per object).						
12	Count as many as 5 objects arranged in a line.						
13	Help children answer 'how many' after counting the objects in a set.						
14	Help children understand that each number name in sequence 0-10 means one more (e.g. 7 is one more than 6).						
15	Count as many as 10 objects arranged in a line.						
16	Be able to determine which of two sets has more objects (e.g. a set of 5 or a set of 2).						
17	Associate quantities with written numerals 1 to 10 (e.g. when shown the number 5, state that it's the number 5).						
18	Explore how adding to and/or taking away objects changes the size of a group.						
19	Duplicate simple picture or number patterns (e.g. red, green, red, green, red).						
20	Say the number created by adding or subtracting objects within five (e.g. "Here are five cars. How many cars do we have if I take away three?")						
21	Help children recognize that rearranging a group of objectives does not change the number of objects in that group						

22	Explore different ways a group of objects can be rearranged to make 5 (2 + 3; 1 + 4).						
23	Explore adding and subtracting from simple picture or number patterns.						
24	Combine (add) two or more groups of objects to find out how many in all.						
25	Compare simple data (likes/dislikes, number of boys/girls in class).						
26	Compare objects using measurable attributes (longer/shorter, bigger/smaller).						
27	Describe objects using measurement words (e.g. long/short; heavy/light/ big/small)						
28	Name basic shapes.						
29	Help children recognize the difference in basic shapes in pictures (two-dimensional) or as objects (three-dimensional).						
30	Identify and name basic shapes regardless of their orientations (i.e., triangle is on its side, on its point, etc.).						
31	Combine basic shapes to create new shapes (e.g. combining 2 triangles to make a square, diamond, etc.).						
32	Print numbers.						
33	Talk about money.						
34	Play with calculators.						
35	Provide “Connect-the-Dot” activities.						
36	Use number activity books.						

37	Read storybooks about number.						
38	Play board games with dice or spinner (Chutes and Ladders, Trouble).						
39	Play card games.						
40	Watch educational TV shows (e.g, Sesame Street, Dora).						
41	Use electronic educational programs						
42	Build with Lego or construction set (e.g.,Duplo, Megablocks).						
43	Talk about time with clocks and calendars.						
44	Encourage the children to do math in their heads.						
45	Learn simple sums (2 + 2).						
46	Sing counting songs (e.g.,Five Little Monkeys).						
47	Play games that involve counting, adding or subtracting.						
48	Sort and classify by color, shape or size.						
49	Time how fast an activity can be completed.						
50	Encourage child to collect objects (cards, stamps, rocks).						
51	Ask child to use fingers to indicate how many.						
52	Point out printed numbers (on signs, in books).						
53	Weigh, measure and compare quantities.						
54	When cooking with children, discuss measurement terms (1/2 cup versus ¼ cup).						

55	When cooking with children, the children add and stir ingredients.						
56	When cooking with children, the children do most of the measuring (with some help).						
57	When cooking with children, the children watch while I measure and stir.						
58	The children play **board** games by themselves or with other children (no adults).						
59	The children play **card** games by themselves or with other children (no adults).						
60	The children play **electronic** games by themselves or with other children (no adults).						
61	Encourage play with musical instruments.						
62	Encourage playing store.						

63. On average, how high can the children (ages 3 ½ to 5) in your care count **without** your help? _____

64. On average, how high can the children (ages 3 ½ to 5) in your care count **with** your help? _____

THANK YOU for your commitment to children and your interest in their learning experiences!

References:

Blevins-Knabe, B., & Musun-Miller, L. (1996). Number use at home by children and their parents and its relationship to early mathematical performance. *Early Development and Parenting*, *5*(1), 35-45. doi: 10.1002/(SICI)1099-0917(199603)5:1<35

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Menlove, M. (2013). Utah's early childhood core standards: With teaching strategies and activities.

Appendix H.

Reading/Literacy Activities

Childcare Program_____

Provider Literacy Activities Scale

Dear Provider: We are interested in the reading/literacy activities that you do with the children in your care. Understanding the kinds of reading/literacy activities providers typically engage in will help us and the Office of Childcare plan future trainings. Following is a list of reading/literacy activities that you may/may not do with the children in your care. Please mark how frequently **you** do the following activities **with** the children or provide the opportunity for the children to do on their own.

		0 Never	1 Monthly	2 2 Times a month	3 Weekly	4 2-3 days per week	5 4-5 days per week
1	Sing the alphabet song.						
2	Explicitly teach the sound(s) of each letter.						
3	Use pictures to identify words.						
4	Draw pictures and use words to tell a story.						
5	Identify child's name in print.						
6	Trace figures and letters.						
7	Ask and answer questions about details in a book (e.g. when reading, pause to point out details).						
8	Retell simple stories through conversations, art, movement, or drama.						
9	Recite rhymes.						
10	Use big books for story time.						
11	Provide opportunities to look at books and other written materials independently.						
12	Ask questions about the sequence in stories (e.g., what happened first, next, and last).						

13	Ask the child to retell stories with simple plots, including some details about characters, settings, and major events in a story.						
14	Prompt the child to ask about unknown words in a book or story.						
15	Help the child understand the difference among common types of text (e.g. storybook, poems).						
16	Help the child recognize that books have a title, author, and illustrator.						
17	Help the child understand that illustrations support the story.						
18	Help the child identify characters and their experiences in familiar stories (e.g., Clifford in different books).						
19	Discuss with the child similarities and differences among characters in familiar stories.						
20	Encourage the child to engage in storytelling and conversations with other children and adults about stories they've read.						
21	Help the child make personal connections with a story or book						
22	Help the child identify the front cover, back cover, and title page of a book.						
23	Actively engage the child in group reading activities.						
24	Help the child recognize the difference between pictures and words on a page.						
25	Help the child recognize print in everyday life (e.g.,						

	numbers, letters, names, words, familiar logos, and signs).						
26	Talk to the child about the sounds that make up spoken words.						
27	Help child recognize that words are made up of letters.						
28	Help the child use a combination of drawing, and scribbling to represent a topic (e.g. “This is my family”).						
29	Provide a variety of writing/drawing tools to represent ideas (e.g. chalk, crayon, paint, makers, etc.).						
30	Provide group activities that use any combination of drawing, dictating, and scribbling specific to make a picture chart, group book, or a mural together (etc.).						

Thank you for your commitment to children and their learning environment!

Appendix I.

Attitudes toward Reading/Literacy

Attitudes toward Reading/Literacy

Childcare Program _____

Following are some statements about how you may feel about some reading/literacy class experiences (from childhood through now) and topics related to reading and literacy. Mark how much you agree/disagree with each statement.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	There was an emphasis on drill and practice during class.					
2	I felt as if I could not keep up with other students in reading/literacy activities in all or most classes.					
3	I was unable to comprehend what I read in my classes.					
4	I lacked an interest in reading/literacy.					
5	I felt insecure and inferior when it came to reading/literacy.					
6	I felt I was just not a good reader.					
7	I was not confident in my reading ability.					
8	I was not good at reading in front of other adults.					
9	I was not good at reading in front of children.					
10	I feel insecure about teaching literacy activities with the children in my care.					

Appendix J.

Caregiver Demographic Survey

Caregiver Demographic Survey

The following set of questions is about you and your program. All responses will be kept confidential.

1. What type of program do you have/work at?
   a. Family Childcare Home
   b. Family Childcare Group
   c. Center

2. Are you accredited?
   a. Yes
   b. No

3. How many children are currently enrolled in your program? _____

4. What is your program capacity? _____

5. How many children receive state subsidy funds? _____

6. What is the main language spoken in the program?
   a. English
   b. Spanish
   c. French
   d. Tongan
   e. Other _____

7. How many training activities have you participated in during the past 6 months? _____

8. How many years have you been providing childcare? _____

9. Mark your current career ladder level:
   a. 0
   b. 1
   c. 2
   d. 3
   e. 4
   f. 5
   g. 6
   h. 7
   i. 8
   j. 9
   k. 10

10. What is your gender?
    a. Male
    b. Female

11. Mark your highest level of education obtained:
    a. High school/GED
    b. Associates/2-year degree
    c. Technical degree
    d. 4-year degree
    f. Masters degree
    g. Ph.D
    e. Professional degree (i.e. law, dental, etc.)

12. What is your ethnicity?
    a. White/Anglo/Caucasian
    b. African American/Black
    c. Asian/Pacific Islander
    d. Latino/Hispanic
    e. American Indian/Alaskan Native
    f. Other _____

13. What year were you born? _____

Shawnee M. Hendershot, PhD

Curriculum Vitae

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EDUCATION

Utah State University, Logan, UT
Ph.D. in Family and Human Development **August 2016**
Emphasis: Child Development
Dissertation: Family and Center Childcare Providers: Correlates between Mathematics Anxiety/Attitudes toward Mathematics, Teaching Self-efficacy, and Other Factors

GPA: 3.72

Utah State University, Logan, UT
M.S. in Family, Consumer, and Human Development **2011**
Thesis: Young Children's Mathematics References During Free Play in Family Childcare Settings
GPA: 3.78

Brigham Young University-Idaho, Rexburg, ID
B.S. in Child Development **2008**
GPA: 3.77

TEACHING EXPERIENCE

PITTSBURG STATE UNIVERSITY
Assistant Professor **Fall 2015-Current**
Courses Taught:
FCS 285, Lifespan Development (35 to 45 students)
FCS 480, Family Dynamics (45 students)
FCS 571, Directed Readings (9 to 15 students)
FCS 580/780, Family Abuse and Child Neglect (45 students)
FCS 590, Development of the Child: Birth through age 8 (30 students)
FCS 592/792, Youth and Adolescent Development (35 students)

BRIGHAM YOUNG UNIVERSITY-IDAHO
Online Instructor **Spr 2015-Current**
for CHILD 310, Early/Middle Development, 3.0 credits
(30 to 45 students)

UTAH STATE UNIVERSITY

Instructor
for FCHD 1500, Human Development Across the Lifespan, 3.0 credits **Fall 2012; Spr 2013Spr 2014; Spr 2015**
(105 to 164 students)

Graduate Teaching Assistant for Dr. Kay Bradford **Fall 2013**
for FCHD 6070, Family Theories, 3.0 credits
Assisted in grading bi-weekly quizzes and student-submitted annotated bibliographies for 27 graduate students.

Teaching Assistant for Multiple Professors **Spring 2012**
for FCHD 1010, Balancing Work and Family, 3.0 credits
Graded written work for 70 students.

Teaching Assistant for Professor Maegan Lokteff **Spring 2012**
for FCHD 1500, Human Development Across the Lifespan
Graded written work for 148 students and gave 3 lectures.

Teaching Assistant for Professor Kelli Barker **Fall 2011**
for FCHD 3520, Children in the Middle Years
Graded written work for 88 students, gave 2 lectures, and met with students upon request.

Teaching Assistant for Dr. Ann M. B. Austin **Spring 2010**
for FCHD 1500, Human Development Across the Lifespan
Collaborated on class curriculum, developed quizzes, helped create exams, gave 6 lectures, met with students upon request, and graded written work for 108 students.

Teaching Assistant for Professor Kelly Esparza **Fall 2009**
for FCHD 1500, Human Development Across the Lifespan
Graded written work for 20 students and met with students upon request.

RESEARCH EXPERIENCE

Research Assistant for Dr. Ann M. B. Austin **Apr 2014 – Aug 2015**
Survey center and family childcare providers on mathematics anxiety and self-efficacy.

- Wrote grant proposal to fund research.
- Applied and receive IRB approval.
- Created Qualtrics survey based on various measures.
- Data entry of all measures into SPSS, assisted with data analyses.

Research Assistant for Dr. Ann M. B. Austin **May 2012 – Dec 2013**
Young children's phonological awareness and receptive language functioning

as mediators between working memory, executive functioning and math.

- Assessed 89 children ages 3 to 5 on phonological awareness (PALS), receptive language (PPVT), working memory (verbal and BRIEF-P), executive functioning (BRIEF-P), math (TEMA-3), number line, home numeracy activities, and family demographics.
- Data entry of all measures into SPSS, assisted with data analyses.

Research Assistant for Dr. Lisa Boyce **Spring 2012**

Assisted with NAEYC accreditation self-study for on-campus childcare and education center.

Research Assistant for Dr. Ann M. B. Austin **May 2010 – April 2012**

How young children reference mathematics during free play in family childcare settings.

- Transcribed recordings for 50 children between ages 3 and 5.
- Used NVivo versions 8 and 9 to code transcripts.

ADDITIONAL TRAINING/PROFESSIONAL DEVELOPMENT & SKILLS

e-Learning Academy, PSU **July 2016 – May 2017**

- Quality Matters online training.
- Redesign FCS 592/792.

New Faculty Orientation, PSU **Aug 2015 – May 2016**

- Monthly training with mentor and other new faculty.

Graduate Instructors Forum (GIF) **Sept 2012 – May 2015**

- Bimonthly meeting with faculty member and other graduate instructors.

Certified in Environment Rating Scale (ERS) and *Early Childhood Environment Rating Scale, Revised Edition* (ECERS-R) **October 2013**

- 8 hour online training through the Environment Rating Scales Institute (http://ersi.info/training_online.html)

"Getting Started as a Successful Proposal Writing and Academician" **February 2013**

- 1-day graduate student training provided by Grant Writers' Seminars & Workshops LLC

NVivo 8 training **February 2011**

-2-day training seminar in San Francisco, CA on using NVivo 8 to facilitate qualitative research program to help with coding of thesis data.

PUBLICATIONS

IN PRINT

Hendershot, S., Austin, A. M. B., Blevins-Knabe, B., & Ota, C. (2016). Young children's mathematics references during free play in family childcare settings. *Early Child Development and Care*, 1-16. doi: 10.1080/03004430.2015.1077819

Boyce, L. K., Cook, G. A., Simonsmeier, V., & **Hendershot, S.** (2014). Academic outcomes of very low birth weight infants: The influence of mother-child relationships. *Infant Mental Health Journal, 36*(2), 156-166. doi: 10.1002/IMHJ.21495

IN PREPARATION

Esplin, J., Thompson, B., Austin, A. M. B., Blevins-Knabe, B., **Hendershot, S.,** Loesch, L. (2016). Number line skills and home numeracy activities for preschoolers in center-based and family-based childcare. In B. Blevins-Knabe & A. M. B. Austin (Eds.), *Early Childhood Mathematics Skill Development in the Home Environment.* doi: 10.1007/978-3-319-43974-7

BOOK REVIEWS

Review of *Child Development from Infancy to Adolescence* (2016, June). Levine, L. E. & Munsch, J. Los Angeles: Sage.

REPORTS

Boyce, L. K., & **Hendershot, S.** (2012, October). *DDE Center evaluation: NAEYC accreditation self-study*. Logan, UT: Utah State University

CONFERENCE PAPERS AND POSTERS

Loesch, L., Neilson, B., Austin, A., Blevins-Knabe, B., **Hendershot, S.** (2015, March). Home numeracy environment, young children's executive functioning, and performance on number line tasks. Poster presented as the Biennial Meeting for the Society of Research for Child Development. Philadelphia, PA.

Hendershot, S., Blevins-Knabe, B., Austin, A. M. B., Ota, C. (2014, June). Encouraging mathematics conversations during free play in childcare settings. Poster presented at the annual Professional Development Institute for the National Association of Education for Young Children (NAEYC-PDI). Minneapolis, MN.

Thompson-Nielson, B. G., Esplin, J., Blevins-Knabe, B., Austin, A. M. B., **Hendershot, S.** (2014, March). Correlations of children's home numeracy and cognitive abilities. Poster presented at the Biennial Meeting for the Society of Research for Human Development. Austin, TX.

Boyce, L., Cook, G., **Hendershot, S.** (2013, April). School-Age Cognitive and Behavioral Outcomes of Very Low Birth Weight Infants: Does Dyadic Mutual Enjoyment Make a Difference? Poster presented at the Biennial Meeting for the Society of Research for Child Development. Seattle, WA.

Hendershot, S., Austin, A. M. B., Dew, J., Fronk, A. (2013, April). Young Children's Phonological Awareness, Working Memory, and Executive Functioning as Mediators between Language and Math. Paper presented at the Biennial Meeting for the Society of Research for Human Development. Seattle, WA.

Hendershot, S., Blevins-Knabe, B., Austin, A. M. B., Ota, C. (2012, April). Young children's mathematics references during free play in family childcare settings. Poster presented at the Biennial Meeting for the Society of Research for Human Development. New Orleans, LA.

Hendershot, S., Blevins-Knabe, B., Austin, A. M. B., Ota, C. (2012, April). Who do children talk with when using math in family home childcare environments? Poster presented at the Biennial Meeting for the Society of Research for Human Development. New Orleans, LA.

Hendershot, S., Blevins-Knabe, B., Ota, C., & Austin, A. (2011, April). Preschool children's math conversations in family home childcare. In J. LeFevre (Chair), Children's early experiences with numeracy: Who's counting, where does it happen, and how much does it matter? Symposium conducted at Biennial Meeting of the Society of Research for Child Development. Montreal, CA.

GRANTS

USU Agriculture Experimental Station Research Grant 2014-2015 — $20,000; funded
Title: Supporting Self Efficacy in Mathematics for Home Childcare Providers
Via an Online Professional Development Math Training

SRCD Student and Early Career Council Grant — $2,000; not funded

SCHOLARSHIPS/AWARDS

The Phyllis R. Snow Graduate Scholarship — 2014-2015
FCHD Scholarship — 2013-2014

PROFESSIONAL MEMBERSHIPS

Society for Research in Child Development (SRCD) — 2010-Current
Society for Research in Human Development (SRHD) — 2011-Current
National Association for the Education of Young Children (NAYEC) — 2013-Current
American Association of Family & Consumer Sciences (AAFCS) — 2015-Current
American Education Research Association (AERA) — 2014

SERVICE TO PROFESSION

Web Master: Society for Research in Human Development (SRHD) **2016-2018**

Program Coordinator: Society for Research in Human Development (SRHD) **2014-2016**

Oversaw submission and review system. Prepared program for conference.

Student Representative: SRHD **2014-2016**

Submission Reviewer: Society for Research in Child Development (SRCD) **2015 Conference**
Philadelphia, PA

Submission Coordinator: SRHD **2014 Conference**
Austin, TX

Coordinated incoming submissions previous to review. Coordinated reviewers and submissions for them to review. Prepared and disseminated reject/accept emails to submitters. Prepared and disseminated schedule emails to accepted submitters.
Prepared program for conference.

Submission Student Reviewer: SRHD **2014 Conference**
Austin, TX

Submission Student Reviewer: SRCD **2013 Conference**
Seattle, WA

Submission Reviewer: SRHD **2012 Conference**
New Orleans, LA

FCHD Department Student Representative **2010-2011**
Logan, UT

Elected as one of two student representative by fellow students for the school year. Responsibilities included planning/executing department wide socials, attending faculty meetings, meeting with students who had issues to discuss, etc.

SERVICE TO UNIVERSITY

PSU College of Arts & Sciences **2015-2016**
Curriculum Committee

CLASSROOM EXPERIENCE WITH YOUNG CHILDREN

Volunteer Teaching Assistant **May 2011-Dec 2012**
Delores Doré Eccles Center Childcare, Utah State University
Logan, UT

Duties included helping the lead teacher set up activities for the day, cleaning after snacks and meals, interacting with the children during free time and outside, changing diapers and helping children in the restroom.

OTHER WORK EXPERIENCE

LDS Church Offices May 1998-Aug 1999
- Secretary for Family History Support Department

Brigham Young University-Provo Aug 1999-Oct 2002
- Scheduled class for 90+ University departments
- Supported department secretaries in training and development

Brigham Young University-Provo Oct 2003-Aug 2004
- Processed program applications for undergraduate and graduate programs in the School of Accountancy and Information Systems (SOAIS)

Brigham Young University-Idaho Aug 2004-Dec 2007
Housing Office

- Made on-campus reservations for approx. 200 single and 150 family units
- Served as liaison between tenants and housing management

English Department
- Supported 50+ faculty
- Managed department budget
- Supervised 7-9 part-time student employees

Rocky Mountain Elementary School Aug 2008-May 2009
- Worked with children with special needs
- Supported teachers as needed with students and/or other needs