Preschool Teachers’ Perspectives on Early Mathematics Education

by

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Abstract

Inadequate mathematical teaching in early childhood settings has been attributed to the lack of curriculum implementation and professional development, with little consideration of teachers’ needs in the classroom. Here, we explored preschool teachers’ perspectives, their current practices, challenges, and needs regarding early mathematics education. This study involved three stages of data collection: an email and phone survey, and two rounds of teacher interviews. Results from both surveys (n = 31) and teacher interviews (n = 19) indicated that few teachers used published curricula regularly. Rather, most adopted a mix-and-match approach, selecting some activities and not others. Despite not using curricula, teachers expressed a sense of sufficiency and satisfaction with their current practices; however, they also pointed out challenges they face in early mathematics education, including diversity of children’s needs, limited time and resources, and the inadequacy of support for meeting performance standards set by the state. We suggest that researchers and educational experts consider teachers’ specific needs prior to the development of curricula and training programs.

Keywords: preschool teachers, early mathematics education
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Preschool Teachers’ Perspectives on Early Mathematics Education

Why Is Early Mathematics Important?

In the past few decades, early mathematics development has been one focus of
researchers and educators. Various studies have revealed that children’s early mathematics
performance is a strong predictor of their later mathematical achievements. For example, Jordan
and colleagues (2009) found that kindergarten number competence, including skills such as
counting, number recognition, number comparisons, and non-verbal calculations, predicts the
rate of growth of mathematics achievement from first through third grade. Individual differences
in early math abilities are also stable over childhood: Children who start off with better
mathematical understanding often become more competent in math than their peers (Aunola,

To explore the relationship between school-entry skills and later achievements, Duncan
and colleagues (2007) conducted a meta-analysis using six longitudinal data sets, which included
data on early academic performance, socioemotional skills, attention, and later achievements.
They found that school-entry reading and mathematics achievements predict children’s later
academic performance. In addition, among all of the variables, early math ability is the most
powerful predictor of the child’s later achievements – even stronger than reading, attention, or
social skills, regardless of children’s gender or socioeconomic background. Their findings direct
attention to current mathematics education in early childhood settings.

The 2002 joint statement issued by the National Association for the Education of Young
Children (NAEYC) and the National Council of Teachers of Mathematics (NCTM) highlights
teachers’ central role in providing high-quality mathematics education to young children
(Clements, Copple, & Hyson, 2002). They suggest that teachers need to recognize the
importance of establishing a good mathematical foundation in early childhood, acquiring relevant knowledge and skills, and being provided with substantial support (Clements et al., 2002). Since then, researchers have developed various research-based curricula in the hopes of improving early mathematics education (e.g., Clements & Sarama, 2007; Greenes, Ginsburg, & Balfanz, 2004). Diverging from past literature on curriculum implementation, the current study aims to explore the foundation of teachers’ practices—their perspectives on early mathematics education and the barriers they perceive to including more math activities in class.

**How Much Math Are American Early Childhood Teachers Teaching?**

Despite American researchers’ recurring emphasis on early mathematics education in the research literature, American students perform worse in mathematics compared to students in other countries. Studies that compare international math abilities have consistently shown that Asian students—in particular Korean, Japanese, and Chinese students—outperform American students in various mathematical domains (Stevenson, Chen, & Lee, 1993; Stevenson, Lee & Stigler, 1986; Zhou, Peverly, & Lin, 2005). Siegler and Mu (2008) reported that Chinese children perform better than American children in arithmetic and novel mathematics problems prior to elementary school entry.

Cross-cultural studies have explored the differences between the early childhood learning environment in Asia and in the United States. Clarke-Stewart, Lee, Allhusen, Kim, and McDowell (2006) compared the learning environments at child-care centers and kindergartens in Korea and the U.S. Through observations and questionnaires, Clarke-Stewart and colleagues found that American classrooms tend to have more materials focused on motor activities and dramatic play, whereas Korean classrooms have more materials geared towards music and
mathematics. They suggested that this difference reflects a stronger emphasis on math learning in Korean primary education curriculum than in U.S. curriculum.

Indeed, previous literature has shown that American early childhood teachers are not teaching much math in classrooms. In their study, Graham, Nash, and Paul (1997) observed four preschool teachers from two preschools and coded incidences of math-related activities in class. They found that teachers rarely incorporated math into their classroom activities: within a total of 12 hours of observations of four teachers, only 14 instances of math discussions were observed, including two instances of song/rhyme, three instances of direct teaching, eight instances of brief discussion, and an instance of child-initiated teaching. Despite their beliefs about the importance of mathematics, the authors found that teachers spent minimal amount of time on math instruction.

Further research has supported the above finding of limited math instruction in classroom. For example, a more recent observational study by Phillips, Gormley, and Lowenstein (2009) provided data on teachers’ time allocation in 106 classrooms in Tulsa, Oklahoma. This study looked at pre-K programs run by the Tulsa Public Schools and Head Start. They found that these preschool teachers spent the largest amount of time on literacy and social skills, with less than half as much time on math (mean proportion of time spent was 24-30% on literacy, and 11-17% on math, across the two program types). They also observed differences across program types, with Tulsa pre-K classroom teachers spending significantly more time on math activities than Head Start teachers (mean proportions of instructional time spent on math were 17% and 11% in Tulsa pre-K and Head Start classrooms respectively).

There are also large discrepancies in the amount of time spent on math between the teacher reported time and calculated classroom observations, bringing the validity of teachers’
self-report into question (Hindman, 2013). Before classroom observations, teachers reported the frequency of children engaged in math-related areas, such as numbers, shapes, patterns, and measurement, using a six-point scale. While almost all teachers reported doing math every day, after completing three 20-minute observations of each teacher (using the Instructional Support domain of the Classroom Assessment Scoring System), researchers observed that only 6% of the teachers consistently carried out math activities, and 50% of the teachers did not teach mathematics at all.

All in all, findings from previous observational and self-report research suggest that teachers are spending less time on math than other subjects and than their international counterparts. Thus, researchers and educators raise concerns about the low level of mathematical input in preschool classrooms. However, the observational nature of previous studies failed to provide an opportunity for teachers to voice out their difficulties with math teaching. Instead, researchers in these studies often stepped into the classrooms and evaluated teachers’ practices without an in-depth understanding of teachers’ situations. Unlike previous research on teachers’ time allocation, this study aims to explore various factors that could explain the limited time spent on math by taking teachers’ perspective into account. This understanding would help to inform change in teaching practices, thus promoting math learning in early childhood classrooms.

**How Are Researchers and Teachers Addressing Early Mathematics Education?**

There are various types of small- and large-scale early mathematics interventions in classrooms to promote math learning and improve children’s performance. Small-scale interventions include research-based classroom activities (Ramani & Siegler, 2012) and digital manipulatives such as an interactive audio-visual device (Khandelwal & Mazalek, 2007). Other
researchers have evaluated certain preschool mathematics routines; for instance, Ethridge and King (2005) criticized that calendar math fails to meet children’s developmental needs.

In order to assist teachers in mathematics education and to facilitate young children’s mathematical development, past literature places emphasis on the importance of research-based mathematics curricula and their positive effects on children’s learning (e.g., Ginsburg, Lee, & Boyd, 2008). Experts in early childhood development have created research-based interventions and curricula such as Building Blocks (Clements & Sarama, 2007, 2008), Big Math for Little Kids (Greenes et al., 2004), Everyday Mathematics (Isaacs, Carroll, & Bell, 2001), Number Worlds (Griffin, 2004), and the Creative Curriculum (Dodge, Colker, Heroman, & Bickart, 2002). These curricula take different approaches to the teaching of early mathematics; for example, while Building Blocks and Big Math for Little Kids focus on children’s learning trajectories by using a suggested day-to-day schedule, the Creative Curriculum provides a more flexible theme-based structure for teachers. Other preschool interventions, such as the one developed by Arnold, Fisher, Dotoroff, and Dobbs (2002), encourage integration of activities into daily classroom routines, such as circle time, transitions, mealtimes, and group activities. Developers have carried out extensive research in hopes that the implementation of their curricula would be increased, which would help to improve the quantity and quality of early mathematics education in American classrooms, especially for children from lower socioeconomic backgrounds (e.g., Clements & Sarama, 2007; Griffin, 2007; Starkey, Klein, & Wakeley, 2004).

In addition, some teachers regularly partake in professional development that encourages them to use research-based curricula and to improve their instructional quality (Ginsburg et al., 2006). Lieber and colleagues (2010) found that coaching and mentoring are associated with
higher level of implementation of curricula in the classroom. Clements and Sarama (2008) suggested that 50 hours of focused group sessions and in-class coaching were necessary for high-quality implementation of a new curriculum. The combination of training workshops and coaching not only increased the amount of math talk in preschool classrooms (Rudd, Lambert, Satterwhite, & Smith, 2009), but also strengthened teachers’ understanding of children’s learning trajectories (Clements & Sarama, 2007). Curricula such as Everyday Mathematics also provide extensive online support in order to assist teachers as they carry out lesson plans (CESM, n.d.).

**Barriers to Carrying Out Math Teaching in American Preschool Classrooms**

Provision of research-based curricula does not necessarily guarantee more math activities in the classroom over time. Previous literature has shown that teachers’ participation in early intervention programs often decreases over time (Baker, Kupersmidt, Voegler-Lee, Arnold, & Willoughby, 2010; Lieber et al., 2010). When teachers were asked to record the activities they did in a Weekly Classroom Activity Log, Baker and colleagues (2010) found that teachers’ participation in activity implementation began to decrease starting from the first week of intervention, falling from 88% of Week 1 activities to 53% of Week 21 activities. Within-week analyses further indicated that the implementation rate of math activities was the lowest among the four types of activities, when compared with dialogic reading, pre-literacy, and communication activities. This evidence suggests that teachers in other intervention implementation research may also gradually reduce their use of certain interventions. This raises the issue of how to sustain the use of research-based interventions.

While many developers believe implementation fidelity is a crucial contributor to the success of interventions and children’s improvements in mathematics (Sarama, Clements, Starkey, Klein, & Wakeley, 2008), it is likely that teachers only implement parts of the curricula
according to their preferences or the needs assumed of their classrooms. In their study, Lieber and colleagues (2010) explored factors that are associated with the level of implementation of the Children’s School Success curriculum (CSS), a research-based intervention for young children who are at risk for school failure. They interviewed the teachers and identified factors that are associated with their level of implementation. The authors found that most teachers only employed parts of the curriculum (partial implementers) and few teachers carried out the entire curriculum a year after it was first introduced. They reported that of all 43 teachers in the study, 12 did not continue using the curriculum, 26 were partial implementers, and only five were full implementers in the following year. Among teachers who only used parts of the curriculum, the math component was used the least. Furthermore, according to Odom and colleagues (2010), some teachers implemented more activities from the literacy section than the mathematics section: they only completed two-thirds of the math component in CSS versus three-fourths of the literacy and social components. These findings suggest that teachers may have a preference for one subject over others, or that there are competing priorities in preschool education (Hindman, 2013). The current study aims to explore teachers’ reasoning for their preferred focuses in class and to identify barriers that discourage teachers from placing a higher priority on mathematics.

To address the problem of low implementation, studies have explored factors that are associated with teachers’ implementation of new curricula or intervention programs. These factors could be placed under teacher or school categories.

**Teacher factors.** Teachers’ concerns about the intervention before training were found to be associated with a lower level of participation (Baker et al., 2010). Through interviews and classroom observations, Lieber and colleagues (2009) found that teachers’ desire to be creative
and flexible, issues with classroom management, and poor relationships with a classroom assistant or coteacher in the classroom are related to a lower level of implementation; whereas teachers’ receptivity to training and having similar beliefs as the program philosophy are associated with a higher level of implementation.

**School factors.** Teachers’ participation also depends on their working environment, including the type of early childhood program, their job satisfaction and commitment (Baker et al., 2010), support from administrators and consultants (e.g., Lieber et al., 2009; Lieber et al., 2010; Payne, Gottfredson, & Gottfredson, 2006), and organizational capacity (Payne et al., 2006). As Sarama, Clements, and Henry (1998) described in their research findings, there is a complex network of factors that influence teachers’ use of curricula and interventions. It is difficult to precisely outline the interplay of variables.

There are also questions regarding the efficacy of professional development on teachers’ practices. Even when teachers are given substantial support and professional training, most do not continue using the new curriculum over a long period of time (Baker et al., 2010). Additionally, some educators may be skeptical about the benefits of professional development on students’ education. A recent study reported that after a few months, students whose teachers received 8 hours of training improved by about 0.1 point higher than the control group in the Prekindergarten Primary Screener for Mathematics (PK-PSM). While the posttest results were found to be significantly different between treatment and control groups, the proportion correct difference in test performance was minimal between the two groups (Brendefur, Strother, Thiede, Lane, & Surges-Prokop, 2013). While preschool teachers often report attending workshops and training, one-shot or short-term sessions may have little influence on teachers’ beliefs and practices (Fullan, 1979, as cited in Fullan & Stiegelbauer, 1991; Sarama, DiBiase, Clements, &
Spitler, 2004). Experts in the field of early mathematics education are still searching for the most effective type of professional development (e.g., Ginsburg et al., 2006; Sarama et al., 2004).

Educators and researchers face various challenges as they provide workshops to encourage more math learning in early childhood settings. Examples of barriers include: teachers’ reluctance to participate in training and to use the curriculum, lack of support from administration personnel for teachers, administration’s limited knowledge about early mathematics education, teachers’ varied beliefs about play and instruction, and their lack of content knowledge about mathematics (Ginsburg et al., 2006). These obstacles are associated with a lower likelihood that teachers will implement early mathematics programs, and a reduced effectiveness in providing math instruction. Taken together, despite the variety of existing support provided by educators and researchers, teachers continue to spend little time on math in early childhood settings.

What Role Do Teachers’ Beliefs Play?

Instead of focusing on the available resources and support, another approach to this issue is to consider teachers’ personal beliefs and their perceptions of early mathematics education. As Lieber and colleagues (2009) concluded that, it might be difficult for professional development to overcome teachers’ preexisting beliefs and values in order to bring about behavioral changes. Teachers’ attitudes about math and their limited knowledge of mathematics standards might be a prevailing factor to consider: Lee and Ginsburg (2009) reported various misconceptions that teachers hold, including that young children are not ready for mathematics education, that activities related to numbers and shapes are sufficient, and that reading and literacy are more important than mathematics. These beliefs continue to influence the ways in which teachers
address math in the classroom. Teachers who have an inaccurate understanding of early math may not provide challenging activities that would stimulate children’s math learning.

Past research has shown the coherence between teachers’ mathematical beliefs and their teaching. Through case studies of three junior high school teachers, Thompson (1984) demonstrated that teachers’ conception about math and math teaching are closely associated with their instructional methods in class. For instance, the teacher who viewed math a static subject presented it “as a collection of more or less arbitrary rules and procedures” and tried to control the learning progress of all students; for the teacher who viewed math as a dynamic subject, she introduced it as a creative and engaging topic and allowed students to explore on their own. As Trice and Ogden (1986) showed, first grade teachers who are most anxious about math allocate less time on math activities than less anxious teachers.

Teachers’ negative perception of math often appears even before teachers enter the school setting—when they are preservice teachers. Kelly and Tomhave (1985) assessed 43 elementary education teachers’ math anxiety, “a fear of failure when students attempt to learn the content and process of mathematics.” Results showed that female elementary education teachers in the study scored significantly higher in the Mathematics Anxiety Rating Scale than other groups, including male elementary education majors and college seniors and freshmen with minimal or no mathematics preparation (mean score of 30 female elementary education students was 245.6; mean score of 13 male students was 194.0). This finding suggests that a high proportion of female elementary teachers have a negative perception of math even before entering the classroom.
Not only do preservice teachers feel anxious about math, more experienced, in-service teachers also show math anxiety. A first-grade teacher expressed her feelings about teaching math:

I was never good at math; in fact, I hated it! If I didn't have the book with the answers, I was never going to do anything. In fact, I must confess… I began teaching first grade because I knew it didn't require much math. (Copley, 2004, p.401)

Thus, teachers’ fear of math affects the quality and the creativity of their math teaching.

Female teachers’ math anxiety also relates to female students’ attitudes and their mathematical achievements (Beilock, Gunderson, Ramirez, & Levine, 2010). Using the shorter version of Mathematics Anxiety Rating Scale, Beilock and colleagues assessed 17 female first and second grade teachers who had 13 years of teaching experience on average. At the end of the school year, they found that teachers’ math anxiety negatively relates to female students’ mathematical performance and their gender ability beliefs that boys are better in mathematics than girls. Additionally, girls who conformed more to the gender ability belief on math performed much worse than those who did not. A separate study by Stipek, Givvin, Salmon, and MacGyvers (2001) further showed that teachers’ self-confidence as math teachers correlates with students’ self-confidence as math learners. These finding suggest that educators’ attitudes play a crucial role in directing and encouraging math learning in the classroom.

Lee and Ginsburg (2007) looked at the pedagogical beliefs teachers who taught at low- and middle-SES preschools. The authors provided teachers with a series of written vignettes that depicted contrasting beliefs about early mathematics education. Teachers were asked to comment on the vignettes according to their own teaching experiences. They found that teacher at low-SES sites tended to support the use of ready-made mathematics curricula and materials, and
middle-SES teachers believed that math learning should be child-initiated and child-centered. Furthermore, teachers at low-SES preschools in the study believed that “mathematics education should be a pre-kindergarten priority,” but middle-SES teachers believed that social development should be prioritized instead. While findings provide information about the different pedagogies of preschool teachers at low- and middle-SES settings, Lee and Ginsburg did not address teachers’ current use of curricula, their views on support, and their needs in the classroom. To facilitate the effectiveness of professional development and curricula in the future, we believe teachers’ views on existing support should be addressed as well. As teachers’ personal perspective toward early mathematics is a contributing factor to the limited amount of math taught in class, the present study aims to explore their opinions through one-on-one interviews.

Current Study

To our knowledge, there is no research that provides a closer examination of preschool teachers’ needs and their general views on published early mathematics curricula. Previous studies on early mathematics interventions have mostly examined implementation fidelity, student performance, and the effectiveness of relevant professional development. Teachers’ involvement in curriculum development has been limited to some participation in the development and evaluation stages, but rarely in the creation of new interventions. These studies briefly mention teachers’ involvement in classroom observations, field-tests, regular meetings, and formative evaluations (e.g., Balfanz, Ginsburg, & Greenes, 2003; Clements, 2007; Isaacs et al., 2001). However, few details have been reported on teachers’ specific opinions of new curricula, developers’ interview questions for teachers, and the changes that researchers have made according to teachers’ feedback. Oftentimes, teachers are only actively involved in the field-testing and training stages, but not during the initial planning or development.
A closer investigation into many of these studies reveals that researchers show little consideration for preschool teachers’ needs prior to the development of new curricula. Scientific interest in curriculum development has been sparked in recent years by the apparent disparity between research findings and the teaching methods actually used in classrooms, the ineffectiveness of those teaching methods, and/or the teachers’ lack of knowledge about children’s mathematical development (for specific examples of the developmental process of mathematics curricula, see: Balfanz et al., 2003; Clements, 2007; Clements & Sarama, 2008). While researchers commonly ask for teachers’ feedback on the activities they have teachers implement in their classrooms, these questions focus on topics specific to the curriculum (Carroll, 2001), rather than on the teachers’ perspectives and needs. To our knowledge, it is rare to find teachers’ needs as a primary focus in the development of new preschool mathematics curricula. The top-down nature of curriculum development and implementation may fail to meet teachers’ perceived needs and therefore inhibit the ultimate goal of improving preschool mathematics education.

The purpose of this study is to explore why teachers are not engaging their students in more math activities, by taking into account the barriers teachers perceive to early mathematics education. While previous literature has examined the reasons for low implementation of interventions, it is essential for researchers and developers to step back and consider the experiences of those tasked with implementation—the teachers themselves. It is critical to ask them for their views of early mathematics education, and, in particular, what they need and whether those needs are being met. Instead of introducing new instructional techniques and interventions, this project explores teachers’ desires, concerns, and perspectives regarding early childhood education. Specifically, this study aims to answer the following questions:
Do preschool teachers believe they are doing enough math in the classroom?

What challenges prevent teachers from including more math instruction?

What types of support are teachers receiving? Is this support adequate?

What do teachers need most in order to incorporate more math learning?

We will answer these questions by addressing preschool teachers’ current practices and attitudes toward early mathematics education. We hypothesize that existing preschool mathematics curricula do not meet teachers’ needs, such as their need for more hands-on, engaging activities (Lee, 2004). In addition, teachers who are content with their current practices in the classroom may be unaware that their math teaching is insufficient, and thus show little interest in carrying out activities from the curriculum or participating in workshops (Singh & Shifflette, 1996). Hence, explaining teachers’ general needs and their desired forms of support for early mathematics would provide a new and crucial viewpoint for researchers, who continue to collaborate with teachers to offer the best math education possible.

This research involved three phases of data collection: email and phone surveys, one round of teacher interviews, and then a follow-up round of interviews. The goal of the surveys was to collect background information on teachers’ current approaches to published mathematics curricula. Our survey focused on public preschool teachers’ use of math curricula since teachers at low-SES, publicly-funded preschools are more likely than those at middle-SES preschools to adopt ready-made mathematics curricula (Lee & Ginsburg, 2007). Additionally, qualitative interviews provided an opportunity for teachers to express their thoughts without strict limitations on their responses. Although there were several guiding questions, the interviews were mostly organic and unstructured conversations. Preschool teachers’ self-disclosure gave
invaluable insight into the research community’s previously incomplete understanding of teachers’ needs and perspectives.

Methods

1. Email and Phone Surveys

Participants. Teachers were questioned via a survey conducted through email and phone in December of 2013. A list of public preschools from the Connecticut State Department of Education website was used to access teachers’ contact information. Afterwards, an email survey was sent to a total of 195 public preschool teachers in Connecticut. Preschool teachers whose email addresses were not found online were contacted by phone, and were left a voicemail that included the primary researcher’s contact information. The overall response rate was 15 percent—a total of 31 teachers: 7 teachers returned the phone call, and 24 teachers replied via email. All respondents were female, public pre-K teachers. Questions related to teachers’ demographics were not included as it was not the primary focus of the survey.

Survey design. The email survey, which included a short description of the research being conducted, a list of questions, and the contact information of the primary researcher, was sent to the 195 public preschool teachers. Teachers were given approximately two weeks to answer the questions. Teachers who were contacted by phone were asked the same questions, listed below:

· Does your preschool own any published math curriculum, such as Everyday Mathematics or Number Worlds?
· Where did you get the curriculum? How did you know about the curriculum that you are using?
· How often do you use the curriculum? To what extent have you been following the curriculum?

· What is your curricular model? How do you select your math activities? (For example, adopting a mix-and-match approach or following a specific curriculum.)

2. Teacher Interviews, Round One

Participants. 15 preschool teachers from the Middletown, Wallingford, and Rocky Hill areas were invited to participate in interviews. Five of the teachers taught at preschools that collaborate with Wesleyan’s Cognitive Development Labs, and the remaining 10 teachers taught at four other preschools in Middletown. All teachers were either contacted and interviewed individually by 10 students from a psychology course (PSYC206: Research Methods in Cognitive Development and Education) at Wesleyan University, or by the primary researcher. These students had been volunteering at several preschools in Middletown for the course, and they conducted and transcribed the interviews as part of their course requirement. All but one of the teachers were female. In the first interview, 6 teachers taught in private centers, 5 in public pre-K, and 4 at Head Start. The average number of years teaching ranged from zero (recently graduated) to 35 years, with an average of 14.66 years.

Interview design. A list of guiding questions was created by the primary researcher (see Appendix A for interview script). The primary researcher conducted a pilot interview with the director of Neighborhood Preschool, a university-affiliated preschool, in order to ensure the relevance of the questions to preschool teachers. The interview was divided into two parts: Part One focused on teachers’ general opinions and experiences related to early childhood education, and Part Two focused specifically on math education. Students from PSYC206 received a brief training session to ensure consistency across interviewers. While students were allowed to select
questions they found relevant in their interviews, all were asked to include four specific questions, including: “Is support adequate? Why?” “What does the ideal support system look like?” “On an average day, how much time do you spend on math?” and “Are you using a math curriculum?” These questions were important for understanding teachers’ current practices and the support they received for early mathematic education.

The purpose of the interview and compensation to be provided at the end were both mentioned before scheduling and prior to the interview. Teachers’ responses were audiotaped and they received $10 for their participation. Interviewers from PSYC206 were asked to complete their conversations within 30 minutes (the lengths of the interview varied from 4 to 39 minutes). Teachers were given a debriefing sheet and the contact information of the primary researcher. Five out of 15 interviews in the first round of interviews were conducted by the primary researcher.

3. Teacher Interviews, Round Two

Participants. A second round of teacher interviews was conducted in late February by the primary researcher. Four new female preschool teachers from public schools in the Central Connecticut area participated. These teachers had responded to the email and phone survey in December. In one of the interviews, three other pre-K teachers in the same school opted to participate in the interview without prior notice; this interview session became a discussion group instead of a one-on-one interview. On average, the teachers who participated in the second round of interviews had 19 years of experience in preschool, ranging from six to 34 years spent teaching.

Interview design. The aim of the second round of interviews was to explore teachers’ views on performance standards and other challenges they might face in teaching math. We
devised these questions because most teachers from the first round of interviews mentioned following a set of standards, such as the Connecticut Preschool Assessment Framework (PAF) (Connecticut State Department of Education, 2008), instead of a particular curriculum. As previous studies have demonstrated the connection between teachers’ beliefs and practice (e.g., Thompson, 1984; Trice & Ogden, 1986), teachers’ attitude toward early mathematics standards could also influence their practices. Therefore, their perspectives on these performance standards became relevant in the current study. Moreover, it was unclear from the first round if the existing support met teachers’ needs. As neither of these topics was addressed previously, they were the primary questions in the second round of interviews.

In addition to the questions regarding teachers’ educational background and existing support, these four teachers were asked questions such as, “What do you think about the standards that you are following (e.g., PAF and the Common Core State Standards)?” “Are the math concepts developmentally appropriate?” “What are some challenges you face?” and “Which of the challenges you mentioned are outside sources actively trying to help you with?” The two-part structure and procedures for the second interviews were the same as those for the first interviews (see Appendix B for interview questions).

4. Analysis Procedure

**Email and phone survey.** Results were read multiple times by the primary researcher for coding. Information regarding teachers’ use of published math curricula (name of the curriculum, the extent to which teachers are using the materials, and reasons for using curricula) and their curriculum model (using a mix-and-match approach or strictly following the curriculum) was highlighted, tallied, and categorized. In addition, a list of previously or currently used published curricula was created.
Rounds one and two of teacher interviews. Audio recordings of the interviews were manually transcribed by the primary researcher, PSYC206 students, and research assistants in the Cognitive Development Lab. Pseudonyms were created for confidentiality. *Atlas.ti* was the primary data analysis and coding software used.

First- and second-level codes were generated in the data analysis process (Tracy, 2013). First-level codes are descriptive coding that provide specific information regarding “what,” “when,” and “how;” second-level codes are more conceptual coding that represent themes or categories of participants’ responses. In the present study, examples of first-level codes include teachers’ educational background, teachers’ use of curricula, and types of support. We also created broader, second-level codes such as teachers’ goals, practices, and beliefs. Second-level codes help to create a more comprehensive picture of teachers’ responses, and first-level codes provide specific examples under each theme.

The primary researcher read all of the transcripts three times and came up with first- and second-level codes. Afterwards, a second research assistant from the Cognitive Development Lab independently developed first- and second-level codes from four of the transcripts. To reach consensus about the coding, the two coders met to discuss the similarities and discrepancies between their codes and drafted a codebook, which included code names and their definitions. For practicing and editing purposes, the two coders separately coded a transcript based on the initial codebook. After comparing the codes and making adjustments, they came up with the final codebook, which was used to code all interviews in *Atlas.ti*. This ensured the accuracy of the codes by the primary researcher, who read and recoded all transcripts based on the finalized codebook (see Appendix C). For intercoder reliability, two coders randomly selected two of the transcripts and coded separately. The percent agreement of each transcript was calculated by
dividing the number of matched coding by the total number of coded data. The averaged percentage agreement was 75%.

In the results section, we report teachers’ lesson planning and practices in the classroom in the form of short summaries; the frequencies of codes and some quotations from the teachers are included.

To further explore teachers’ responses, the primary researcher created a web that indicates the associations between various codes. This process began with more specific, first-level codes then progressed to second-level codes. Relevant first-level codes were placed under various broader, second-level codes. For instance, codes such as “feel comfortable teaching math” and “positive attitude towards math” were categorized as “teachers’ attitudes.” The relations of second-level codes were explored in the same way. This network of codes helped to answer the question of “Why are teachers not doing more math?”

Table 1

*Participants’ Educational Degree by Type of Early Childhood Setting*

<table>
<thead>
<tr>
<th>Final degree</th>
<th>Head Start (n = 4)</th>
<th>Public pre-K (n = 9)</th>
<th>Private pre-K (n = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate’s degree</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>0</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

*Note. Associate’s degree includes the Child Development Associates (CDA) Credential. Missing information from one public pre-K teacher.*
Table 2

*Participants’ Specializations by Type of Early Childhood Settings*

<table>
<thead>
<tr>
<th>Specializations</th>
<th>Head Start</th>
<th>Public pre-K</th>
<th>Private pre-K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Childhood Education</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Elementary Education</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Special Education</td>
<td>0</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Curriculum and Instruction</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note.* Seven teachers reported specializing in two or more areas.
Missing information from one Head Start and two public pre-K teachers.

Table 3

*Teachers’ Average Years of Teaching Experience by Type of Early Childhood Setting*

<table>
<thead>
<tr>
<th></th>
<th>All teachers</th>
<th>Head Start</th>
<th>Public pre-K</th>
<th>Private pre-K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average years of experience</td>
<td>14.66</td>
<td>15.00</td>
<td>12.11</td>
<td>18.25</td>
</tr>
</tbody>
</table>

**Email and Phone Survey Results**

Tables 4, 5, and 6 indicate the number of incidences that teachers mentioned their current use of curricula, curriculum model, and reasons for using published curricula. For question 3 (“How often do you use the curriculum?”), teachers were considered as occasional implementers if they mentioned using curricula as a reference for their lesson plan or only select components of the curricula. In contrast, they were listed as frequent implementers if curricula were used on a day-to-day basis. The selection of materials from various sources was labeled as a “mix-and-match approach.”

It is important to note that not all teachers provided answers to every question in the survey. Furthermore, teachers’ responses were not mutually exclusive: eight teachers mentioned
using a curriculum/curricula while following a set of performance standards, such as the PAF, the Connecticut Early Learning and Development Standards (ELDS), and the Common Core State Standards (CCSS). Two teachers used a comprehensive curriculum and a math specific curriculum simultaneously.

Table 4

*Teachers’ Use of Curricula and Curriculum Model*

<table>
<thead>
<tr>
<th>Currently using published curricula</th>
<th>Not using published math curricula</th>
<th>Using standards as a guiding curriculum</th>
<th>Using a mix-and-match approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using a comprehensive curriculum (n=12)</td>
<td>Using a math specific curriculum (n=9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occasional implementation</td>
<td>Frequent implementation</td>
<td>Occasional implementation</td>
<td>Frequent implementation</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>4</td>
<td>17</td>
</tr>
</tbody>
</table>

*Note.* Table 4 shows teachers’ responses to interview questions 1 and 3: “Does your preschool own any published math curriculum?” and “How often do you use the curriculum?” Comprehensive curriculum is one that includes math and literacy, arts, or science. Performance standards include: CT PAF, CT ELDS, and CCSS.

Table 5

*Reasons for Using a Published Curriculum*

<table>
<thead>
<tr>
<th>Provided by the district (Decision of the school committee or supervisor)</th>
<th>Provided by the school</th>
<th>Kindergarten using the same curriculum</th>
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</thead>
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<tr>
<td>7</td>
<td>6</td>
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</tbody>
</table>

*Note.* Table 5 shows teachers’ responses to interview question 2: “Where did you get the curriculum? How did you know about the curriculum that you are using?”
Table 6

Published Curricula Mentioned in Survey Responses

<table>
<thead>
<tr>
<th>Published curricula</th>
<th>Frequency</th>
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<tbody>
<tr>
<td><strong>Comprehensive Curricula</strong></td>
<td></td>
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<tr>
<td>Big Day Curriculum</td>
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</tr>
<tr>
<td>Houghton Mifflin PRE-K</td>
<td>4</td>
</tr>
<tr>
<td>Creative Curriculum</td>
<td>2</td>
</tr>
<tr>
<td>Little Treasures</td>
<td>1</td>
</tr>
<tr>
<td>Teaching Strategies Gold</td>
<td>1</td>
</tr>
<tr>
<td><strong>Math specific curricula</strong></td>
<td></td>
</tr>
<tr>
<td>Everyday Mathematics (Pre-K)</td>
<td>4</td>
</tr>
<tr>
<td>Growing with Mathematics</td>
<td>2</td>
</tr>
<tr>
<td>Math Connects</td>
<td>2</td>
</tr>
<tr>
<td>enVisionMATH</td>
<td>1</td>
</tr>
<tr>
<td>Numbers and Math Program from</td>
<td>1</td>
</tr>
<tr>
<td>Handwriting Without Tears</td>
<td></td>
</tr>
<tr>
<td>Touch Math</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Table 6 shows teachers’ responses to interview questions 1: “Does your preschool own any published math curriculum?”

**Interview Results**

A first round of teacher interviews were conducted to get a general understanding of preschool teachers’ thoughts on their current practices. The first interview answered the following research questions: a) How are teachers teaching math in the classroom? b) Do teachers think they are doing enough? c) What kind of support are they receiving? d) Is support adequate?

Eight out of 15 teachers in the first round of interviews reported selecting and creating activities according to a set of performance standards, such as the PAF, while only one teacher reported fully implementing a published curriculum. As these standards appeared to be more
relevant to their practices than published curricula, we conducted a second round of interviews to further explore teachers’ perspectives on the standards. In the second interviews, we also looked into the effectiveness of various kinds of support in addressing teachers’ needs and challenges. The four teachers who participated in the second round of interviews contributed to our understanding of the following questions: a) What do teachers think about the standards they are following? b) Which of the math concepts do teachers think are developmentally appropriate for preschoolers? c) What challenges do teachers face when they are teaching math? d) Does the existing support address their challenges? Altogether, these two rounds of interviews provided insight into preschool teachers’ current practices and their reasoning for the amount of math activity they do in class.

1. Lesson Planning

Published curricula. Overall, four out of 19 teachers said they were currently using published comprehensive or math specific curricula in part or in whole, including: Big Day Curriculum, Everyday Mathematics, Growing with Math, High/Scope, and Houghton and Mifflin PRE-K. Moreover, ten teachers reported not following any preschool math curriculum, and two said they used to but no longer use the Creative Curriculum. Among teachers who were using curricula, only one mentioned following the daily teaching schedule of the Big Day curriculum, a scripted literacy-based curriculum with a math component. Other teachers did not follow curricula strictly and adopted a mix-and-match approach: selecting activities that were relevant to the lesson from the curricula. Five teachers noted that they also looked at math activity books for ideas.

Several teachers regarded the curricula they used as a helpful resource: “I don’t use it [the Creative Curriculum] much, but if I wanted to do something I haven’t done in a while, I could
always look back” (Brenda). These curricula provided teachers with ideas and activities to use; one teacher remarked, “I really enjoy the Everyday Mathematics because there are little things that you can do with them to just have math all the time” (Simon). Three teachers occasionally used parts of the curricula, when they found well-made materials for math activities. Lastly, district requirement was another reason for curriculum implementation—a teacher from public preschool said she did not have control over curriculum selection and she had used ten different curricula chosen by the school since she started teaching at her current site 24 years ago.

On the other hand, teachers also highlighted barriers to using any published math curriculum, particularly the inflexibility of its teaching schedules and the inability of curricula to meet children’s diverse needs. A teacher further explained that, “Educationally, everyone is differentiating… You’ve got so many different things that make it so I can’t just take a set curriculum in this classroom and make it work” (Elizabeth). Additionally, three teachers who had over 20 years of teaching experience did not find math curricula helpful, as they had sufficient ideas for math activities; one teacher said, “We’re doing more than what they’re trying to sell, so I was never too interested in purchasing any of them” (Jennifer). Two other teachers from a play-based preschool mentioned that published curricula did not match their teaching philosophy: “Our philosophy is ‘great is the mind of the child.’ I wouldn't want to set a stricter curriculum saying that we need to teach the kids four hours of math every week. I don't know… they’re too young. They still need to explore and find interest in it themselves” (Maya).

All in all, only one of the 19 teachers in both interviews fully implemented a published curriculum on daily basis—which was required by the school district. Other teachers either adopted a mix-and-match approach, or referred to curricula occasionally. Overall, teachers’ use of curricular materials was limited in the current study.
Standards and assessments. In total, 11 out of 19 teachers reported using the Connecticut Preschool Assessment Framework (PAF) as their guiding curriculum for lesson planning (CSDE, 2008a); two other teachers were using the Connecticut Early Learning and Development Standards (ELDS), an updated set of standards (CSDE, 2013). Most teachers who followed PAF and ELDS created their lesson plans and picked their activities and materials accordingly.

The PAF and ELDS not only provide suggestions for lesson planning and curriculum implementation, but also act as resources for teachers to observe and assess children’s progress in reaching their performance standards (CSDE, 2008a; CSDE, 2013). Teachers using the PAF are provided with a Flip Chart, which consists of brief descriptions and examples of what children can do at various ages (CSDE, 2008b). While ELDS includes one-sentence indicators of children’s performance in various age groups (e.g., “Count out a set of objects up to 4,” CSDE, 2013, p.43), there are no specific examples of how children would demonstrate those skills. Neither PAF nor ELDS includes detailed examples of assessments for teachers.

There are two main differences regarding the math standards in PAF and ELDS. Firstly, the math topics listed in the ELDS are more specific than those in the PAF. For example, components of “Relates number to quantity” in PAF are listed as the “Number names,” “Cardinality,” “Recognition of quantity,” and “Comparison” areas under the ELDS. Therefore, skills are more clearly illustrated in the ELDS. Secondly, PAF’s descriptions of children’s performances are not separated into small age groups, but are presented as “benchmarks for 2.5- to 6-year-old children.” In contrast, the ELDS divides children’s performance into seven age ranges, such as “24-36 months,” “3 to 4 years,” and “4 to 5 years.”
Since the first round of interviews revealed low implementation of published curricula, we directed our attention to teachers’ opinions of performance standards in the second interviews. The four teachers in the second round of interviews used various types of standards: one used the ELDS, another collaborated with her colleagues to create a math rubric that corresponded to the Common Core Kindergarten Standards, and the remaining two teachers reported using the PAF.

The two teachers were satisfied with the PAF—they found the math concepts in PAF developmentally appropriate. They explained that PAF not only considered children’s diverse ages, abilities, and needs, but also created room for teachers to be flexible with their lesson planning: “We did like the standards because it left us to have our creativity in our classrooms to do what we want to with the kids, but all through the standard [to] get them to the same point” (Roxanne). These two teachers said they were able to cater to students’ needs and interests because of the inclusiveness of PAF.

However, teachers also pointed out several limitations of the standards. The lack of specificity in both the PAF and ELDS made it difficult for them to follow through and to assess students’ level of understanding. Some teachers wished to receive standards with specific prerequisite skills and assessments: “That break down [of prerequisite skills] would be really nice… because then you can say, ‘Okay, so these are your prerequisite skills, you’ve got this, this, this [skill]. Oh, we need to teach this [another skill] in order to get there [the performance standards]’” (Joyce). Another teacher said, “I think for report card purposes, the standards are harder because it’s very subjective. And you can kind of say, ‘Hmm… maybe they [the children] are here [a certain level], or maybe they are there’” (Roxanne). Teachers also felt that the standards were too advanced for children with special needs. Another limitation was that some
math topics, such as geometry in the PAF, were missing. In those cases, teachers added the missing math areas into their teaching plans.

A few teachers mentioned the use of assessments. Three teachers reported using formal math assessments such as the High/Scope assessment tool, adaptations of the Smarter Balance, and other teacher-created, formal assessments. Two of these teachers also used informal assessments such as asking children to demonstrate patterning skills as exit activities and keeping the worksheets for their records.

**Children’s abilities and interests.** Teachers’ consideration of children’s diverse abilities and interests was evident in our conversations. To meet students’ needs, six teachers mentioned the importance of modifying activities for children of different abilities. One teacher told us confidently, “It’s easy for me to take one project and make it for people who are ready for the advanced things, in the middle, or still struggling” (Simon). On the other hand, a teacher pointed out that the modifications suggested by her curriculum did not meet students’ needs, and she had to rely on her teaching experience instead of the curriculum. For children who were not developmentally ready for more difficult math concepts, teachers said they had to aside time to teach the “more foundational skills,” such as learning to rote count before recognizing numbers. Moreover, having children work in small groups not only allowed students to help one another, but also created opportunities for teachers to work with children who needed more direct instruction.

Furthermore, preschool teachers tried making math activities fun and engaging in order to keep students interested, especially for slow learners and those who did not show interest in math. As one teacher said, “The most important thing is looking at the learner and saying based on the learners that you have in front of you, how are the best ways to motivate those children to
want to learn it” (Lydia). Teachers believed the use of food, toys, and students’ preferred counting manipulatives helped to maintain children’s attention on math activities.

**Collaborations with other teachers.** Nine teachers acknowledged the importance of teamwork in their lesson planning. These teachers worked with their colleagues on various tasks, including material preparations, evaluation of the day and the activities, and the development of assessment tools. They found it beneficial to be in frequent communications with other teachers, as they were able to share materials and ideas for math teaching. One teacher commented, “We all work together. The three year-old [classroom] teacher do something similar. Ours [math activities] are more advanced, but we’ll share materials that we each have” (Brenda).

### 2. Math in the Classroom

**Time and frequency.** The average time spent on math ranged from “about 30 minutes” to three hours, with some teachers reporting “an hour,” “a couple hours a day,” or “a third of the day.” Asked about how they came up with these estimations, some said, “because it’s throughout the day,” and “because we count all day.” One of the teachers mentioned that actual instruction was about ten to fifteen minutes per day.

Moreover, a total of eight teachers stated that they did math every day and ten said there was always a lot of math-related activities in the classroom. Teachers were also asked specifically what kinds of changes they were hoping to make to include more math or math curricula in the classroom: While most teachers noted that math was incorporated throughout the entire day, seven expressed they were open to including more math activities. One of the teachers felt she was not doing as much math as she should and another teacher pointed out that, “We probably have not focused enough on math…literacy has been the main focus” (Naomi).
Math topics. Examples of math activities mentioned by teachers were categorized according to their relevant math topics. While a total of 13 early math topics emerged from the interviews, counting was the only topic that was mentioned by all teachers, with a total of 78 incidences. The total number of counting examples was about four times greater than patterning, one-to-one correspondence, and number learning, with 21, 18, and 17 incidences in the transcripts. Other math topics included: shapes, comparison, sorting, measurement, addition, matching, graphing, estimation, and probability—with 14 examples of shapes activities and one example of probability.

Math activities. Ten out of 19 teachers reported having math activities during center time, in which math was included either daily or occasionally depending on the teachers’ planning. On the other hand, nearly all teachers mentioned doing math in their daily preschool routine. Teachers repeatedly said that they had students count as they were setting up the tables and getting food during snack time. Teachers also reported that students needed to count when they were at different activity stations, during morning circle time, or in line. One teacher used three-step directions as another example of math in daily routine. In addition, a majority of teachers tried to incorporate math in other activities, such as songs, storybooks, art projects, science activities, or outside time. Teachers specifically mentioned adding a counting component to these other activities. Five teachers, including two teachers from play-based or Montessori preschools, felt it was essential to incorporate math into children’s play. All in all, teachers frequently mentioned, “do[ing] math all through the day.”

Teacher-directed and child-initiated learning. There are two types of activities in preschools—teacher-directed and child-initiated (Schweinhart & Weikart, 1988). The teacher-directed approach refers to a teacher giving explicit instructions and guiding the learning
process; child-initiated learning means a child has control over what he/she wants to explore or work on, and the teacher assists accordingly. When asked about their teaching approach, most teachers reported adopting both methods depending on the situation, the math topic, and children’s needs.

Teachers used direct instructions for various early math topics, especially for counting, addition, and estimation activities. Instructions such as “How many pitchers do we need?” (Lydia) created learning opportunities out of ordinary preschool routine or other classroom activities. For example, a majority of teachers told us that they asked students to count during snack time.

Three teachers explained that teacher-directed learning was helpful especially when children did not initiate math activities by themselves, “If they don't come over [to the math center] on their own, we’ll call them over when we have space” (Brenda). This helped to ensure children received training and practice for various math skills. Additionally, three teachers said they needed to use direct instructions to assist children who needed more help with math. Two public preschool teachers further explained that most of the math topics had to be directly taught: “Because a lot of it [math learning] does come down to direct teaching, especially with numbers” (Roxanne). Overall, direct instructions were often used during morning circle time and center time.

Child-initiated learning was highly valued in the classroom as well. Children were free to select their toys or activities during playtime. Three teachers—two from public preschools and one from a private learning center—said that a child-initiated approach also helped to encourage independent learning, supporting children to learn “on their own.” Two teachers from a play-based program said that child-initiated learning was the central philosophy of the program,
though teacher-directed learning was included during circle time in the morning. One teacher, who had Montessori training background, said she created a structured environment for children by placing math-related materials for them to choose from.

As mentioned earlier, teacher usually integrated both approaches. While children were allowed to select their activities, teachers often reinforced their learning by providing direct instructions before, during, or after the activities. Three teachers mentioned having to demonstrate the skills before they let children play with the math manipulatives. As one of them noted, “I need them [the students] to learn pattern[ing] right now, so I have to direct[ly] teach it, and then let them go and explore with it” (Roxanne).

**Materials for math.** There are various ways for teachers to get materials. Two teachers reported buying materials from Lakeshore, a company that sells educational products, another used books from a curriculum, and one teacher used Montessori material. Though most teachers reported paying with school funding, one teacher said she had to spend her own money. While teachers mostly purchased their materials, one teacher at a private learning center said she participated in a “teacher swap,” which gave her access to materials that kindergarten teachers no longer need. One teacher from a play-based, private preschool said that teachers created wish lists for parents, who often donated fun materials. In addition to receiving materials from other sources, teachers who created their own math activities often gathered everyday objects or prepared printed cards for the students to practice counting and other math skills.

Most examples of materials given by teachers were used in counting, patterning, and sorting activities. Manipulatives such as count bears, Unifix Cubes, and blocks were popular choices for counting. Some gave students food such as M&Ms and Goldfish, and made them count during snack time. For art projects and outside activities, teachers reported using kernels,
leaves, and acorns for counting. Everyday objects such as bottle caps, buttons, mittens, and clothespins were used for one-to-one correspondence as well. In addition, two teachers mentioned using measuring cups and scales in measurement activities. Other materials included dice, flashcards, puzzles, and counting boards. Two other teachers specifically said they would use “whatever’s in the classroom.” In short, teachers were creative with their selection of materials for math teaching.

3. Why Are Teachers Not Doing More Math?

Overall, we found that teachers’ responses could be categorized into two major themes: sense of sufficiency and challenges. Most teachers in our study not only felt confident about their current practices, but also believed they had sufficient knowledge and materials for early mathematics education. On the other hand, they also reported certain challenges and limitations that prevented them from doing more math. These two overarching themes are helpful in understanding teachers’ beliefs about their current practices and the amount of math they do. Themes and their components are listed in Table 7.
Table 7

Themes from Teacher Interviews

<table>
<thead>
<tr>
<th>I) Sense of Sufficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal Factors</strong></td>
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<tr>
<td>Teachers’ beliefs</td>
</tr>
<tr>
<td>Practices</td>
</tr>
<tr>
<td><strong>External Factors</strong></td>
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<tr>
<td>Resources</td>
</tr>
<tr>
<td>Support</td>
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<tr>
<td></td>
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<td>Goals</td>
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</table>

<table>
<thead>
<tr>
<th>II) Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversity of children’s needs</td>
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<tr>
<td>Time</td>
</tr>
<tr>
<td>Resources</td>
</tr>
<tr>
<td>Support</td>
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</table>

### I) Sense of Sufficiency

Five themes associated with teachers’ sense of sufficiency emerged from the transcripts, including: “beliefs,” “practices,” “resources,” “support,” and “goals.” Here, we categorize beliefs and practices as internal factors, knowing that teachers often have the agency to choose what they believe and how they teach. On the contrary, resources, support, and standards given by outside sources are external factors that influence their math teaching. Together, both internal and external factors contribute to teachers’ sense of sufficiency, confidence, and satisfaction with their current practices.

**Teachers’ beliefs.** Teachers hold different beliefs about priorities and preferred practices in the classroom. These beliefs affect not only their teaching, but also illustrate their attitude
toward various aspects of early childhood education. When asked about their priorities, nearly all teachers mentioned the importance of all aspects in child development, such as literacy, social skills, science, and math. Yet teachers showed preferences for certain areas over others. As one public preschool teacher told us, “It [math] is important part of our pre-K, but it is behind the language” (Naomi).

To be honest I think that social skills are most important because if the child is not socially available to learn, if their behavior is not appropriate, or if their social or emotional needs are not met then they are not ready to learn math or literacy. (Daniela)

Subject-wise I think I tend to focus more on literacy, I think literacy is the biggest focus, probably the overarching focus. (Morgan)

Literacy is very important because literacy helps them learn to read and write and math helps them to be able to count and be ready for everything. Because preschool and kindergarten is different than it ever was when we were in school. What we [preschoolers] learned they [kindergarteners] need to learn more. And socialization, we used to just be working on the social but now we have to work on everything because kindergarten is a lot different. (Penelope)

The need to be flexible was mentioned frequently in the interviews. Flexibility was necessary mainly because of the diverse needs, abilities, and preferences of the children. As some children required more assistance than others, teachers needed to make spontaneous adjustments to their activities and lesson plans. Moreover, a number of teachers believed that the
early childhood setting allows room for creativity and the consideration of children’s needs; teachers mentioned their consideration of children’s interests and preferences as they selected materials for math. Two teachers also mentioned the needs of children from lower socioeconomic backgrounds. In addition, the preschool environment usually includes unpredictable elements. Two teachers noted the need to spend more time on classroom management when children misbehave on a certain day. Inevitably, the amount of time for math would be shortened in such situations. Flexibility, therefore, enables teachers to be responsive to the needs and changes that happen each day.

At this age you have to be spontaneous. I could plan the best lesson plan in the world, but if the children are absorbed or focused on something else, it’s not, you know, my agenda is not always going to be the topic… They can learn so much, so it’s…but we do plan a lot, but like I said, at the same time, with this age group, I think it’s real important to be spontaneous. (Jennifer)

In general, I think that preschool is a wonderful place to be teaching because we are at this time in this nation, afforded creativity and afforded flexibility in the way that we want to teach things. (Morgan)

We have to be creative and figure out how we are going to teach sorting or counting. That’s in our lesson plans every week. (Katherine)

Because of the diverse needs of children and the nature of the early childhood setting, teachers claimed their autonomy in planning allows flexibility in classroom. Teachers expressed
a sense of autonomy in their practices: They decided what to include for each lesson, selected materials, and modified activities for children with different needs and interests.

Well, certain things you’ll modify for certain children. So if I was doing an adding thing with one child that I knew was ready for adding, we’re adding Unifix cubes or whatever the case, and another young child comes along and says, oh, but I want to do that, too, but I know that they’re not at the level to add, I’m going to modify it for them. (Jennifer)

I think of each of the curriculum areas and what could be used to get the children to focus on math things, so I choose things that would be appropriate to what we are working with in math. (Morgan)

Lastly, nearly all of the teachers expressed a sense of confidence about their current math teaching. With regards to early math, two teachers specifically stated their personal interest and confidence in math, which motivated them to intentionally incorporate more math activities. Although two teachers said math was not their best subject when they were young, none of the teachers reported having anxiety about math as a subject or early math teaching. Overall, 13 teachers expressed comfort with early math education.

I personally am very mathematical. Math has come really easy to me, not something I loved, but just something natural... I am very analytical in my thoughts process so I think that helps me dissect things and break it down to a level the children can understand.

(Daniela)
I think we’re [doing] okay because I think, you know, both the head teacher and I went to school for Early Childhood, and both of us have a degree in Early Childhood. So I think we know what we’re doing. (Laurel)

**Practices.** Teachers were generally comfortable with the amount of time spent on math and the way they taught it. When asked about the structure of math time, teachers pointed out that many activities they did involved math. As a result, they are “doing math every day,” ranging from 30 minutes to “a third of a day” on average. Whether it was a teacher-directed or child-initiated activity, independent or structured math learning, children were often engaged in counting. As reported above, all teachers used counting as the primary example of their math activities. Teachers in the interviews carried out fewer activities related to areas such as shapes, sorting, and measurement as compared to counting activities. No teachers expressed the desire to include more math activities until they were asked about the changes they would like to make regarding math teaching. All in all, teachers seemed satisfied with their lesson planning and math teaching in class.

We start in the morning time…we do our numbers at the first circle. Then the second circle they do it again. When we are doing blocks they are only supposed to be playing with blocks…if I put five blocks here and you take one away and you count them how many blocks are left. So we basically do math, roughly three hours a day. (Charlotte)

Actually, we do more than ten minutes because we count all day. (Penelope)
Resources. Teachers mentioned various kinds of resources available to them to get new ideas for classroom activities, including professional development, the Internet, and published curricula. While not every teacher listed all of the above resources, most of them expressed their satisfaction with the variety of help they had received. Specifically, the training and workshops that they attended had given them more ideas for their classrooms.

We actually like having the math classes because it opens our eyes to better things and easier ways to teach the math without getting frustrated. (Penelope)

I look forward to that [the Keefe-Bruyette Symposium at the University of St. Joseph] every year cause I like to leave there with hands on tactile objects that I can bring back to the classroom and work with the kids. (Roxanne)

Support. Thirteen teachers reported feeling supported in their math teaching, particularly by school funding for math materials and professional development. As they described the types of support, teachers repeatedly mentioned training, materials, and ideas for math activities. However, none of the teachers listed published curricula as a type of support. Regarding sources of support, five teachers talked about recognition from their principals, four mentioned parents, five said there was support from an educational specialist or program coordinator, and three mentioned the training offered by the school district. Two teachers also noted that assistant teachers and new teachers needed more support than head teachers and directors who are more experienced. Despite the minimal support they had received, most teachers were satisfied with what they were given, considering their personal knowledge about children’s mathematical development and the range of online resources.
And if there were a course or workshop being offered that I knew about, if it was pertaining to math, Ms. R [the principal] would certainly support staff members going. (Brenda)

I know that if there is something specific that I wanted to improve upon, I could ask for approval to get some more professional development and I know I would be supported in that way, and I have taken workshops in that. (Morgan)

I’m very confident in what I’m doing, and they [the principal and the administrators] are very supportive and confident in what I’m doing. So it’s working out. (Simon)

**Goals.** Performance standards, such as the PAF and EDLS, were given to teachers in early childhood settings in Connecticut, including preschools, learning centers, and day cares. While most teachers are given the freedom to approach these benchmarks differently, most chose to adopt a mix-and-match method by selecting activities and materials from various sources. However, one public school teacher was required by the district to follow the scripted Big Day Curriculum, instead of selecting her own materials, to meet the PAF benchmarks. Some teachers did not follow the framework entirely either because the children were performing beyond the standards or were learning at a slower pace. Altogether, reaching state standards and other assessment requirements was perceived as an important goal in early childhood education, as it provided direction and guidance for teachers. Teachers were generally content with their performance regarding their responsibility to follow the state standards or other teaching requirements.
We just go by the framework—the state of Connecticut Framework—it doesn't say anything particular, there’s not a name for it or anything. They just say, “Go through this, and develop your plans.” (Simon)

Our kids are mostly above and beyond their framework [PAF]. They really are. Because we really provide a very good program here. I’m very proud of what we do here. The kids are usually well beyond what the Connecticut Framework [PAF] is. (Jennifer)

II) Challenges

Despite an overall sense of self-sufficiency, several challenges in the classroom emerged from the interviews as teachers discussed their ideal types of support. These challenges place limitations on the ways that teachers carry out mathematics activities in class. The following four factors make it difficult for them to include more math activities or to teach math with their preferred approaches: the diversity of children’s needs, limited time, limited resources, and inadequate support.

Diversity of children’s needs. When asked about the main challenge with math teaching, teachers repeatedly mentioned the diversity of children in their classrooms; especially for teachers in classrooms with a wide age range. Teachers needed to consider the abilities and needs of each child. Often times, there were some students who performed beyond the standards and others who needed more assistance with math. Three teachers said that they needed to teach children the basics before they could move on to more difficult concepts. Two other teachers told us that it was more difficult to teach children with behavioral issues or special needs in general, not to mention mathematical concepts.
So I think the diversity of learners is probably one of the hardest things to do, just because they’re all over the gamut of ability. (Roxanne)

If you are working, let’s say, with a group of three children, you have a five-year-old, a three-year-old, and a two-year-nine-months. It can get tricky. (Samantha)

Not only are they [the children] ultimately going to have diverse abilities, they are very diverse in terms of the speed of development. So, some kids are going to learn very quickly, and then they’re going to get there fast; some kids are going to learn slowly, but then they’re going to get there. So you have this range of ability, this range of pacing of their growth and development, and all of that combined together makes it really tricky. (Elizabeth)

The diversity of children also reflects differences in their preferences. Five teachers mentioned their difficulties engaging students in math activities. In addition to children’s short attention span, other materials—such as items on the sensory table—often seemed more appealing to the students. Therefore, uninteresting materials tended to go unnoticed during center time or playtime. Teachers also said it was sometimes difficult for them to come up with new materials or activities that would keep students engaged, regardless of their knowledge about early math, their resourcefulness, or their creativity.

The hard part is kind of just getting them interested in it. Our math table kind of goes unnoticed at times, if the game doesn’t have enough pieces to it. They kind of just walk by it. (Maya)
They are not really interested in the math part, not really interested in the counting…So we try to find different ways to get them to start counting and learning. (Penelope)

Mm… Sometimes I don’t [try to engage the students]. The only way to really engage them if they’re not interested is for one of us teachers to go to the math table and sit down and start playing with the stuff, and then the children will choose to come, because they like to be with us. So it’s us. I mean, without us, a lot of times they just don't [do math activities]. And if we’re busy doing other things and every child is occupied and busy, then we just don't do it [math]. (Elizabeth)

**Time.** According to the PAF, teachers had to meet the benchmarks in four domains. Teachers who were working at half day preschools said it was sometimes difficult for them to fit math into their daily schedules. Another teacher noted that it was usually more challenging for children to learn math in the first half of the year because those who were new to school had to get used to the rules and routines. Program length and other competing priorities reduced the amount of time teachers could spend on math.

We have so many issues going on in here. Learning sometimes is hard because we’re still trying to deal with all of the new kids that we have in this room and just get them to follow the rules, let alone learn math. (Laurel)

**Resources.** The amount and quality of materials were relevant to teachers’ practices as well. Ten teachers mentioned wanting more materials and ideas; although they could make do
with what they were already provided with, teachers commented that having more materials and ideas would allow them to create more opportunities for math learning in class. Two teachers suggested that more training would give them new ideas for math activities.

If we had more ideas, even more materials. We don't have, as you can see, very much. If we had more things to do, or more materials… I feel like they could learn better that way with more materials. (Charlotte)

Support. Although teachers reported feeling supported overall, they highlighted a lack of feedback when they were asked about their ideal kind of support. Feedback and support for practices would not only help to improve the teaching quality, but also teachers’ confidence. Two teachers, both from public preschools, said they would like to receive more feedback from math specialists in order to improve their teaching and to include more math activities. Another teacher said that feedback was particularly important for new teachers.

It would just be nice to know the trajectory that you’re on, that what you’re doing is the right one. It would be nice if you could be doing things more efficiently, or making it more developmentally appropriate. It’s just always nice to know more. (Joyce)

And I feel like I’ve never heard any feedback from a kindergarten teacher saying, ‘He doesn’t know how to count,’ or ‘She doesn't know how to sort.’ You know, it’s never about math. You don't really get that feedback. (Joyce)

I would prefer that they came in and modeled and then was here while I was doing it, and gave me feedback on what I was doing. (Naomi)
Furthermore, three teachers stressed the importance of having more support for the implementation of new performance standards, such as the ELDS. A public preschool teacher explained her frustration with the lack of explicit guidance; in particular, she hoped to be told the priority of various math topics, so as to focus more on the most essential math skills.

You know, I seriously think, Angela, this [ELDS] has been thrown at us. And it’s brilliant, but there’s been very little support to implement it. It’s great, we have it. But it’s almost like, “Okay, this is it. Work out how to put it in place, work out how to achieve this yourself.” (Joyce)

Discussion

This study explored the current practices of teachers in early math education, as well as their needs, the support they receive, and their opinions of early math. The majority of previous literature fails to fully consider these factors, instead focusing on curriculum implementation or professional development. The purpose of the current study is to shed light on teachers’ perspectives on early math education, in the hopes of improving professional development and future support for teachers.

Current Practices

In spite of early childhood researchers’ efforts to promote research-based curricula (e.g., Clements & Sarama, 2011; Ginsburg et al., 2008), few teachers reported using published math curricula regularly. Instead, teachers see curricula as a source for ideas to which they refer occasionally. Both survey respondents and interviewees mentioned using performance standards such as the PAF and ELDS as a guide for lesson planning in place of published curricula. These
teachers do not follow a strict teaching sequence; they incorporate various types of math activities throughout the day, or at a specific time of their choosing. With this flexibility, many teachers report adopting a mix-and-match approach by selecting activities and materials from various sources that they find appropriate.

Furthermore, all of our teachers provided examples of counting as a common activity. Not only is counting their primary mathematical focus, but they also consider counting throughout the day as “doing a lot of math.” This finding reinforces past research on teachers’ preferred math focuses, which has shown that teachers often pay more attention to number acquisition and the understanding of quantity than other mathematical areas (Lee & Ginsburg, 2009). Sarama (2002) also asked teachers to select their top three mathematics activities: results showed that 67% of the teachers chose counting, 60% chose sorting, and 50% chose numeral recognition as their top choices. Although we did not ask teachers to select their top activities here, counting was mentioned most frequently, followed by patterning, one-to-one correspondence, and number learning. We hypothesize that this could result from teachers believing that counting is a fundamental mathematical skill, or perhaps that is easier to teach than other topics, such as estimation. In fact, past literature has emphasized that teachers should expand their current focus on basic arithmetic or numeracy to other math areas, because “early childhood mathematics is both broad and deep” (Ginsburg et al., 2006; Lee & Ginsburg, 2009). Future studies should consider ways to broaden teachers’ conceptions of early math so as to provide children with a more comprehensive learning experience (Ginsburg et al., 2006).

Based on their assumption that counting and arithmetic skills should be the main focuses of early mathematics education, many teachers are generally satisfied with the amount of math that they do. Teachers reported that they teach mathematics from 30 minutes per day to a third of
the day, or approximately three hours. Most teachers participated in our study believe that “math is all around us,” and they try to incorporate it into various types of classroom activities. Overall, the teachers expressed a sense of contentment with their current practices.

**Barriers to More Math Teaching**

When asked about priorities in their classrooms, only three out of 19 teachers mentioned math. Our findings are in accord with past studies that most teachers placed a greater emphasis on language and/or social skills than on math (Odom et al., 2010; Phillips et al., 2009). As suggested by Hindman (2013), competing requirements and priorities in preschool settings may reduce the amount of time that teachers spend on math.

To answer the question of why teachers are not doing more math, we explored teachers’ difficulties with math teaching. Some preschool teachers find children’s diverse abilities and needs, time limitation, insufficient resources, and inadequate support for standards implementation especially challenging. Regarding support for ELDS, the new performance standards in Connecticut, there is inadequate guidance and feedback from math specialists on teachers’ current practices. These challenges could further restrict the variety and quality of math activities for young children.

Earlier research has suggested that a possible barrier to time spent on math is teachers’ own math anxiety: teachers who are most anxious about math allocate less time to math activities (Trice & Ogden, 1986). However, our teachers did not report having such anxiety. On the contrary, there was a sense of satisfaction with their current math teaching: teachers are confident in their ability to engage students in math activities in a variety of situations, their responses to students’ needs and preferences, and their flexibility and creativity. Our findings
further demonstrate that some teachers feel positively about early math, particularly in regard to counting-related activities.

Despite the potential benefits of teachers’ confidence, we suggest that this sense of sufficiency may prevent them from believing it necessary to improve their math teaching or to reflect upon their conceptions of early math development. As Singh and Shifflette (1996) pointed out, teachers need to recognize the limitations of their current practices for improvements to occur. Although teachers feel confident about their knowledge and experiences with early math, they find it difficult to engage students in math activities at times. This indicates a discrepancy between teachers’ self-evaluation and children’s engagement in math learning. Instead of identifying the limitations in their teaching approaches, teachers in our study attributed the children’s lack of interest to their preference for other activities, or the design of materials. Preschool teachers who do not receive constructive feedback from math specialists or training might be unaware of their limited knowledge of children’s mathematical development, or ways to encourage children’s interest in math.

Support and Teachers’ Needs

In spite of the challenges associated with early math education, nearly all teachers reported feeling comfortable and supported teaching math. Teacher identified professional development, funding, or materials from other teachers, parents, principals, and the state or the school district as common types of support. Notably, none of the teachers we interviewed listed published curricula as a type of support; most teachers did not talk about their use of published math curricula unless they were asked specifically. One possible explanation is that few are currently implementing a published curriculum in the first place. Another possibility is that teachers view curricula as simply resources for ideas, rather than support. Teachers’ knowledge
of math, the scripted day-to-day schedules of many curricula, and inflexible activities are the primary reasons as to why teachers may not find published math curricula helpful. Yet, researchers created research-based curricula to provide teachers with guidelines that would broaden teachers' knowledge of the subject matter, rather than place strict limitations on their teaching (Clements & Sarama, 2011). Further research on teachers’ opinions toward published preschool math curricula is necessary for formatting existing curricula in more useable way, such that research-based materials would be considered an essential source of support, instead of merely as a reference for ideas. On the one hand, teachers need to be aware of the importance and relevance of research-based curricula to fully utilize such materials; on the other hand, curriculum developers need to clearly convey the purpose of their materials and their expectations on teachers’ implementation.

Contrary to our expectations, nearly all teachers reported using a set of standards instead of fully implementing a published curriculum. This finding stresses the need for a closer look at teachers’ perspectives on state standards. Teachers suggested that standard developers specify the prerequisite skills required for children to reach various math standards. Additionally, formal assessments for each math skill would assist teachers in providing appropriate math instruction for children who are falling behind and for those with special needs. With the lack of specific guidelines and feedback, teachers who are new to the ELDS do not feel confident about meeting the requirements. For this reason, teachers find receiving feedback on current math teaching necessary for improving their instructional quality. In fact, the teachers’ desire for feedback and teaching demonstrations aligns with researchers’ recommended process of change: “Learning by doing, concrete role models, meetings with resource consultants and fellow implementers, practice of the behavior, and the fits and starts of cumulative, ambivalent, gradual self-
confidence all constitute a process of coming to see the meaning of change more clearly” (Fullan & Stiegelbauer, 1991, p.85).

Implications and Future Directions

To our surprise, most teachers we interviewed expressed a sense of satisfaction with their current math practices and existing forms of support. Our findings provide contrary evidence to the existing literature, in which teachers’ lack of incentive and knowledge are the primary explanations for the small amount of math taught in class. Moreover, most studies on math professional development focused on the content knowledge and instructional quality of teachers at elementary schools or above, rather than at the preschool level. While several have explored the topic of early math professional development and discussed its benefits, researchers are still searching for the most effective form of training for early childhood teachers (Copley, 2004; Ginsburg et al., 2006; Sarama et al., 2004). In light of teachers’ challenges and needs, we thought of several ways to encourage teachers to do more math in the classroom, some of which echo recommendations from previous literature.

First and foremost, early math education workshops and training are crucial for broadening teachers’ knowledge. According to the NCTM (2000), “Effective mathematics teaching requires understanding of what students know and need to learn and then challenging and supporting them to learn it well.” Despite the above recommendation, teachers reported that most professional development they received focused on literacy and social skills, not mathematics. More math workshops, available specifically to early childhood teachers, will help convey the importance of early math education. Meanwhile, low implementation of published math curricula suggests workshops which focus specifically on the implementation of one
curriculum may be ineffective in increasing the amount of math learning in class; in contrast, training that targets teachers’ overall knowledge and instructional quality may be more helpful.

Similarly, training should be extensive and ongoing (NCTM, 2000, p. 370; Sarama et al., 2004). Instead of simply providing teachers with ideas for math activities, program developers and math specialists should aim to develop preschool teachers’ understanding of underlying mathematical concepts. In addition, having more specific expectations in the standards would help teachers to accurately assess children’s abilities and provide activities that are suitable for their next stage of math development, rather than having to guess what children’s abilities and needs are.

Teachers also express a desire to have more materials and ideas for math teaching. While published math curricula are a useful resource, early childhood teachers view them as inflexible, limiting, and unable to engage children with diverse needs and abilities. Rather than imposing day-to-day schedules, curricula that provide information on children’s developmental stages and examples of suitable activities would be more helpful for teachers looking for ideas.

Previous studies have shown how little math is taught in early childhood settings (e.g., Graham et al., 1997; Phillips et al., 2009). While preschool math ability is found to be the most powerful predictor of children’s later achievements (including later reading and math abilities) (Duncan et al., 2007), preschool teachers continue to place a stronger emphasis on literacy instead of mathematics (Lee & Ginsburg, 2009). Here, we find overconfidence to be a potential limitation of teachers’ awareness of their inadequate math teaching. Our question is, then, how can researchers inform teachers that they are not doing enough math? As a few teachers have suggested, the most direct way is to provide feedback on their current practices. Classroom observations—either by peers or by early math specialists—would provide more learning and
reflection opportunities. In-service training should address teachers’ desire to learn and improve on the weaknesses in their current teaching practices.

Lee (2004) demonstrated an example of a Teacher Needs-Based Professional Development Program for K-8 teachers. He explored teachers and students’ needs and identified areas of deficiency in the local math curriculum through a survey, Statewide Standardized test outcomes, and local school’s improvement plans. Information collected was then used to develop the goals, content, activities, and overall structure of the program. Lee found teacher needs-based model helpful in changing their attitudes, beliefs, and practices with math teaching; he concluded, “A professional development program must be developed based on what participants need and what they already know…Project goals must respond to the potential project participants’ needs and expectations of a program.” The current study expanded upon their findings by exploring preschool teachers’ needs and their current practices through one-on-one conversations. Future study could incorporate our findings into the development of Teacher Needs-Based programs for preschool teachers.

Taken together, our findings point to the need for a stronger emphasis on teachers’ needs and preferences prior to the development of training programs and curricula. Indeed, the inability to address the individual needs and concerns of teachers is one of the reasons curricula and training programs fail (Fullan, 1979). This study shows that most teachers believe their early math teaching is sufficient; they also perceive preschool as a dynamic learning environment that constantly requires teachers’ sensitivity and flexibility. Thus, professional development that values teachers’ needs for autonomy, flexibility, and creativity would make in-service training more relevant and desirable. As teachers enjoy sharing ideas and discussing their challenges (Singh & Shifflette, 1996), training providers and curriculum developers should create
opportunities for preschool teachers to voice their concerns and contribute to the development of materials and training (Clarke, 1994).

This study is a first attempt to explore preschool teachers’ needs and their perspectives on early math education. While this study brought to light teachers’ thoughts and current practices, participants were limited to a small sample of teachers in central Connecticut. This research should extend across the nation to provide a more in-depth understanding of teachers’ needs. Further, quantitative follow-up studies would help explore the relationships between various factors, such as teachers’ education background, their sense of sufficiency, and their current practices (see Appendix D for a draft sample online survey for follow-up studies). It is our hope that curriculum developers, training providers, and researchers will put more emphasis on preschool teachers’ needs, knowledge, and viewpoints as they aim to improve early mathematics education.
References


Appendix A
Interview script for the first round of teacher interviews

I) Introduction
Thank you very much for taking the time to talk to me today. I am (name) from Wesleyan University. The interview that you are about to participate is part of my class project. This interview focuses on teachers’ needs in the classroom and their perspectives on early childhood education, particularly math education. The purpose of this study is not to evaluate individual teachers or classrooms. Instead, we hope to provide a clearer picture of teachers’ needs and opinions for researchers, curriculum developers, and administrators.

II) Signing the Informed Consent Form
Before you sign the interview consent form, I would like to tell you the details and procedure.

This interview will last roughly 30-40 minutes. You may discontinue the interview or take a break at any time. Participation of this study is voluntary, and your response will remain anonymous. After we have completed the interview, you will receive $10 as compensation to thank you for your participation. Your responses will be audiotaped for data collection purposes only. The audiotape will be kept confidential and stored securely at the research lab. You may be invited to participate in classroom observation in spring semester as well.

Here is the consent form of this interview. Do you have any questions about the procedure of the interview? At the end of this interview, I will provide more background information about this study. (Teacher reads and signs the consent form.)

-----------------------------START RECORDING-----------------------------------

III) Interview with Preschool Teachers
This interview consists of two parts. The first part will focus on your thoughts about preschool classrooms and early childhood education; the second part will focus specifically on math education. As I said earlier, the goal of this interview is not to evaluate your teaching or your classroom, but to understand teachers’ needs and opinions in general.

(Interviewers are required to include the bolded questions listed below.)

Part 1: General questions
1) Tell me about your educational background.
   - How many years have you been teaching at a preschool?
   - What is your educational training?
2) What’s your classroom like? Tell us more about your classroom.
   - How many students are there in your class?
   - What is the priority in your teaching? (Or: Which aspect of early childhood education do you think is the most important? Why?)
   - Of literacy, math, social skills, which do you spend the most time on?
   - Are most of the activities self-directed, or instruction-based?

3) Curriculum
   - How do you pick materials for class? (e.g. Purchased curriculum, online resources, mix and match approach)
   - What is your curriculum model?

Part 2: Math education
1) Tell me your educational background on early mathematics.
   - Where did you learn about children’s math development? What was the focus of those courses? (e.g. Courses taken in teacher education programs)
   - What do you know about children’s math development?

2) How comfortable and supported do you feel teaching math?
   - How comfortable do you feel with children who are at different levels in their math learning?
   - What kind of support do you receive? (e.g. Principal, school administrators, professional development, and curriculum developers)
   - Is support adequate? Why?
   - What does the ideal support system look like?

3) How do you address math in your classroom?
   - On an average day, how much time do you spend on math (reflect on the past two weeks)? (Or: How many math related activities do you do?)
   - Outside of the regular math time, what are some math components in the classroom? (e.g. Math talks, classroom decorations)
   - What kind of math-related knowledge are your students most interested in?

4) What kind of materials are you using for math?
   - Are you using a math curriculum?
   - What types of activities do you choose to implement in class? (e.g. Sorting, counting, and patterning)
   - How do you choose your math activities?
· How often do you use the curriculum or the materials? (e.g. Never, once a week, less than three times a week, every class)

5) If teacher is using a math curriculum, ask about the one that he/she is using;
   If teacher is not using a math curriculum, ask about his/her opinion on curricula in general.
   · What do you think about the math curriculum/materials that you’re using?
   · What would make it easier for you to use the curriculum?
   · What do you find difficult? (e.g. Clarity of the instructions, practicality, and students’ learning outcome)
   · Are you hoping to make any changes? What kinds of changes are you hoping to make for inclusion of math or math curricula in your classroom?

6) Anything else you might want to say?

IV) Debriefing
Thank you very much for completing the interview. We appreciate your help! Would you like to know more about the background of the study?

In previous studies on curriculum development, researchers mainly focus on children’s learning stages, teachers’ skills, and the quality of activities. They do not pay much attention to teachers’ needs. We think that teachers know their classrooms and students best and researchers should consider teachers’ perspectives when they are developing the materials.

Therefore, this study looks at the questions of “What do teachers need to support math learning?” and “Are their needs met by curriculum developers and administrators?” Our goal is to initiate conversations with preschool teachers in order to find out the kinds of support they need and the difficulties they face. We would also like to provide curriculum developers a more comprehensive picture of teachers’ perspectives, which will be valuable for future development of curricula.

If you are interested in learning more about this study, or if you have concerns about your rights as a participant, please contact Professor Anna Shusterman or Angela Lo. [Give teacher the debriefing sheet and $10.] Do you have any other questions or comments about anything you did today or anything we have talked about? Thanks again for your participation!
Appendix B
Questions for the second round of teacher interviews

Part 1: General view
1) Education background:
   • How many years have you been teaching at a preschool?
   • What is your educational degree?

2) Standards: In our previous round of interviews, many teachers reported following the Preschool Assessment Framework. However, we don’t have much information on teachers’ opinions on the PAF, or performance standards in general.
   • What do you think about the PAF (or other standards that you are following)?
   • Are the standards developmentally appropriate for children in your class?
   • Are there missing areas or topics in the standards?

Part 2: Math
1) Goals:
   • Which math concepts are developmentally appropriate for preschoolers?
   • What do you think is too hard, and doesn't belong to preschool?

2) Support:
   • What kind of support do you receive? (e.g. Principal, school administrators, professional development, and curriculum developers) Is support adequate? Why?
   • What are some challenges you face as you are teaching math?
   • Do you think that curriculum developers, researchers, or administrators are aware of the challenges you face?
   • Which of the challenges you face do you think outside sources actively try to help you with?

3) Teachers beliefs:
   • How comfortable do you feel teaching math?
   • What are you most successful at engaging children in math?

4) Anything else you might want to say?
## Appendix C
### Codebook

<table>
<thead>
<tr>
<th>Codes</th>
<th>Code Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns</td>
<td>What do teachers care about as they plan for the day? What influences teachers' decisions?</td>
</tr>
<tr>
<td>Behavioral issues in the classroom</td>
<td>Children's behavioral problems that interfere with teaching</td>
</tr>
<tr>
<td>Classroom as a comfortable community</td>
<td>Teacher tries to create a comfortable learning environment and to develop trusting relationships in the classroom</td>
</tr>
<tr>
<td>Common Core</td>
<td>Teacher tries to align his/her lesson plans with the Kindergarten Common Core</td>
</tr>
<tr>
<td>Describing children's abilities</td>
<td>Teacher describes the different or similar levels in children's performance in the classroom</td>
</tr>
<tr>
<td>Developing independence</td>
<td>Teacher sets development of independence as a goal</td>
</tr>
<tr>
<td>Difficult to allocate time for math</td>
<td>Teacher has difficulty fitting math into the classroom schedule</td>
</tr>
<tr>
<td>Diverse age groups</td>
<td>The classroom is made up of children of a variety of ages with different needs</td>
</tr>
<tr>
<td>Diverse backgrounds</td>
<td>The classroom is made up of children from a variety of backgrounds with different needs</td>
</tr>
<tr>
<td>Go by PAF</td>
<td>Teacher reports using the Connecticut Preschool Assessment Framework (PAF) as guide in classroom planning, oftentimes in place of a published curriculum</td>
</tr>
<tr>
<td>Go by ELDS</td>
<td>Teacher reports using the Early Learning and Development Standards as guide in classroom planning, oftentimes in place of a published curriculum</td>
</tr>
<tr>
<td>Head teacher's decision</td>
<td>Teacher describes lesson planning as a responsibility of the head teacher</td>
</tr>
<tr>
<td>Limitations of performance standards</td>
<td>Teacher expresses opinions about the limitations of the PAF, ELDS, or other performance standards</td>
</tr>
<tr>
<td>No control over what to focus on</td>
<td>Teacher feels he/she does not have the authority to decide his/her primary focuses in the classroom</td>
</tr>
<tr>
<td>Number of students in class</td>
<td>Teacher provides information about the total number of students in class</td>
</tr>
<tr>
<td>School readiness</td>
<td>Teacher sets kindergarten readiness as a goal</td>
</tr>
<tr>
<td>Setting higher expectations on the students</td>
<td>Teacher mentions setting high expectations on the students in class</td>
</tr>
<tr>
<td>Strengths of performance standards</td>
<td>Teacher expresses opinions about the benefits of following performance standards</td>
</tr>
<tr>
<td>Teacher's response to children's preferences and personality</td>
<td>Teacher explains how different preferences and personalities in children are dealt with</td>
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<tr>
<td>-------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Teacher's response to different abilities and needs</td>
<td>Teacher explains how different abilities and needs in children are dealt with</td>
</tr>
<tr>
<td>Using informal assessments</td>
<td>Teacher conducts informal assessments in class</td>
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<td>Using preschool assessment</td>
<td>Teacher uses a preschool assessment in class</td>
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<tr>
<td>Using teacher-created assessments</td>
<td>Teacher creates assessments to evaluate children's mathematical ability</td>
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</table>

<table>
<thead>
<tr>
<th>Curricula</th>
<th>How are teachers using published curricula? What do they think about published curricula?</th>
</tr>
</thead>
<tbody>
<tr>
<td>About to get a curriculum</td>
<td>Teacher is in the process of selecting a new math curriculum</td>
</tr>
<tr>
<td>Head Start curriculum</td>
<td>Head Start teacher who is currently following the Head Start curriculum</td>
</tr>
<tr>
<td>Mix-and-match approach</td>
<td>Teacher does not adhere solely to one curriculum or resource but selects pieces of various sources to create lesson plans</td>
</tr>
<tr>
<td>No longer using a published curriculum</td>
<td>Teacher no longer uses a published curriculum; teacher has used a curriculum (/curricula) in the past</td>
</tr>
<tr>
<td>Not given a published curriculum</td>
<td>Teacher was not provided with a published curriculum</td>
</tr>
<tr>
<td>Not opposed to published curricula</td>
<td>Teacher would be willing to try a published curriculum were they given the option</td>
</tr>
<tr>
<td>Not using a published math curriculum</td>
<td>Teacher is not using a published math curriculum</td>
</tr>
<tr>
<td>Own a published curriculum</td>
<td>Teacher has a published math curriculum (/curricula) in the classroom</td>
</tr>
<tr>
<td>Published curricula</td>
<td>Teacher mentions the names of published curricula</td>
</tr>
<tr>
<td>Reasons for not using published curricula</td>
<td>Teacher's explanations for not using published curricula</td>
</tr>
<tr>
<td>Reasons for using published curricula</td>
<td>Teacher's explanations for using published curricula</td>
</tr>
<tr>
<td>Using published curricula</td>
<td>Teacher is using published curricula (including comprehensive or math specific curricula)</td>
</tr>
<tr>
<td>Using the math component in a literacy curriculum</td>
<td>Teacher uses the math component of a literacy curriculum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education Background</th>
<th>What are teachers' education degrees, majors, and years of experience?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate's degree</td>
<td>Teacher holds an Associate's degree</td>
</tr>
<tr>
<td>Qualification</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>Teacher holds a Bachelor's degree</td>
</tr>
<tr>
<td>CDA</td>
<td>Teacher holds the Child Development Associates Credential</td>
</tr>
<tr>
<td>Degree in curriculum and instruction</td>
<td>Teacher has a degree in Curriculum and Instruction</td>
</tr>
<tr>
<td>Degree in Early Childhood Education</td>
<td>Teacher has a degree in Early Childhood</td>
</tr>
<tr>
<td>Degree in Education (unspecified)</td>
<td>Teacher does not mention the specific educational degree</td>
</tr>
<tr>
<td>Degree in Elementary Education</td>
<td>Teacher has a degree in Elementary Education</td>
</tr>
<tr>
<td>Degree in related fields</td>
<td>Teacher has a degree in early childhood related fields,</td>
</tr>
<tr>
<td></td>
<td>including Home Economics, Sociology, Psychology, Human Development, and Family Relations</td>
</tr>
<tr>
<td>Degree in special education</td>
<td>Teacher has a degree in Special Education</td>
</tr>
<tr>
<td>Math course content</td>
<td>Teacher describes the content of math courses they took before receiving the degree</td>
</tr>
<tr>
<td>Master's degree</td>
<td>Teacher holds a Master's degree</td>
</tr>
<tr>
<td>No previous math development courses</td>
<td>Teacher did not take any math courses in early mathematics development in his/her education program</td>
</tr>
<tr>
<td>No previous math training</td>
<td>Teacher did not receive training in math (after receiving the degree)</td>
</tr>
<tr>
<td>Previous early childhood settings</td>
<td>Teacher describes his/her previous experience at early childhood settings</td>
</tr>
<tr>
<td>Years at preschools</td>
<td>Teacher mentions the number of years he/she has been working at preschool</td>
</tr>
<tr>
<td>Years of experience at current site</td>
<td>Teacher mentions the number of years he/she has been working at current site</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Math Topics</th>
<th>What math topics do teachers teach in class?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addition</td>
<td>Teacher describes or gives examples of addition as math learning in the classroom</td>
</tr>
<tr>
<td>Comparison</td>
<td>Teacher describes or gives examples of comparison of quantities as math learning in the classroom</td>
</tr>
<tr>
<td>Counting</td>
<td>Teacher describes or gives examples of counting as math learning in the classroom (Note: Teacher who is simply stating &quot;How many…&quot; is not considered as &quot;counting&quot;)</td>
</tr>
<tr>
<td>Estimation</td>
<td>Teacher describes or gives examples of estimation as math learning in the classroom</td>
</tr>
<tr>
<td>Graphing</td>
<td>Teacher describes or gives examples of graphing as math learning in the classroom</td>
</tr>
<tr>
<td>Matching</td>
<td>Teacher describes or gives examples of matching as</td>
</tr>
<tr>
<td>Math Learning Category</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Measurement</td>
<td>Teacher describes or gives examples of measurement as math learning in the classroom</td>
</tr>
<tr>
<td>Number learning</td>
<td>Teacher describes or gives examples of number learning, including number sequence and number recognition, as math learning in the classroom</td>
</tr>
<tr>
<td>One-to-one correspondence</td>
<td>Teacher describes or gives examples of one-to-one correspondence as math learning in the classroom</td>
</tr>
<tr>
<td>Patterning</td>
<td>Teacher describes or gives examples of patterning as math learning in the classroom</td>
</tr>
<tr>
<td>Probability</td>
<td>Teacher describes or gives examples of probability as math learning in the classroom</td>
</tr>
<tr>
<td>Shapes</td>
<td>Teacher describes or gives examples of shapes as math learning in the classroom</td>
</tr>
<tr>
<td>Sorting</td>
<td>Teacher describes or gives examples of sorting as math learning in the classroom</td>
</tr>
</tbody>
</table>

### Practices

<table>
<thead>
<tr>
<th>Practice Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>How does the classroom setup for math time look? How much time (on average) are teachers spending on math in class?</td>
<td>How does the classroom setup for math time look? How much time (on average) are teachers spending on math in class?</td>
</tr>
<tr>
<td>Both child-initiated and teacher-directed</td>
<td>Children can both initiate their own learning activities or receive guidance and instruction from their teacher (If coded &quot;Both child-initiated and teacher-directed,&quot; do not code the same sentence as &quot;Child-initiated/self-directed learning&quot; or &quot;Teacher-directed.&quot;)</td>
</tr>
<tr>
<td>Calendar</td>
<td>A popular math activity in the classroom. It is a routine that involves a simple discussion on the dates, numbers, and days of the week (see Erithdge &amp; King, 2005)</td>
</tr>
<tr>
<td>Child-initiated/self-directed learning</td>
<td>Children are free to engage in learning without teacher instruction; children have control over their learning experience</td>
</tr>
<tr>
<td>Describing a math-related activity</td>
<td>Teacher describes the procedure of a math-related activity (could be in-class or outdoor activities)</td>
</tr>
<tr>
<td>Doing a lot of math</td>
<td>Teacher feels math is a regularly incorporated activity or teacher expresses doing a lot of math in the classroom</td>
</tr>
<tr>
<td>Doing math every day</td>
<td>Math activities are participated in every day</td>
</tr>
<tr>
<td>Materials for math</td>
<td>Materials used for math teaching</td>
</tr>
</tbody>
</table>
### Math activity books
Teacher uses math activity books as a resource for ideas. (Note: "Math activity books" are books that include many math activities but are not categorized as curricula; picture books with number content are not considered as "math activity books")

### Math in center time
Math is an open center activity which children can participate in of their own volition.

### Math in daily routine
Math is incorporated in everyday activities, such as lining up and distributing snacks.

### Math in other classroom activities
Math is incorporated across subjects.

### Math in play
Using play as a way to learn math.

### No specific math time
There is no time in the schedule specifically allotted to math instruction.

### Specific math days
Teacher sets aside certain days for math learning.

### Teacher-directed
Teacher provides guidance and instructions for the children.

### Thematic approach
Teacher creates lesson plans according to a specific theme.

### Time spent on math
Amount of time teacher believes is spent on math in classroom. Teacher is asked, "On an average day, how much time do you spend on math (reflect on the past two weeks)?"

### Using teacher-created materials
Teacher gives example of the materials he/she created for math learning in class.

### Want to include more math
Teacher wants to include more math in the classroom.

### Priorities in Preschool Classroom

<table>
<thead>
<tr>
<th>Area</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All areas are important</td>
<td>Teacher thinks all areas of early childhood education are important (areas such as literacy, math, socioemotional skills, and others) and he/she tries to include activities in from all areas</td>
</tr>
<tr>
<td>Area: Fine motor</td>
<td>Teacher describes fine motor development as an area of teaching</td>
</tr>
<tr>
<td>Area: Language</td>
<td>Teacher describes language as an area of teaching</td>
</tr>
<tr>
<td>Area: Math</td>
<td>Teacher describes math as an area of teaching</td>
</tr>
<tr>
<td>Area: Science</td>
<td>Teacher describes science as an area of teaching</td>
</tr>
<tr>
<td>Area: Social skills</td>
<td>Teacher describes social skill as an area of teaching</td>
</tr>
<tr>
<td>Free play program</td>
<td>Teacher describes the program type: a type of program that emphasizes children's free interactions with the</td>
</tr>
</tbody>
</table>
Teacher describes or gives examples of developing critical learners as his/her priority in teaching.

Teacher describes or gives examples of playing outside as his/her priorities in teaching.

Teacher describes or gives examples of literacy as his/her priorities in teaching.

Teacher describes or gives examples of social skills as his/her priorities in teaching.

Teacher describes or gives examples of socioemotional skills as his/her priorities in teaching.

Teacher expresses preferred focus(es) in classroom activities and learning.

How do teachers describe their experiences with professional development?

Teacher mentions the benefits of professional development, such as workshops and training.

Teacher specifically mentions what they learn or the topics covered in PD (Note: Teacher listing out the title of training/workshop is not considered as "Content of PD").

Teacher expresses that there is a lack of math workshops for preschool teachers.

Teacher mentions the training he/she has received; training is more direct, and one-way than workshops.

Teacher mentions the workshops he/she has attended (for math and other areas); workshops are often more interactive than training.

How do teachers think about their existing support for math teaching?

Teacher does not feel supported teaching math in the classroom.

Teacher feels supported teaching math in the classroom.

Teacher receives ideas or materials from fellow teachers.

Teacher uses Internet as a resource for ideas.

Teacher reports having limited funding.

Teacher reports having limited materials.
<table>
<thead>
<tr>
<th>Little support from administrators</th>
<th>Teacher does not receive much support from administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD as support</td>
<td>Teacher defines professional development such as training and workshops as a source of support</td>
</tr>
<tr>
<td>Provision of materials as support</td>
<td>Teacher defines the provision of materials as support</td>
</tr>
<tr>
<td>Sources of materials</td>
<td>Teacher explains sources of materials</td>
</tr>
<tr>
<td>Support from state/district</td>
<td>Teacher describes or gives examples of support from the state education department or the school district</td>
</tr>
<tr>
<td>Support and guidance for new teachers</td>
<td>Teacher mentions support is needed especially for new teachers</td>
</tr>
<tr>
<td>Support from educational coordinator or consultant</td>
<td>Teacher describes or gives examples of support from educational coordinator or consultant</td>
</tr>
<tr>
<td>Support from parents</td>
<td>Teacher describes or gives examples of support from parents</td>
</tr>
<tr>
<td>Support from the principal</td>
<td>Teacher describes or gives examples of support from the principal</td>
</tr>
<tr>
<td>The need for feedback</td>
<td>Teacher expresses wanting to have more feedback with regards to math teaching</td>
</tr>
<tr>
<td>Want a preschool math specialist</td>
<td>Teacher wants a preschool math specialist to support math teaching</td>
</tr>
<tr>
<td>Want more ideas</td>
<td>Teacher wants more ideas for math activities</td>
</tr>
<tr>
<td>Want more materials</td>
<td>Teacher wants more materials for math activities</td>
</tr>
<tr>
<td>Want more support</td>
<td>Teacher wants more support for math teaching</td>
</tr>
<tr>
<td>Want more training</td>
<td>Teacher wants more math training</td>
</tr>
</tbody>
</table>

**Teacher's Perspectives**

<table>
<thead>
<tr>
<th>Teacher's Perspectives</th>
<th>What do teachers think about early childhood education and math education?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomy and freedom</td>
<td>Teacher's ability to plan for the classroom without restrictions</td>
</tr>
<tr>
<td>Enjoy teaching at preschools</td>
<td>Teacher is content about teaching at preschools</td>
</tr>
<tr>
<td>Feel comfortable teaching math</td>
<td>Teacher feels comfortable teaching math</td>
</tr>
<tr>
<td>Feel comfortable using preschool assessments</td>
<td>Teacher feels comfortable using preschool assessments</td>
</tr>
<tr>
<td>Feel uncomfortable teaching math</td>
<td>Teacher feels uncomfortable teaching math</td>
</tr>
<tr>
<td>Flexibility and creativity</td>
<td>Teacher's ability to respond and adapt to different or unexpected situations in the classroom as they come up</td>
</tr>
<tr>
<td>Learn from personal experiences with early math development</td>
<td>Teacher uses his/her personal experiences and knowledge as a resource for ideas</td>
</tr>
<tr>
<td>Stronger emphasis on math education nowadays</td>
<td>Teacher thinks there is a stronger emphasis on early math development compared to his/her own time in school</td>
</tr>
<tr>
<td>Teacher confidence</td>
<td>Teacher expresses confidence in teaching</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>Teacher's challenges</td>
<td>Teacher identifies challenges related to math teaching, including the lack of feedback, the diversity of children’s abilities, and difficulty in engaging children in math activities</td>
</tr>
<tr>
<td>Teacher's knowledge about math</td>
<td>Teacher's explains what he/she knows about math or early math</td>
</tr>
<tr>
<td>Teacher's positive attitude toward math</td>
<td>Teacher expresses positivity toward mathematics</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Teachers work together as they create lesson plans and teach mathematics</td>
</tr>
</tbody>
</table>
Preschool Teachers’ Perspectives on Early Math Education

This survey explores teachers’ current practices, needs, support, and their general opinion on early math education. Results would provide researchers a new and crucial viewpoint as they encourage teachers to provide more math instruction in the classroom.

* Required

1. How many years have you been teaching in preschool classrooms? *
   At current location or elsewhere

2. What is your highest education degree? *
   Mark only one oval.
   - Teaching Certificate
   - Associates
   - Bachelors
   - Masters
   - Other:

3. What are your degrees in? *
   Check all that apply.
   - Early Childhood Education
   - Elementary Education
   - Special Education
   - Curriculum and instruction
   - Other:

4. On average, how much time are you spending on math each day? (Reflect on the past two weeks) *
   Mark only one oval.
   - Less than 15 minutes
   - 15-30 minutes
   - 30 minutes to an hour
   - 1-2 hours
   - More than 2 hours
5. **What type of materials are you currently using to teach math?** *
   
   *Check all that apply.*
   
   [ ] Published math curricula
   [ ] Online resources
   [ ] Purchased materials
   [ ] Materials you made yourself
   [ ] Other: ________________________________________________________________

6. **Which of the following factors strongly influence your planning for the day?** *
   
   *Check as many as apply.*
   
   [ ] Following a curriculum
   [ ] Meeting teaching standards
   [ ] Behavioral issues in the classroom
   [ ] Diverse age groups of the students
   [ ] Diverse backgrounds of the students
   [ ] Different preferences and personalities of students
   [ ] Different needs and abilities of students
   [ ] Other: ________________________________________________________________

7. **What obstacles to teaching math do you face in the classroom? Explain or give an example.** *

   ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

8. **Which areas of focus are most important in your classroom?** *
   
   *Check all that apply.*
   
   [ ] Literacy
   [ ] Math
   [ ] Social/socioemotional skills
   [ ] Fine motor development
   [ ] Other: ________________________________________________________________
9. **Please rank the effectiveness of the following types of support for your math teaching in class** *

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Support</th>
<th>1 (Least Effective)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (Most Effective)</th>
<th>Not Applicable/Did not receive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Workshops and training)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses at your educational institution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational consultants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Researchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curriculum providers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State/district</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. **What types of support would be useful for you to have in order to include more math in the classroom?** *

*Check all that apply.*

- [ ] Professional development (Workshops and training)
- [ ] Courses at your educational institution
- [ ] Educational consultants
- [ ] Researchers
- [ ] Curriculum providers
- [ ] Other teachers
- [ ] Administrators
- [ ] Principal
- [ ] Parents
- [ ] State/district
- [ ] Other: ____________________________
11. **How do you feel about teaching mathematics?** *

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Statement</th>
<th>1 (Strongly Disagree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (Strongly Agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>When I was in school, I really struggled with my math courses.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would like to develop my math teaching skills more.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am giving my students a better introduction to mathematics than I had when I was in school.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math is very interesting and rewarding to teach.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching math is uncomfortable for me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel as though I am a successful math teacher.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel supported in my efforts to teach math.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think I am not able to teach enough math.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>